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34.163.2 Member Function Documentation

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Chapter 1

FLTK Programming Manual

This software and manual are provided under the terms of the GNU Library General Public License. Permission is granted to reproduce this manual or any portion for any purpose, provided this copyright and permission notice are preserved.
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Chapter 2

Preface

This manual describes the Fast Light Tool Kit ("FLTK") version 1.4.0, a C++ Graphical User Interface ("GUI") toolkit for UNIX, Microsoft Windows and Apple OS X.

Version 1.4.0 introduces support for a new windowing system under Linux/Unix: Wayland. FLTK applications under Linux/Unix run, unchanged, as Wayland or X11 clients depending on what’s available at run-time.

Each of the chapters in this manual is designed as a tutorial for using FLTK, while the appendices provide a convenient reference for all FLTK widgets, functions, and operating system interfaces.

This manual may be printed, modified, and/or used under the terms of the FLTK license provided in Software License.

2.1 Organization

This manual is organized into the following chapters and appendices:

- Introduction to FLTK
- FLTK Basics
- Common Widgets and Attributes
- Designing a Simple Text Editor
- Drawing Things in FLTK
- Handling Events
- Adding and Extending Widgets
- Using OpenGL
- Programming with FLUID
- FLTK Runtime Options
- Advanced FLTK
- Unicode and UTF-8 Support
- Constants and Enumerations
2.2 Conventions

This manual was generated using Doxygen (see http://www.doxygen.org/) to process the source code itself, special comments in the code, and additional documentation files. In general, Doxygen recognizes and denotes the following entities as shown:

- classes, such as Fl_Widget,
- methods, such as Fl_Widget::callback(Fl_Callback * cb, void * p),
- functions, such as fl_draw(const char *str, int x, int y),
- internal links, such as Conventions,
- external links, such as http://www.stack.nl/~dimitri/doxygen/

Other code samples and commands are shown in regular courier type.

2.3 Abbreviations

The following abbreviations are used in this manual:

X11

The X Window System version 11.

Xlib

The X Window System interface library.

MS Windows, WIN32

The Microsoft Windows Application Programmer's Interface for Windows 2000, Windows XP, Windows Vista, Windows 7 and later Windows versions. FLTK uses the preprocessor definition _WIN32 for the 32 bit and 64 bit MS Windows API.

OS X, APPLE

The Apple desktop operating system OS X 10.0 and later. MacOS 8 and 9 support was dropped after FLTK 1.0.10. FLTK uses the preprocessor definition APPLE for OS X.

2.4 Copyrights and Trademarks

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Chapter 3

Introduction to FLTK

The Fast Light Tool Kit (“FLTK”) is a cross-platform C++ GUI toolkit for UNIX®/Linux® (X11 or Wayland), Microsoft® Windows®, and Apple® macOS®.

FLTK provides modern GUI functionality without the bloat and supports 3D graphics via OpenGL® and its built-in GLUT emulation. It was originally developed by Mr. Bill Spitzak and is currently maintained by a small group of developers across the world with a central repository in the US.

3.1 History of FLTK

It has always been Bill’s belief that the GUI API of all modern systems is much too high level. Toolkits (even FLTK) are not what should be provided and documented as part of an operating system. The system only has to provide arbitrary shaped but featureless windows, a powerful set of graphics drawing calls, and a simple unalterable method of delivering events to the owners of the windows. NeXT (if you ignored NextStep) provided this, but they chose to hide it and tried to push their own baroque toolkit instead.

Many of the ideas in FLTK were developed on a NeXT (but not using NextStep) in 1987 in a C toolkit Bill called “views”. Here he came up with passing events downward in the tree and having the handle routine return a value indicating whether it used the event, and the table-driven menus. In general he was trying to prove that complex UI ideas could be entirely implemented in a user space toolkit, with no knowledge or support by the system.

After going to film school for a few years, Bill worked at Sun Microsystems on the (doomed) NeWS project. Here he found an even better and cleaner windowing system, and he reimplemented “views” atop that. NeWS did have an unnecessarily complex method of delivering events which hurt it. But the designers did admit that perhaps the user could write just as good of a button as they could, and officially exposed the lower level interface.

With the death of NeWS Bill realized that he would have to live with X. The biggest problem with X is the “window manager”, which means that the toolkit can no longer control the window borders or drag the window around.

At Digital Domain Bill discovered another toolkit, “Forms”. Forms was similar to his work, but provided many more widgets, since it was used in many real applications, rather than as theoretical work. He decided to use Forms, except he integrated his table-driven menus into it. Several very large programs were created using this version of Forms.

The need to switch to OpenGL and GLX, portability, and a desire to use C++ subclassing required a rewrite of Forms. This produced the first version of FLTK. The conversion to C++ required so many changes it made it impossible to recompile any Forms objects. Since it was incompatible anyway, Bill decided to incorporate his older ideas as much as possible by simplifying the lower level interface and the event passing mechanism.

Bill received permission to release it for free on the Internet, with the GNU general public license. Response from Internet users indicated that the Linux market dwarfed the SGI and high-speed GL market, so he rewrote it to use X for all drawing, greatly speeding it up on these machines. That is the version you have now.

Digital Domain has since withdrawn support for FLTK. While Bill is no longer able to actively develop it, he still contributes to FLTK in his free time and is a part of the FLTK development team.
3.2 Features

FLTK was designed to be statically linked. This was done by splitting it into many small objects and designing it so
that functions that are not used do not have pointers to them in the parts that are used, and thus do not get linked in.
This allows you to make an easy-to-install program or to modify FLTK to the exact requirements of your application
without worrying about bloat. FLTK works fine as a shared library, though, and is now included with several Linux
distributions.

Here are some of the core features unique to FLTK:

- `sizeof(Fl_Widget) == 64 to 92`

- The "core" (the "hello" program compiled & linked with a static FLTK library using gcc on a 486 and then
  stripped) is 114K.

- The FLUID program (which includes every widget) is 538k.

- Written directly atop core libraries (Xlib, Wayland, Windows or Cocoa) for maximum speed, and carefully
  optimized for code size and performance.

- Precise low-level compatibility between the X11, Windows and MacOS versions - only about 10% of the code
  is different.

- Interactive user interface builder program. Output is human-readable and editable C++ source code.

- Support for overlay hardware, with emulation if none is available.

- Very small & fast portable 2-D drawing library to hide Xlib, Cairo, Windows, or macOS Quartz.

- OpenGL/Mesa drawing area widget.

- Support for OpenGL overlay hardware on both X11 and Windows, with emulation if none is available.

- Text widgets with cut & paste, undo, and support for Unicode text and international input methods.

- Compatibility header file for the GLUT library.

- Compatibility header file for the XForms library.

3.3 Licensing

FLTK comes with complete free source code. FLTK is available under the terms of the GNU Library General Public License
with exceptions that allow for static linking. Contrary to popular belief, it can be used in commercial software - even
Bill Gates could use it!
3.4 What Does "FLTK" Mean?

FLTK was originally designed to be compatible with the Forms Library written for SGI machines. In that library all the functions and structures started with "fl_". This naming was extended to all new methods and widgets in the C++ library, and this prefix was taken as the name of the library. It is almost impossible to search for "FL" on the Internet, due to the fact that it is also the abbreviation for Florida. After much debating and searching for a new name for the toolkit, which was already in use by several people, Bill came up with "FLTK"; including a bogus excuse that it stands for "The Fast Light Toolkit".

3.5 Building and Installing FLTK with CMake

Starting with version 1.4, the recommended FLTK building system is CMake. See file README.CMake of the FLTK source tree for all information. It's also possible to use configure and make as follows to build and install FLTK.

3.6 Building and Installing FLTK Under UNIX and macOS with make

In most cases you can just type "make". This will run configure with the default of no options and then compile everything.

FLTK uses GNU autoconf to configure itself for your UNIX platform. The main things that the configure script will look for are the X11 and OpenGL (or Mesa) header and library files. If these cannot be found in the standard include/library locations you'll need to define the CFLAGS, CXXFLAGS, and LDFLAGS environment variables. For the Bourne and Korn shells you'd use:

CFLAGS=-Iincludedir; export CFLAGS
CXXFLAGS=-Iincludedir; export CXXFLAGS
LDFLAGS=-Llibdir; export LDFLAGS

For C shell and tcsh, use:
setenv CFLAGS "-Iincludedir"
setenv CXXFLAGS "-Iincludedir"
setenv LDFLAGS "-Llibdir"

By default configure will look for a C++ compiler named CC, c++, g++, or gcc in that order. To use another compiler you need to set the CXX environment variable:
CXX=xlC; export CXX
setenv CXX "xlC"

The CC environment variable can also be used to override the default C compiler (cc or gcc), which is used for a few FLTK source files.

You can run configure yourself to get the exact setup you need. Type "./configure <options>"; where options are:

- enable-cygwin
  Enable the Cygwin libraries under Windows

- enable-debug
  Enable debugging code & symbols

- disable-gl
  Disable OpenGL support
--disable-svg

Disable support of reading and writing of Support Vector Graphics (.svg) files.

--disable-print

Disable print support for an X11/Wayland platform

--enable-shared

Enable generation of shared libraries

--enable-threads

Enable multithreading support

--enable-wayland

This is the default for Linux and FreeBSD systems equipped with the Wayland software. Enable the use of Wayland for all window operations, of Cairo for all graphics and of Pango for text drawing. Resulting FLTK apps run as Wayland clients if a Wayland compositor is available at run-time, and as X11 clients otherwise but keep using Cairo and Pango for all graphics.

--disable-xft

Disables the Xft library, resulting in non anti-aliased fonts (X11 platform).

--enable-usecairo

All drawing operations use the Cairo library (rather than Xlib) producing antialiased graphics (X11 platform, implies --enable-pango).

--enable-pango

Enable the Pango library for drawing any text in any script with any font under X11/Wayland.

--enable-x11

When targeting cygwin, build with X11 GUI instead of windows GDI. Also applicable to macOS platforms supplemented with XQuartz.

--enable-cairo

Enable support of class Fl_Cairo_Window (all platforms, requires the Cairo library).

--enable-cairoext

Enable the FLTK instrumentation for cairo extended use (requires --enable-cairo).
3.7 Building FLTK Under Microsoft Windows

--disable-gdiplus

Don't use GDI+ when drawing curves and oblique lines (Windows platform).

--enable-cp936

Under X11, enable use of the GB2312 locale

--bindir=/path

Set the location for executables [default = $prefix/bin]

--datadir=/path

Set the location for data files. [default = $prefix/share]

--libdir=/path

Set the location for libraries [default = $prefix/lib]

--includedir=/path

Set the location for include files. [default = $prefix/include]

--mandir=/path

Set the location for man pages. [default = $prefix/man]

--prefix=/dir

Set the directory prefix for files [default = /usr/local]

When the configure script is done you can just run the "make" command. This will build the library, FLUID tool, and all of the test programs.

To install the library, become root and type "make install". This will copy the "fluid" executable to "bindir", the header files to "includedir", and the library files to "libdir".

3.7 Building FLTK Under Microsoft Windows

NOTE: This documentation section is currently under review. More up-to-date information for this release may be available in the file "README.Windows.txt" and you should read that file to determine if there are changes that may be applicable to your build environment.

FLTK 1.3 is officially supported on Windows (2000,) 2003, XP, and later. Older Windows versions prior to Windows 2000 are not officially supported, but may still work. The main reason is that the OS version needs to support UTF-8.

FLTK 1.3 is known to work on recent versions of Windows such as Windows 7, Windows 8/8.1 and Windows 10 and has been reported to work in both 32-bit and 64-bit versions of these.

FLTK currently supports the following development environments on the Windows platform:

CAUTION: Libraries built by any one of these build environments can not be mixed with object files from any of the other environments! (They use incompatible C++ conventions internally.)

Free Microsoft Visual C++ 2008 Express and Visual C++ 2010 Express or later versions using workspace and project files generated by CMake. Older versions and the commercial versions can be used as well, if they can open the project files. Be sure to get your service packs!

Since FLTK 1.4 the project files MUST be generated with CMake. Please read "README.CMake.txt" for more information about this.
3.7.1 GNU toolsets (Cygwin or MinGW) hosted on Windows

If using Cygwin with the Cygwin shell, or MinGW with the Msys shell, these build environments behave very much like a Unix or macOS build and the notes above in the section on Building and Installing FLTK Under UNIX and Apple macOS apply, in particular the descriptions of using the "configure" script and its related options.

In general for a build using these tools, e.g. for the Msys shell with MinGW, it should suffice to "cd" into the directory where you have extracted the FLTK tarball and type:

```
./configure
make
```

This will build the FLTK libraries and they can then be utilised directly from the build location. NOTE: this may be simpler than "installing" them in many cases as different tool chains on Windows have different ideas about where the files should be "installed" to.

For example, if you "install" the libraries using Msys/MinGW with the following command:

```
make install
```

Then Msys will "install" the libraries to where it thinks the path "/usr/local/" leads to. If you only ever build code from within the Msys environment this works well, but the actual "Windows path" these files are located in will be something like "C:\msys\1.0\local\lib", depending on where your Msys installation is rooted, which may not be useful to other tools.

If you want to install your built FLTK libraries in a non-standard location you may do:

```
sh configure --prefix=C:/FLTK
make
```

Where the value passed to "prefix" is the path at which you would like FLTK to be installed.

A subsequent invocation of "make install" will then place the FLTK libraries and header files into that path.

The other options to "configure" may also be used to tailor the build to suit your environment.

3.7.2 Using the Visual C++ DLL Library

The "fltkdll.dsp" project file builds a DLL-version of the FLTK library. Because of name mangling differences between PC compilers (even between different versions of Visual C++) you can only use the DLL that is generated with the same version compiler that you built it with.

When compiling an application or DLL that uses the FLTK DLL, you will need to define the FL_DLL preprocessor symbol to get the correct linkage commands embedded within the FLTK header files.

3.8 Internet Resources

FLTK is available on the 'net in a bunch of locations:

WWW

- [https://www.fltk.org/](https://www.fltk.org/)
- [https://www.fltk.org/bugs.php](https://www.fltk.org/bugs.php) [for reporting bugs]
- [https://www.fltk.org/software.php](https://www.fltk.org/software.php) [download source code]
- [https://www.fltk.org/newsgroups.php](https://www.fltk.org/newsgroups.php) [newsgroup/forums]

NNTP Newsgroups

- [https://groups.google.com/forum/#!forum/fltkgeneral](https://groups.google.com/forum/#!forum/fltkgeneral) [Google Groups interface]
- [https://www.fltk.org/newsgroups.php](https://www.fltk.org/newsgroups.php) [web interface]
3.9 Reporting Bugs

To report a bug in FLTK, or for feature requests, please use the form at https://www.fltk.org/bugs.php, and click on “Submit Bug or Feature Request”.

You'll be prompted for the FLTK version, operating system & version, and compiler that you are using. We will be unable to provide any kind of help without that basic information.

For general support and questions, please use the fltk.general newsgroup (see above, "NNTP Newsgroups") or the web interface to the newsgroups at https://www.fltk.org/newsgroups.php.
Chapter 4

FLTK Basics

This chapter teaches you the basics of writing and compiling programs that use FLTK.

4.1 Writing Your First FLTK Program

Up to FLTK 1.3.x all FLTK programs were required to include the file `<FL/Fl.H>` as the first FLTK header file.

Since FLTK 1.4.0 this requirement was relaxed and `<FL/Fl.H>` needs only be included if the class `Fl` is used or if some other stuff like enumerations is used in the source code. Example code in this documentation may still include it "everywhere" even if it is no longer strictly required.

In addition the program must include a header file for each FLTK class it uses. Listing 1 shows a simple "Hello, World!" program that uses FLTK to display the window.

Listing 1 - "hello.cxx"

```c
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
int main(int argc, char **argv) {
  Fl_Window *window = new Fl_Window(340, 180);
  Fl_Box *box = new Fl_Box(20, 40, 300, 100, "Hello, World!");
  box->box(FL_UP_BOX);
  box->labelfont(FL_BOLD + FL_ITALIC);
  box->labelsize(36);
  box->labeltype(FL_SHADOW_LABEL);
  window->end();
  window->show(argc, argv);
  return Fl::run();
}
```

After including the required header files, the program then creates a window. All following widgets will automatically be children of this window.

```c
Fl_Window *window = new Fl_Window(340, 180);
```

Then we create a box with the "Hello, World!" string in it. FLTK automatically adds the new box to `window`, the current grouping widget.

```c
Fl_Box *box = new Fl_Box(20, 40, 300, 100, "Hello, World!");
```

Next, we set the type of box and the font, size, and style of the label:

```c
box->box(FL_UP_BOX);
box->labelfont(FL_BOLD + FL_ITALIC);
box->labelsize(36);
box->labeltype(FL_SHADOW_LABEL);
```
We tell FLTK that we will not add any more widgets to window.
window->end();

Finally, we show the window and enter the FLTK event loop:
window->show(argc, argv);
return Fl::run();

The resulting program will display the "Hello, World!" window:

![Figure 4.1 The Hello, World! Window](image)

You can quit the program by closing the window or pressing the ESCape key.

### 4.1.1 Creating the Widgets

The widgets are created using the C++ new operator. For most widgets the arguments to the constructor are:

`Fl_Widget(x, y, width, height, label)`

The `x` and `y` parameters determine where the widget or window is placed on the screen. In FLTK the top left corner of the window or screen is the origin (i.e. `x = 0, y = 0`).

The `width` and `height` parameters determine the size of the widget or window. The maximum widget size is typically governed by the underlying window system or hardware.

What Units Do FLTK Functions Use? describes the unit FLTK employs for `x`, `y`, `width`, and `height`, and more generally, for all graphical quantities.

`label` is a pointer to a character string to label the widget with or NULL. If not specified the label defaults to NULL. The label string must be in static storage such as a string constant because FLTK does not make a copy of it - it just uses the pointer.

### 4.1.2 Creating Widget Hierarchies

Widgets are commonly ordered into functional groups, which in turn may be grouped again, creating a hierarchy of widgets. FLTK makes it easy to fill groups by automatically adding all widgets that are created between a `myGroup->begin()` and `myGroup->end()`. In this example, `myGroup` would be the current group.

Newly created groups and their derived widgets implicitly call `begin()` in the constructor, effectively adding all subsequently created widgets to itself until `end()` is called.

Calling `end()` on one group widget transfers the "current group" property to the parent of that widget. Calling `end()` on a top level window (which has no parent) sets the current group to NULL.

Setting the current group to NULL will stop automatic hierarchies. New widgets can now be added manually using `Fl_Group::add(...)` and `Fl_Group::insert(...).`
4.1 Writing Your First FLTK Program

4.1.3 Get/Set Methods

`box->box(FL_UP_BOX)` sets the type of box the `Fl_Box` draws, changing it from the default of `FL_NO_BOX`, which means that no box is drawn. In our "Hello, World!" example we use `FL_UP_BOX`, which means that a raised button border will be drawn around the widget. More details are available in the Box Types section.

You could examine the boxtype by doing `box->box()`. FLTK uses method name overloading to make short names for get/set methods. A "set" method is always of the form "void name(type)", and a "get" method is always of the form "type name() const".

4.1.4 Redrawing After Changing Attributes

Almost all of the get/set pairs are very fast, short inline functions and thus very efficient. However, the "set" methods do not call `redraw()` - you have to call it yourself. This greatly reduces code size and execution time. The only common exceptions are `value()` which calls `redraw()` and `label()` which calls `redraw_label()` if necessary.

4.1.5 Labels

All widgets support labels. In the case of window widgets, the label is used for the label in the title bar. Our example program calls the `labelfont()`, `labelsize()`, and `labeltype()` methods.

The `labelfont()` method sets the typeface and style that is used for the label, which for this example we are using `FL_BOLD` and `FL_ITALIC`.

The `labelsize()` method sets the height of the font in FLTK units.

The `labeltype()` method sets the type of label. FLTK supports normal, embossed, and shadowed labels internally, and more types can be added as desired.

A complete list of all label options can be found in the section on Labels and Label Types.

4.1.6 Showing the Window

The `show()` method shows the widget or window. For windows you can also provide the command-line arguments to allow users to customize the appearance, size, and position of your windows.

4.1.7 The Main Event Loop

All FLTK applications (and most GUI applications in general) are based on a simple event processing model. User actions such as mouse movement, button clicks, and keyboard activity generate events that are sent to an application. The application may then ignore the events or respond to the user, typically by redrawing a button in the "down" position, adding the text to an input field, and so forth.

FLTK also supports idle, timer, and file pseudo-events that cause a function to be called when they occur. Idle functions are called when no user input is present and no timers or files need to be handled - in short, when the application is not doing anything. Idle callbacks are often used to update a 3D display or do other background processing.

Timer functions are called after a specific amount of time has expired. They can be used to pop up a progress dialog after a certain amount of time or do other things that need to happen at more-or-less regular intervals. FLTK timers are not 100% accurate, so they should not be used to measure time intervals, for example.

File functions are called when data is ready to read or write, or when an error condition occurs on a file. They are most often used to monitor network connections (sockets) for data-driven displays.

FLTK applications must periodically check (Fl::check()) or wait (Fl::wait()) for events or use the Fl::run() method to enter a standard event processing loop. Calling Fl::run() is equivalent to the following code:

```
while (Fl::wait());
```

Fl::run() does not return until all of the windows under FLTK control are closed by the user or your program.
4.2 Naming Conventions

All public symbols in FLTK start with the characters ‘F’ and ‘L’:

- Functions are either `Fl::foo()` or `fl_foo()`.

- Class and type names are capitalized: `Fl_Foo`.

- Constants and Enumerations are uppercase: `FL_FOO`.

- All header files start with `<FL/...>`.

4.3 Header Files

The proper way to include FLTK header files is:

```
#include <FL/Fl_xyz.H>
```

**Note**  
Case is significant on many operating systems, and the C standard uses the forward slash (/) to separate directories. Do not use any of the following include lines:

```
#include <FL\Fl_xyz.H>
#include <fl/fl_xyz.h>
#include <Fl/fl_xyz.h>
```

4.4 Compiling Programs that Use FLTK

Since FLTK 1.4 CMake is the recommended build system. The details below show the "old" methods and reference information in case you like to write your build configuration manually (e.g. Makefiles, Visual Studio, other IDE's ...).

CMake can simplify this task substantially. For now, refer to README.CMake.txt for further information.

**Todo**  
This section needs a major rework. Add a chapter “Building FLTK with CMake”.

4.4.1 Compiling Programs with Standard Compilers

Under UNIX (and under Microsoft Windows when using the GNU development tools) you will probably need to tell the compiler where to find the header files. This is usually done using the `-I` option:

```
c++ -I/usr/local/include ...
```

**Note**  
You need a C++ compiler to build FLTK. The commands given in this chapter are examples using `c++`. Please replace this command with the C++ compiler suitable for your system or use the `fltk-config` script as described below (this is recommended).
4.4 Compiling Programs that Use FLTK

4.4.2 Compiling Programs with the 'fltk-config' Script

The fltk-config script included with FLTK can be used on systems with a Posix compliant shell, for instance Unix/Linux, macOS, Windows with MinGW, MSYS2, or Cygwin.

Note

fltk-config is not designed to work on Windows with Visual Studio compilers. If it works, then only by accident and this is undefined behavior.

fltk-config --help

displays all available options.

fltk-config can be used to get the compiler and the options that are required by your compiler to build a program using the FLTK library:

fltk-config --cc
fltk-config --cxx

return the C and C++ compiler commands used to build FLTK.

c++ 'fltk-config --cxxflags' ...

can be used to include the required compiler flags in the command line.

Similarly, when linking your application you will need to tell the compiler to use the FLTK library:

c++ ... -L/usr/local/lib -lfltk -lXext -lX11 ... -lm -ldl

Aside from the "fltk" library, there are also the following libraries

• "fltk_forms" for the XForms compatibility classes (deprecated)
• "fltk_gl" for the OpenGL and GLUT classes
• "fltk_images" for the image file classes, Fl_Help_Dialog widget, and system icon support.

The libraries are named fltk.lib, fltk_forms.lib, fltk_gl.lib, and fltk_images.lib under Windows.

Note

The separate fltk_cairo library is no longer necessary since FLTK 1.4.0. However, this release of FLTK builds a dummy fltk_cairo library for backwards compatibility. You are advised to remove the usage of the fltk_cairo library from your build systems and tools. The fltk_cairo library will be removed in a future release.

As before, the fltk-config script can be used to get the options that are required by your linker:

c++ ... 'fltk-config --ldflags'

The forms, GL, and images libraries are included with the "--use-foo" options, as follows:

c++ ... 'fltk-config --use-forms --ldflags'
c++ ... 'fltk-config --use-gl --ldflags'
c++ ... 'fltk-config --use-images --ldflags'
c++ ... 'fltk-config --use-cairo --ldflags'
c++ ... 'fltk-config --use-forms --use-gl --use-images --ldflags'

The option --use-cairo may be used to build your program with Cairo libs if you use Cairo in your code. It does no longer include the fltk_cairo lib but all necessary Cairo compiler flags and Cairo libs, if and only if FLTK has been built with the optional Cairo support by configure or CMake.

Finally, you can use the fltk-config script to compile one or more source files as a FLTK program.

The following examples will create an executable named filename (or filename.exe under Windows) from a single source file:

fltk-config --compile filename.cxx
fltk-config --use-forms --compile filename.cpp
fltk-config --use-gl --compile filename.c
fltk-config --use-images --compile filename.cc
fltk-config --use-cairo --compile filename.cpp
fltk-config --use-forms --use-gl --use-images --compile filename.cpp

Note

'fltk-config --compile' accepts only a limited set of file extensions for C++ source files: '.cpp', '.cxx', '.cc', and '.C' (capital 'C').
4.4.3 Compiling Multiple Source Files with 'fltk-config'

Before version 1.4.0 fltk-config accepted only a single source file and no additional compiler options or libraries. As of FLTK 1.4.0 it is possible to use additional compiler flags, more than one source file, and additional link libraries.

This is intended to be used for quick prototyping and not for production code development. It can be used to test compiler command options (like -Wall or -Wextra) or additional link libraries if these are required.

Building from more than one source file with flags and libraries can be achieved as follows:

```
fltk-config [USE-FLAGS] --compile MAIN [FLAGS] [SOURCES] [--link LFLAGS LIBS]
```

where

- arguments in [...] are optional
- USE-FLAGS are as described above, e.g. --use-images
- MAIN is the main C++ source file as documented above
- FLAGS are additional compiler flags
- SOURCES are additional source files or libraries
- --link is used to separate source files and flags from linker flags and libs
- LFLAGS are optional linker flags
- LIBS are additional libraries to link against

The final commandline is composed like this example:

```
$ fltk-config --compile main.cxx button.o -Wextra x1.a --link -L/usr/include/cairo/ -lcairo g++ {fltk-flags} -o main -Wextra main.cxx button.o x1.a {fltk-libs} -L/usr/include/cairo/ -lcairo
```

where {fltk-flags} are the compiler flags generated by fltk-config as before and {fltk-libs} are the usual linker flags and libraries. All optional parameters are used as-is, i.e. there is no syntax checking or special parsing except: the order of flags and source files is preserved (from the commandline) but all flags (-something) are positioned before all sources, i.e. arguments w/o leading dash ('-'). All compiler flags and libraries generated from the library build follow all options and source files given on the commandline, and finally everything after --link is appended.

4.4.4 Compiling Programs with Makefiles

The previous sections described how to use fltk-config to build a program from the command line, and this is very convenient for small test programs. But fltk-config can also be used to set the compiler and linker options as variables within a Makefile that can be used to build larger programs.

```
CXX = $(shell fltk-config --cxx)
DEBUG = -g
CXXFLAGS = $(shell fltk-config --use-gl --use-images --cxxflags ) -I.
LDFLAGS = $(shell fltk-config --use-gl --use-images --ldflags )
LDSTATIC = $(shell fltk-config --use-gl --use-images --ldstaticflags )
LINK = $(CXX)
TARGET = cube
OBJS = CubeMain.o CubeView.o CubeViewUI.o
SRCS = CubeMain.cxx CubeView.cxx CubeViewUI.cxx
.SUFFIXES: .o .cxx
%.o: %.cxx
  $(CXX) $(CXXFLAGS) $(DEBUG) -c $<
all: $(TARGET)
  $(LINK) -o $(TARGET) $(OBJS) $(LDSTATIC)
$(TARGET): $(OBJS)
CubeMain.o: CubeMain.cxx CubeViewUI.h
CubeView.o: CubeView.cxx CubeViewUI.h
CubeViewUI.o: CubeViewUI.cxx CubeView.h
clean: $(TARGET) $(OBJS)
  rm -f *.o 2>/dev/null
  rm -f $(TARGET) 2>/dev/null
```

Generated by Doxygen
4.4.5 Compiling Programs with Microsoft Visual C++

In Visual C++ you will need to tell the compiler where to find the FLTK header files. This can be done by selecting "Settings" from the "Project" menu and then changing the "Preprocessor" settings under the "C/C++" tab.

You will also need to add the following libraries to the Linker settings:

- `fltk.lib` or `fltkd.lib`, the main FLTK library (postfix 'd' = Debug)
- all FLTK libraries your program requires (`fltk_gl`, `fltk_images`, ...)
- additional libraries like `libpng.lib`, `libjpeg.lib`, etc.
- the Windows Common Controls (`comctl32.lib`) and
- the GDIplus library if used to build FLTK (`gdiplus.lib`) and
- the Windows Socket (`ws2_32.lib`) libraries.

Note

There's a Linker setting "Additional Library Directories" or similar; the exact name depends on the Visual Studio version you're using. You can and should use this to simplify adding the libraries above. If you set this to the FLTK library path you can just use the library names and don't need to use the full paths to all libraries.

You must also define `_WIN32` if the compiler doesn't do this. Currently all known Windows compilers define `_WIN32` - unless you use Cygwin (that's correct, you must not define `_WIN32` if you use Cygwin).

More information can be found in README.Windows.txt.

You can build your Microsoft Windows applications as Console or Desktop applications. If you want to use the standard C `main()` function as the entry point, FLTK includes a `WinMain()` function that will call your `main()` function for you.
Chapter 5

Common Widgets and Attributes

This chapter describes many of the widgets that are provided with FLTK and covers how to query and set the standard attributes.

5.1 Buttons

FLTK provides many types of buttons:

- **Fl_Button** - A standard push button.
- **Fl_Check_Button** - A button with a check box.
- **Fl_Light_Button** - A push button with a light.
- **Fl_Repeat_Button** - A push button that repeats when held.
- **Fl_Return_Button** - A push button that is activated by the Enter key.
- **Fl_Round_Button** - A button with a radio circle.

![Figure 5.1 FLTK Button Widgets](image)

All of these buttons just need the corresponding `<FL/Fl_xyz_Button.H>` header file. The constructor takes the bounding box of the button and optionally a label string:

```c
Fl_Button *button = new Fl_Button(x, y, width, height, "label");
Fl_Light_Button *lbutton = new Fl_Light_Button(x, y, width, height);
Fl_Round_Button *rbutton = new Fl_Round_Button(x, y, width, height, "label");
```

Each button has an associated `type()` which allows it to behave as a push button, toggle button, or radio button:

```c
button->type(FL_NORMAL_BUTTON);
lbutton->type(FL_TOGGLE_BUTTON);
rbutton->type(FL_RADIO_BUTTON);
```

For toggle and radio buttons, the `value()` method returns the current button state (0 = off, 1 = on). The `set()` and `clear()` methods can be used on toggle buttons to turn a toggle button on or off, respectively. Radio buttons can be turned on with the `setonly()` method; this will also turn off other radio buttons in the same group.
5.2 Text

FLTK provides several text widgets for displaying and receiving text:

- **FL_Input** - A one-line text input field.

- **FL_Output** - A one-line text output field.

- **FL_Multiline_Input** - A multi-line text input field.

- **FL_Multiline_Output** - A multi-line text output field.

- **FL_Text_Display** - A multi-line text display widget.

- **FL_Text_Editor** - A multi-line text editing widget.

- **FL_Help_View** - A HTML text display widget.

The **FL_Output** and **FL_Multiline_Output** widgets allow the user to copy text from the output field but not change it.

The `value()` method is used to get or set the string that is displayed:

```c++
FL_Input *input = new FL_Input(x, y, width, height, "label");
input->value("Now is the time for all good men...");
```

The string is copied to the widget's own storage when you set the `value()` of the widget.

The **FL_Text_Display** and **FL_Text_Editor** widgets use an associated **FL_Text_Buffer** class for the value, instead of a simple string.

5.3 Valuators

Unlike text widgets, valuators keep track of numbers instead of strings. FLTK provides the following valuators:

- **FL.Counter** - A widget with arrow buttons that shows the current value.

- **FL.Dial** - A round knob.

- **FL.Roller** - An SGI-like dolly widget.

- **FL.Scrollbar** - A standard scrollbar widget.

- **FL.Slider** - A scrollbar with a knob.

- **FL.Value_Slider** - A slider that shows the current value.
The `value()` method gets and sets the current value of the widget. The `minimum()` and `maximum()` methods set the range of values that are reported by the widget.

## 5.4 Groups

The `Fl_Group` widget class is used as a general purpose "container" widget. Besides grouping radio buttons, the groups are used to encapsulate windows, tabs, and scrolled windows. The following group classes are available with FLTK:

- **Fl_Double_Window** - A double-buffered window on the screen.
- **Fl_Gl_Window** - An OpenGL window on the screen.
- **Fl_Group** - The base container class; can be used to group any widgets together.
- **Fl_Pack** - A collection of widgets that are packed into the group area.
- **Fl_Scroll** - A scrolled window area.
- **Fl_Tabs** - Displays child widgets as tabs.
- **Fl_Tile** - A tiled window area.
- **Fl_Window** - A window on the screen.
- **Fl_Wizard** - Displays one group of widgets at a time.
5.5 Setting the Size and Position of Widgets

The size and position of widgets is usually set when you create them. You can access them with the x(), y(), w(), and h() methods.

You can change the size and position by using the position(), resize(), and size() methods:
button->position(x, y);
group->resize(x, y, width, height);
window->size(width, height);

If you change a widget's size or position after it is displayed you will have to call redraw() on the widget's parent.

5.6 Colors

FLTK stores the colors of widgets as an 32-bit unsigned number that is either an index into a color palette of 256 colors or a 24-bit RGB color. The color palette is not the X or MS Windows colormap, but instead is an internal table with fixed contents.

See the Colors section of Drawing Things in FLTK for implementation details.

There are symbols for naming some of the more common colors:

- FL_BLACK
- FL_RED
- FL_GREEN
- FL_YELLOW
- FL_BLUE
- FL_MAGENTA
- FL_CYAN
- FL_WHITE

Other symbols are used as the default colors for all FLTK widgets.

- FL_FOREGROUND_COLOR
- FL_BACKGROUND_COLOR
- FL_INACTIVE_COLOR
- FL_SELECTION_COLOR

The full list of named color values can be found in FLTK Enumerations.

A color value can be created from its RGB components by using the fl_rgb_color() function, and decomposed again with Fl::get_color():

Fl_Color c = fl_rgb_color(85, 170, 255); // RGB to Fl_Color
Fl::get_color(c, r, g, b); // Fl_Color to RGB

The widget color is set using the color() method:
button->color(FL_RED); // set color using named value

Similarly, the label color is set using the labelcolor() method:
button->labelcolor(FL_WHITE);

The Fl_Color encoding maps to a 32-bit unsigned integer representing RGBI, so it is also possible to specify a color using a hex constant as a color map index:
button->color(0x000000ff); // colormap index #255 (FL_WHITE)

or specify a color using a hex constant for the RGB components:
button->color(0xff000000); // RGB: red
button->color(0x00ff0000); // RGB: green
button->color(0x0000ff00); // RGB: blue
button->color(0xffffff00); // RGB: white
Note

If TrueColor is not available, any RGB colors will be set to the nearest entry in the colormap.

5.7 Box Types

The type Fl_Boxtype stored and returned in Fl_Widget::box() is an enumeration defined in Enumerations.H.

These are the standard box types included with FLTK:

![Figure 5.3 FLTK Standard Box Types](image)

| FL_NO_BOX | FL_FLAT_BOX |
| FL_UP_BOX | FL_DOWN_BOX |
| FL_THIN_UP_BOX | FL_THIN_DOWN_BOX |
| FL_ENGRAVED_BOX | FL_EMBOSSED_BOX |
| FL_BORDER_BOX | FL_SHADOW_BOX |
| FL_ROUNDED_BOX | FL_SHADOW_BOX |
| FL_OVAL_BOX | FL_SHADOW_BOX |
| FL_ROUND_UP_BOX | FL_ROUND_DOWN_BOX |
| FL_PLASTIC_UP_BOX | FL_PLASTIC_DOWN_BOX |
| FL_PLASTIC_THIN_UP_BOX | FL_PLASTIC_THIN_DOWN_BOX |
| FL_PLASTIC_ROUND_UP_BOX | FL_PLASTIC_ROUND_DOWN_BOX |
| FL_GTK_UP_BOX | FL_GTK_DOWN_BOX |
| FL_GTK_THIN_UP_BOX | FL_GTK_THIN_DOWN_BOX |
| FL_GTK_ROUND_UP_BOX | FL_GTK_ROUND_DOWN_BOX |

FL_NO_BOX means nothing is drawn at all, so whatever is already on the screen remains. The FL_..._FRAME types only draw their edges, leaving the interior unchanged. The blue color in the image above is the area that is not drawn by the frame types.

5.7.1 Making Your Own Boxtypes

You can define your own boxtypes by making a small function that draws the box and adding it to the table of boxtypes.
The Drawing Function

The drawing function is passed the bounding box and background color for the widget:

```c
void xyz_draw(int x, int y, int w, int h, Fl_Color c) {
...
}
```

A simple drawing function might fill a rectangle with the given color and then draw a black outline:

```c
void xyz_draw(int x, int y, int w, int h, Fl_Color c) {
    fl_color(c);
    fl_rectf(x, y, w, h);
    fl_color(FL_BLACK);
    fl_rect(x, y, w, h);
}
```

`Fl_Boxtype fl_down(Fl_Boxtype b)

`fl_down()` returns the "pressed" or "down" version of a box. If no "down" version of a given box exists, the behavior of this function is undefined and some random box or frame is returned. See Drawing Functions for more details.

`Fl_Boxtype fl_frame(Fl_Boxtype b)

`fl_frame()` returns the unfilled, frame-only version of a box. If no frame version of a given box exists, the behavior of this function is undefined and some random box or frame is returned. See Drawing Functions for more details.

`Fl_Boxtype fl_box(Fl_Boxtype b)

`fl_box()` returns the filled version of a frame. If no filled version of a given frame exists, the behavior of this function is undefined and some random box or frame is returned. See Drawing Functions for more details.

Adding Your Box Type

The `Fl::set_boxtype()` method adds or replaces the specified box type:

```c
#define XYZ_BOX FL_FREE_BOXTYPE
Fl::set_boxtype(XYZ_BOX, xyz_draw, 1, 1, 2, 2);
```

The last 4 arguments to `Fl::set_boxtype()` are the offsets for the x, y, width, and height values that should be subtracted when drawing the label inside the box.

A complete box design contains four box types in this order: a filled, neutral box (`UP_BOX`), a filled, depressed box (`DOWN_BOX`), and the same as outlines only (`UP_FRAME` and `DOWN_FRAME`). The function `fl_down(Fl_Boxtype)` expects the neutral design on a boxtype with a numerical value evenly dividable by two. `fl_frame(Fl_Boxtype)` expects the `UP_BOX` design at a value dividable by four.
5.8 Labels and Label Types

The `label()`, `align()`, `labelfont()`, `labelsiz()`e, `labelfont()`, `labelsiz()`e, `labeltype()`, `image()`, and `deimage()` methods control the labeling of widgets.

**label()**

The `label()` method sets the string that is displayed for the label. Symbols can be included with the label string by escaping them using the "@" symbol - "@@" displays a single at sign. These are the available symbols:

![Figure 5.4 FLTK label symbols](image)

The @ sign may also be followed by the following optional "formatting" characters, in this order:

- '#' forces square scaling, rather than distortion to the widget's shape.
- +[1-9] or -[1-9] tweaks the scaling a little bigger or smaller.
- '$' flips the symbol horizontally, '% ' flips it vertically.
- [0-9] - rotates by a multiple of 45 degrees. '5' and '6' do no rotation while the others point in the direction of that key on a numeric keypad. '0', followed by four more digits rotates the symbol by that amount in degrees.
Thus, to show a very large arrow pointing downward you would use the label string "@+92->".

Symbols and text can be combined in a label, however the symbol must be at the beginning and/or at the end of the text. If the text spans multiple lines, the symbol or symbols will scale up to match the height of all the lines.

The `align()` method positions the label. The following constants are defined and may be OR'd together as needed:

- `FL_ALIGN_CENTER` - center the label in the widget.
- `FL_ALIGN_TOP` - align the label at the top of the widget.
- `FL_ALIGN_BOTTOM` - align the label at the bottom of the widget.
- `FL_ALIGN_LEFT` - align the label to the left of the widget.
- `FL_ALIGN_RIGHT` - align the label to the right of the widget.
- `FL_ALIGN_LEFT_TOP` - The label appears to the left of the widget, aligned at the top. Outside labels only.
- `FL_ALIGN_RIGHT_TOP` - The label appears to the right of the widget, aligned at the top. Outside labels only.
- `FL_ALIGN_LEFT_BOTTOM` - The label appears to the left of the widget, aligned at the bottom. Outside labels only.
- `FL_ALIGN_RIGHT_BOTTOM` - The label appears to the right of the widget, aligned at the bottom. Outside labels only.
- `FL_ALIGN_INSIDE` - align the label inside the widget.
- `FL_ALIGN_CLIP` - clip the label to the widget's bounding box.
- `FL_ALIGN_WRAP` - wrap the label text as needed.
- `FL_ALIGN_TEXT_OVER_IMAGE` - show the label text over the image.
- `FL_ALIGN_IMAGE_OVER_TEXT` - show the label image over the text (default).
- `FL_ALIGN_IMAGE_NEXT_TO_TEXT` - The image will appear to the left of the text.
- `FL_ALIGN_TEXT_NEXT_TO_IMAGE` - The image will appear to the right of the text.
- `FL_ALIGN_IMAGE_BACKDROP` - The image will be used as a background for the widget.
The `labeltype()` method sets the type of the label. The following standard label types are included:

- `FL_NORMAL_LABEL` - draws the text.
- `FL_NO_LABEL` - does nothing.
- `FL_SHADOW_LABEL` - draws a drop shadow under the text.
- `FL_ENGRAVED_LABEL` - draws edges as though the text is engraved.
- `FL_EMBOSSED_LABEL` - draws edges as though the text is raised.
- `FL_ICON_LABEL` - draws the icon (`Fl_Image`) associated with the text.
- `FL_IMAGE_LABEL` - draws the image (`Fl_Image`) associated with the text.
- `FL_MULTI_LABEL` - draws multiple parts side by side, see `Fl_Multi_Label`.

Note

Some of these label types are no longer necessary for normal widgets. Widgets allow for an image and a text side by side, depending on the widget's `align()` flag. `FL_MULTI_LABEL` was designed to be used with `Fl_Menu_Item`s to support icons or small images, typically left of the menu text. As of this writing (FLTK 1.4.0, Sep 2017) `Fl_Menu_Items` support only one label part (text or image), but using `Fl_Multi_Label` as the label can extend this to more than one part.

See also

- class `Fl_Multi_Label`, `Fl_Widget::align()`

The `image()` and `deimage()` methods set an image that will be displayed with the widget. The `deimage()` method sets the image that is shown when the widget is inactive, while the `image()` method sets the image that is shown when the widget is active.

To make an image you use a subclass of `Fl_Image`.

Making Your Own Label Types

Label types are actually indexes into a table of functions that draw them. The primary purpose of this is to use this to draw the labels in ways inaccessible through the `fl_font()` mechanism (e.g. `FL_ENGRAVED_LABEL`) or with program-generated letters or symbology.
Label Type Functions

To setup your own label type you will need to write two functions: one to draw and one to measure the label. The draw function is called with a pointer to a Fl_Label structure containing the label information, the bounding box for the label, and the label alignment:

```c
void xyz_draw(const Fl_Label *label, int x, int y, int w, int h, Fl_Align align) {
  ...
}
```

The label should be drawn inside this bounding box, even if FL_ALIGN_INSIDE is not enabled. The function is not called if the label value is NULL.

The measure function is called with a pointer to a Fl_Label structure and references to the width and height:

```c
void xyz_measure(const Fl_Label *label, int &w, int &h) {
  ...
}
```

The function should measure the size of the label and set \( w \) and \( h \) to the size it will occupy.

Adding Your Label Type

The Fl::set_labeltype() method creates a label type using your draw and measure functions:

```c
#define XYZ_LABEL FL_FREE_LABELTYPE
Fl::set_labeltype(XYZ_LABEL, xyz_draw, xyz_measure);
```

The label type number \( n \) can be any integer value starting at the constant FL_FREE_LABELTYPE. Once you have added the label type you can use the labeltype() method to select your label type.

The Fl::set_labeltype() method can also be used to overload an existing label type such as FL_NORMAL_LABEL.

Making your own symbols

It is also possible to define your own drawings and add them to the symbol list, so they can be rendered as part of any label.

To create a new symbol, you implement a drawing function `void drawit(Fl_Color c)` which typically uses the functions described in Drawing Complex Shapes to generate a vector shape inside a two-by-two units sized box around the origin. This function is then linked into the symbols table using `fl_add_symbol()`:

```c
int fl_add_symbol(const char *name, void (*)(Fl_Color), int scalable)
```

name is the name of the symbol without the `"@"`; scalable must be set to 1 if the symbol is generated using scalable vector drawing functions.

```c
int fl_draw_symbol(const char *name,int x,int y,int w,int h,Fl_Color col)
```

This function draws a named symbol fitting the given rectangle.
5.9 Callbacks

Callbacks are functions that are called when the value of a widget changes. A callback function is sent a Fl_Widget pointer of the widget that changed and a pointer to data that you provide:

```c
void xyz_callback(Fl_Widget *w, void *data) { }
```

The `callback()` method sets the callback function for a widget. You can optionally pass a pointer to some data needed for the callback:

```c
int xyz_data;
button->callback(xyz_callback, &xyz_data);
```

Note

You cannot delete a widget inside a callback, as the widget may still be accessed by FLTK after your callback is completed. Instead, use the `Fl::delete_widget()` method to mark your widget for deletion when it is safe to do so.

Many programmers new to FLTK or C++ try to use a non-static class method instead of a static class method or function for their callback. Since callbacks are done outside a C++ class, the `this` pointer is not initialized for class methods.

To work around this problem, define a static method in your class that accepts a pointer to the class, and then have the static method call the class method(s) as needed. The data pointer you provide to the `callback()` method of the widget can be a pointer to the instance of your class.

```c
class Foo {
   void my_callback(Fl_Widget *w);
   static void my_static_callback(Fl_Widget *w, void *f) { ((Foo *)f)->my_callback(w); }
   ...
} ...
```

w->callback(my_static_callback, (void *)this);

In an effort to make callbacks easier, more flexible, and type safe, FLTK provides three groups of macros that generate the code needed to call class methods directly with up to five custom parameters.

- `FL_FUNCTION_CALLBACK_#(WIDGET, FUNCTION, ...)` creates code for callbacks to functions and static class methods with up to five arguments. The `#` must be replaced by the number of callback arguments.
- `FL_METHOD_CALLBACK_#(WIDGET, CLASS, SELF, METH, ...)` creates code for callbacks to arbitrary public class methods
- `FL_INLINE_CALLBACK_#(WIDGET, ..., FUNCTION_BODY)` creates code for callback functions that are very close to (almost in the same line) the widget creation code, similar to lambda function in C++11. The last argument of this macro is the callback code.

The syntax is a bit unconventional, but the resulting code is flexible and needs no additional maintenance. It is also C++98 compatible. For example:

```c
#include <FL/fl_callback_macros.H>
...
FL_String *str = new FL_String("FLTK");
FL_Button *btn = new FL_Button(10, 10, 100, 100);
FL_METHOD_CALLBACK_2(btn, Fl_String, str, insert, int, 2, const char *, "...");
...
FL_Button *inline_cb_btn_2 = new FL_Button(390, 60, 180, 25, "2 args");
FL_INLINE_CALLBACK_2(inline_cb_btn_2, const char *, text, "FLTK", int, number, 2,
    { fl_message("We received the message %s with %d!", text, number); })
);}
```

See also

- `Fl_Widget::callback(Fl_Callback ∗, void ∗)`
- `FL_FUNCTION_CALLBACK_3`
- `FL_METHOD_CALLBACK_1`
- `FL_INLINE_CALLBACK_2`
5.10 When and Reason

Normally callbacks are performed only when the value of the widget changes. You can change this using the `Fl_Widget::when()` method:

```c
button->when(FL_WHEN_NEVER);
button->when(FL_WHEN_CHANGED);
button->when(FL_WHEN_RELEASE);
button->when(FL_WHEN_RELEASE_ALWAYS);
button->when(FL_WHEN_ENTER_KEY);
button->when(FL_WHEN_ENTER_KEY_ALWAYS);
button->when(FL_WHEN_CHANGED | FL_WHEN_NOT_CHANGED);
```

Within the callback, you can query why the callback was called using `Fl::callback_reason()`. For example, setting `myInput->when(FL_WHEN_RELEASE|FL_WHEN_CHANGED)` for a text input field may return `FL_REASON_LOST_FOCUS` or `FL_REASON_CHANGED` as a callback reason.

5.11 Shortcuts

Shortcuts are key sequences that activate widgets such as buttons or menu items. The `shortcut()` method sets the shortcut for a widget:

```c
button->shortcut(FL_Enter);
button->shortcut(FL_SHIFT + 'b');
button->shortcut(FL_CTRL + 'b');
button->shortcut(FL_ALT + 'b');
button->shortcut(FL_CTRL + FL_ALT + 'b');
button->shortcut(0); // no shortcut
```

The shortcut value is the key event value - the ASCII value or one of the special keys described in `Fl::event_key()`. Values combined with any modifiers like Shift, Alt, and Control.
Chapter 6

Coordinates and Layout Widgets

This chapter describes the coordinate systems that apply when positioning widgets manually, and some of the basics of FLTK layout widgets that are used to position widgets automatically.

6.1 The Widget Coordinate System

All widgets have constructors with $x$ and $y$ parameters to let the programmer specify the desired initial position of the top left corner during explicit manual layout within Fl_Window and Fl_Group container widgets.

This position is always relative to the enclosing Fl_Window, which is usually, but not always, the top-level application window, or a free-floating pop-up dialog window. In some cases it could also be a subwindow embedded in a higher-level window, as shown in the figure below.

![FLTK coordinate system](image)

The positions of the TL and BR sub-windows and the TR and BL groups are all relative to the top-left corner of the main window. The positions of the boxes inside the TR and BL groups are also relative to the main window, but the boxes inside the TL and BR sub-windows are positioned relative to the enclosing sub-window.

In other words, the widget hierarchy and positions can be summarized as:

```
Fl_Window main window
Fl_Window TL subwindow    # x, y relative to main window
  Fl_Box tl box           # x, y relative to TL subwindow
Fl_Window BR subwindow    # x, y relative to main window
  Fl_Box br box           # x, y relative to BR subwindow
Fl_Group TR group        # x, y relative to main window
  Fl_Box tr box           # x, y relative to main window
Fl_Group BL group        # x, y relative to main window
  Fl_Box bl box           # x, y relative to main window
```

Figure 6.1 FLTK coordinate system

Generated by Doxygen
6.2 Layout and Container Widgets

There are four main groups of widgets derived from Fl_Group for a range of different purposes.

The first group are composite widgets that each contain a fixed set of components that work together for a specific purpose, rather than layout widgets as such, and are not discussed here.

The second group are basically containers offering the same manual layout features as Fl_Group, as described above, but which add one new capability. These widgets are Fl_Scroll, Fl_Tabs and Fl_Wizard.

The third group are layout managers that relocate and resize the child widgets added to them in order to satisfy a particular layout algorithm. These widgets are Fl_Flex, Fl_Grid, Fl_Pack, and Fl_Tile.

The final group consists of Fl_Window and its derivatives. Their special capability is that they can be top-level application windows and dialogs that interface with the operating system window manager, but can also be embedded within other windows and groups as shown in the example above. Note that the window manager may impose its own constraints on the position of top-level windows, and the x and y position parameters may be treated as hints, or even ignored. The Fl_Window class has an extra constructor that omits them.

Descriptions of layout and container widgets follow in alphabetical order.

6.2.1 The Fl_Flex Layout Widget

The Fl_Flex widget allows the layout of its direct children as a single row or column. If its type() is set to give the row or horizontal layout, the children are all resized to have the same height as the Fl_Flex and are moved next to each other. If set to give the column or vertical layout, the children are all resized to have the same width as the Fl_Flex and are then stacked below each other.

Widget positions (x, y) need not be given by the user because widgets are positioned inside the Fl_Flex container in the order of its children. Widget sizes can be set to (0, 0) as in Fl_Pack since they are calculated by Fl_Flex. This is similar to Fl_Pack described below and Fl_Flex is designed to act as a drop-in replacement of Fl_Pack with some minor differences.

Other than Fl_Pack the Fl_Flex widget does not resize itself but resizes its children to fill the entire space of the Fl_Flex container. Single children of Fl_Flex can be set to fixed sizes to inhibit this resizing behavior. In this case the remaining space is distributed to all non-fixed widgets.

Fl_Flex widgets can be nested inside each other and with Fl_Grid in any combination.

The name Fl_Flex was inspired by the CSS 'flex' container.

File Save Exit

Figure 6.2 Simple Fl_Flex Layout

Fl_Flex was added in FLTK 1.4.0.
6.2 Layout and Container Widgets

6.2.2 The Fl_Grid Layout Widget

Fl_Grid is the most flexible layout container in FLTK 1.4. It is based on a flexible grid of cells that can be assigned one widget per cell which is the anchor of the widget. Widgets can span multiple rows and columns and the cells can constitute a sparse matrix. Widgets can be aligned inside their cells in several ways (left, right, top, bottom) and can stretch horizontally, vertically, or both, i.e. fill the entire cell.

Widget positions (x, y) need not be given by the user because widgets are assigned to a particular grid cell by row and column number. Widget sizes can be given as their minimal sizes and will be resized appropriately depending on the free space.

Optional margins around all cells inside the widget border and gaps between rows and cells make the layout even more flexible.

The Fl_Grid widget should be designed with a grid (matrix) and its minimal size in mind. It is designed to enlarge cells and widgets in a flexible way when the Fl_Grid widget itself is created or resized.

Additional free space inside the Fl_Grid container is distributed to widgets by considering minimal row heights, column widths, sizes of widgets, and row and column weights. These weights are used to distribute the free space proportionally according to the row and column weights.

Fl_Grid widgets can be nested inside each other and with Fl_Flex and other subclasses of Fl_Group in any combination.

Note

We don't recommend to use Fl_Pack as child widgets although this may work as well.

The name Fl_Grid was inspired by the CSS 'grid' container but it has some properties in common with HTML <table> containers as well, for instance row and column spanning.

![3x3 Fl_Grid with Buttons](image)

Figure 6.3 Simple Fl_Grid Layout

Fl_Grid was added in FLTK 1.4.0.
6.2.3 The Fl_Pack Layout Widget

The Fl_Pack widget allows the layout of its direct children as a single row, or column. If its type() is set to give the row or horizontal layout, the children are all resized to have the same height as the Fl_Pack and are moved next to each other. If set to give the column or vertical layout, the children are all resized to have the same width as the Fl_Pack and are then stacked below each other. The Fl_Pack then resizes itself to shrink-wrap itself around all of the children.

Fl_Pack widgets are often used inside an Fl_Scroll, as shown in the diagram below, to avoid having to deal with tricky resize behavior when used with nested widgets.

Since FLTK 1.4.0 Fl_Flex (described above) can in many cases be used as a drop-in replacement for Fl_Pack if this "shrink-wrap" behavior is not required. Note that the Fl_Pack layout algorithm can cause some issues because its widget size can change depending on its children and particularly because this is done late, i.e. during draw() and not as usual during resize of the window.

Note

We recommend that developers evaluate whether using Fl_Flex or Fl_Grid instead of Fl_Pack can be a better solution with more predictable and reliable resizing behavior of the overall program layout.

6.2.4 The Fl_Scroll Container Widget

The Fl_Scroll container widget can hold an assortment of widgets that may extend beyond its own width and height, in which case horizontal and/or vertical scrollbars may appear automatically so that you can scroll and view the entire contents.
6.2 Layout and Container Widgets

6.2.5 The Fl_Tabs Container Widget

The Fl_Tabs widget provides a front-to-back stack of individual panels which usually contain Fl_Group widgets and their children. The user can switch between panels by clicking on the small tabs that protrude from the panels. The appearance of each tab is determined by the child widget's label and related attributes.

Figure 6.6 Fl_Tabs container widget

6.2.6 The Fl_Tile Layout Widget

The Fl_Tile widget allows the user to resize one or more of its children by dragging on the border between adjacent child widgets. However, the programmer must first explicitly layout the child widgets so that their borders exactly fill the width and height of the Fl_Tile without having any gaps between them, or at the edges. Some care is needed when initially positioning the children and setting the resizable() widget within the Fl_Tile to prevent squeezing a child to have a zero width or height. For more information see the Fl_Tile widget manual page, and How Does Resizing Work?.

Figure 6.7 The Fl_Tile layout widget

6.2.7 The Fl_Wizard Container Widget

The Fl_Wizard widget derives from the Fl_Tabs class, but instead of having tabs that the user can click to select the corresponding panel, the programmer uses the prev(), next() or value() methods to show the appropriate panel. For example, the user might be able to click on "Next" and "Prev" navigation buttons or keys, as shown below.

Figure 6.8 Fl_Wizard container widget
Chapter 7

How Does Resizing Work?

This chapter describes the basic mechanism behind the creation of resizable user interface elements in FLTK.

FLTK uses a simple, but very versatile system to resize even the most complex dialogs and interfaces. The resizing is implemented within the Fl_Group widget, and the exact resizing behavior of that group is determined by its resizable() attribute.

7.1 Resizing can be disabled

Summary:
```c
// no resizing
```

The resizable may be set to the NULL pointer, which means that the group will not resize. Note that this is the default behavior for Fl_Window and Fl_Pack derived widgets, and therefore the programmer must explicitly set the window's resizable attribute if they want to allow the window to be resized.

7.2 Resizing can be simple

Summary:
```c
// simple proportional resizing
```

The resizable may be set to the group itself, which means that all widgets within the group will resize as the group itself is resized. This is the default behavior for Fl_Group widgets, and is shown in the diagram below.

If the group is stretched horizontally, the widths of the widgets within the group are adjusted proportionally. The same is true for vertical resizing.
### 7.3 Resizing can be complex

**Summary:**

```c
    group = new Fl_Group(xg, yg, wg, hg, "Complex Resizing");
    child1 = new Fl_Box(xb, yb, wb, hb, "B"); // or other widget type
    ...
    group->resizable(child1); // complex resizing
    group->end()
```

It is when the group's `resizable` attribute is set to one of the group's child widgets, that things become really interesting.

In the diagram below, imagine vertical lines extending from the left and right sides of the yellow widget marked "resizable", and horizontal lines extending from the top and bottom sides. Exactly which widgets resize, and by how much, is determined by which ones lie completely or partially within this cross.

The widgets marked B, C, J, K and M clearly lie completely or partially within the vertical part of the cross; the widgets marked E, F, G, H and N lie completely or partially within the horizontal part of the cross; and the widgets marked A, D, I and L do not overlap with the cross at all. The resizing behavior is as follows:

- the width and height of the `resizable` widget increase to match the change in the width and height of the group widget as it is stretched;

- the widths of those widgets that overlap with the vertical part of the cross increase proportionally as the width of the group widget increases, but their heights remain unchanged, i.e. the widgets marked B, C, J, K and M;

- the heights of those widgets that overlap with the horizontal part of the cross increase proportionally as the height of the group widget increases, but their widths remain unchanged, i.e. the widgets marked E, F, G, H and N;
7.4 Practical examples

Why is this so powerful, you may ask. Well, every widget group can have a completely independent resizing strategy. By replacing one or more of the group's "normal" child widgets with another group widget where all of the above rules can be applied again, it is possible to create a hierarchy of group widgets with very complex layouts and resizing behavior.

Consider a simple dialog box, consisting of an icon box and a message area on the top and a button at the bottom right: which widget should be the resizable one?

Setting the resizable to be the icon box won't give us what we want:

---

**Figure 7.2 Complex resizing example**

**Figure 7.3 Resizing dialog example (a)**
How Does Resizing Work?

The message text area would be the logical choice so that the user can expand the dialog to see if there is more of an explanation below the short error message. This results in the behavior shown in the diagram below.

The result is close to what we want, but not quite: the text area will fully resize, the "!" icon box will resize vertically but not horizontally, which we can live with, but the "Darn!" button will resize horizontally? That's ugly. How do we stop that from happening? Simple: put it in its own group and set the `resizable` to an invisible box widget, as shown in the diagram below.

Now the invisible box, shown as "R", takes all of the horizontal resizing and the "Darn!" box will stay as it is. Here's the skeleton code:

```java
dialog = new Fl_Window(300, 100);
icon = new Fl_Box(0, 0, 50, 50, "!");
text = new Fl_Box(50, 0, 250, 40, "Out of Memory Error");
text->resizable(dialog); // make sure it's visible
btns = new Fl_Group(50, 50, 250, 50); // parent group
darn = new Fl_Button(200, 50, 100, 50, "Darn!");
R = new Fl_Box(50, 50, 150, 50); // "invisible" box "R"
R->hide(); // make sure it's invisible
btns->resizable(R); // make *R* parent group resizable
btns->end();
dialog->end();
dialog->resizable(text);
dialog->end();
```

Imagine instead that you have a group that has a button, an input field, another button and a second input field, all next to each other, and you want the input fields to resize equally, but not the buttons. How could you achieve this?
Setting either of the input fields to be the `resizable` leaves the other one fixed, as shown below:

![Figure 7.6 Resizing input fields example (b)](image)

The answer is to leave the `resizable` of the group set to itself, and to create two equal size subgroups, each of which will resize equally. Add a button and input field to each subgroup, and set each subgroup's `resizable` to the input field, as shown below. Tada!

![Figure 7.7 Resizing input fields example (b)](image)

In FLTK it is possible to solve almost any layout and resizing problem by introducing an invisible box into a group, or an extra group into the widget hierarchy. It might take some thought to achieve exactly what you want and sometimes it is necessary to introduce parallel hierarchies in order to get widgets in different groups to resize together.

Imagine you have a group containing three widgets in a row, and you want the widget in the middle to stay the same size when the group is stretched and the ones on either side and the padding between them to resize symmetrically. As described earlier, the default resizing behavior for a group results in proportional resizing of the child widgets (and also of the margins and padding between them) as shown below, which is clearly not what you want.

![Figure 7.8 Resizing a row of widgets (a)](image)

Simply adding a group around A and B and setting its `resizable` to A, as in the previous btn-input example, will mean that B stays the same size, but the other widgets won't resize symmetrically, so what else is needed? It isn't immediately obvious how to solve this problem, even for experienced FLTK users. This is possibly because users are generally advised to design widgets so that they don't overlap.

Albrecht Schlosser proposed an innovative technique that involves an invisible box that deliberately overlaps others to achieve the desired behavior. For the current example, this means inserting two new groups into the existing group and adding a hidden `resizable` widget.

The first group, shown in red below, extends from the left edge of the parent group to the middle of the gap between boxes B and C on the right. This first group contains boxes A and B, where A is the first group's `resizable` attribute.
The second group, shown in blue, extends from the right edge of the first group to the right edge of the parent group. This second group contains box C, where C is the second group's resizable.

The extra box widget is added to the parent group and is set as the group's resizable. The three resizable widgets are shown in yellow.

The clever bit is that this extra box widget is not horizontally aligned with any of the existing groups and widgets in the usual way, but instead overlaps the right and left parts of the two new groups by the same small amount, which means that its midpoint is aligned with the edge between the groups.

Note that, for clarity, the height of the original group has been increased to allow space for the additional annotation and to highlight the extra resizable box in the extra space at the bottom of the group. This is fine for the horizontal-only resizing shown here, but means that widgets A, B and C will never change height because the extra resizable box does not overlap them vertically. Only the padding below them will be resized.

In a real application, you probably want to allow widgets A, B and C to resize vertically while the height of any padding or widgets above or below remains fixed, so the extra resizable box has to lie within the height of widgets A, B and C. Obviously after calling hide() on the box it is no longer visible, and may therefore be the same height as the other widgets, or a fraction of the height, as shown below.

To summarize the key points of the new technique:

- The new resizable widget must overlap the widgets on each side by exactly the same amount.

- The width of the new resizable widget is not fixed, but should probably be a relatively small value to avoid potential problems.

- The total width of the two new groups must equal the width of the existing group and there can be no offsets or gaps between them because margins and gaps will affect the resizing behavior.

- The same principles apply to vertical resizing.
Chapter 8

Designing a Simple Text Editor

This chapter takes you through the design of a simple FLTK-based text editor.

8.1 Determining the Goals of the Text Editor

Since this will be the first big project you'll be doing with FLTK, let's define what we want our text editor to do:

1. Provide a menubar/menus for all functions.
2. Edit a single text file, possibly with multiple views.
3. Load from a file.
4. Save to a file.
5. Cut/copy/delete/paste functions.
6. Search and replace functions.
7. Keep track of when the file has been changed.

8.2 Designing the Main Window

Now that we've outlined the goals for our editor, we can begin with the design of our GUI. Obviously the first thing that we need is a window, which we'll place inside a class called EditorWindow:

class EditorWindow : public Fl_Double_Window {
public:
    EditorWindow(int w, int h, const char* t);
    ~EditorWindow();
    Fl_Window *replace_dlg;
    Fl_Input *replace_find;
    Fl_Input *replace_with;
    Fl_Button *replace_all;
    Fl_Return_Button *replace_next;
    Fl_Button *replace_cancel;
    Fl_Text_Editor *editor;
    char search[256];
};

Generated by Doxygen
8.3 Variables

Our text editor will need some global variables to keep track of things:

```c
int changed = 0;
char filename[FL_PATH_MAX] = "";
char title[FL_PATH_MAX];
Fl_Text_Buffer *textbuf = 0;
```

The `textbuf` variable is the text editor buffer for our window class described previously. We'll cover the other variables as we build the application.

8.4 Menubars and Menus

The first goal requires us to use a menubar and menus that define each function the editor needs to perform. The `Fl_Menu_Item` structure is used to define the menus and items in a menubar:

```c
Fl_Menu_Item menuitems[] = {
   { "*File", 0, 0, 0, FL_SUBMENU },
   { "*New File", 0, (Fl_Callback *)new_cb },
   { "Open File...", FL_COMMAND + 'o', (Fl_Callback *)open_cb },
   { "Insert File...", FL_COMMAND + 'i', (Fl_Callback *)insert_cb, 0, FL_MENU_DIVIDER },
   { "*Save File", FL_COMMAND + 's', (Fl_Callback *)save_cb },
   { "Save File &As...", FL_COMMAND + FL_SHIFT + 's', (Fl_Callback *)saveas_cb, 0, FL_MENU_DIVIDER },
   { "*View", FL_ALT + 'v', (Fl_Callback *)view_cb, 0 },
   { "*Close View", FL_COMMAND + 'w', (Fl_Callback *)close_cb, 0, FL_MENU_DIVIDER },
   { "*Exit", FL_COMMAND + 'q', (Fl_Callback *)quit_cb, 0 },
   { 0 },
   { "*Edit", 0, 0, 0, FL_SUBMENU },
   { "*Undo", FL_COMMAND + 'z', (Fl_Callback *)undo_cb, 0, FL_MENU_DIVIDER },
   { "Cut", FL_COMMAND + 'x', (Fl_Callback *)cut_cb },
   { "Copy", FL_COMMAND + 'c', (Fl_Callback *)copy_cb },
   { "Paste", FL_COMMAND + 'v', (Fl_Callback *)paste_cb },
   { "*Delete", 0, (Fl_Callback *)delete_cb },
   { 0 },
   { "*Search", 0, 0, 0, FL_SUBMENU },
   { "*Find...", FL_COMMAND + 'f', (Fl_Callback *)find_cb },
   { "Find Again", FL_COMMAND + 'g', find2_cb },
   { "Replace Again", FL_COMMAND + 'r', replace2_cb },
   { 0 },
};
```

Once we have the menus defined we can create the `Fl_Menu_Bar` widget and assign the menus to it with:

```c
Fl_Menu_Bar *m = new Fl_Menu_Bar(0, 0, 640, 30);
m->copy(menuitems);
```

We'll define the callback functions later.

8.5 Editing the Text

To keep things simple our text editor will use the `Fl_Text_Editor` widget to edit the text:

```c
w->editor = new Fl_Text_Editor(0, 30, 640, 370);
w->editor->buffer(textbuf);
```

So that we can keep track of changes to the file, we also want to add a “modify” callback:

```c
textbuf->add_modify_callback(changed_cb, w);
textbuf->call_modify_callbacks();
```

Finally, we want to use a mono-spaced font like `FL_COURIER`:

```c
w->editor->textfont(FL_COURIER);
```
8.6 The Replace Dialog

We can use the FLTK convenience functions for many of the editor's dialogs, however the replace dialog needs its own custom window. To keep things simple we will have a "find" string, a "replace" string, and "replace all", "replace next", and "cancel" buttons. The strings are just Fl_Input widgets, the "replace all" and "cancel" buttons are Fl_Button widgets, and the "replace next" button is a Fl_Return_Button widget:

```c
Fl_Window *replace_dlg = new Fl_Window(300, 105, "Replace");
Fl_Input *replace_find = new Fl_Input(70, 10, 200, 25, "Find: ");
Fl_Input *replace_with = new Fl_Input(70, 40, 200, 25, "Replace: ");
Fl_Button *replace_all = new Fl_Button(10, 70, 90, 25, "Replace All");
Fl_Button *replace_next = new Fl_Button(105, 70, 120, 25, "Replace Next");
Fl_Button *replace_cancel = new Fl_Button(230, 70, 60, 25, "Cancel");
```

8.7 Callbacks

Now that we've defined the GUI components of our editor, we need to define our callback functions.

8.7.1 changed_cb()

This function will be called whenever the user changes any text in the editor widget:

```c
void changed_cb(int, int nInserted, int nDeleted, const char*, void* v) {
    if ((nInserted || nDeleted) && !loading) changed = 1;
    EditorWindow *w = (EditorWindow *)v;
    set_title(w);
    if (loading) w->editor->show_insert_position();
}
```

The set_title() function is one that we will write to set the changed status on the current file. We're doing it this way because we want to show the changed status in the window's title bar.

8.7.2 copy_cb()

This callback function will call Fl_Text_Editor::kf_copy() to copy the currently selected text to the clipboard:

```c
void copy_cb(Fl_Widget*, void* v) {
    EditorWindow* e = (EditorWindow*)v;
    Fl_Text_Editor::kf_copy(0, e->editor);
}
```

8.7.3 cut_cb()

This callback function will call Fl_Text_Editor::kf_cut() to cut the currently selected text to the clipboard:

```c
void cut_cb(Fl_Widget*, void* v) {
    EditorWindow* e = (EditorWindow*)v;
    Fl_Text_Editor::kf_cut(0, e->editor);
}
```
8.7.4 delete_cb()

This callback function will call `Fl_Text_Buffer::remove_selection()` to delete the currently selected text to the clipboard:

```c
void delete_cb(Fl_Widget*, void* v) {
    textbuf->remove_selection();
}
```

8.7.5 find_cb()

This callback function asks for a search string using the `fl_input()` convenience function and then calls the `find2_cb()` function to find the string:

```c
void find_cb(Fl_Widget* w, void* v) {
    EditorWindow* e = (EditorWindow*)v;
    const char *val;
    val = fl_input("Search String:", e->search);
    if (val != NULL) {
        // User entered a string - go find it!
        strcpy(e->search, val);
        find2_cb(w, v);
    }
}
```

8.7.6 find2_cb()

This function will find the next occurrence of the search string. If the search string is blank then we want to pop up the search dialog:

```c
void find2_cb(Fl_Widget* w, void* v) {
    EditorWindow* e = (EditorWindow*)v;
    if (e->search[0] == '\0') {
        // Search string is blank; get a new one...
        find_cb(w, v);
        return;
    }
    int pos = e->editor->insert_position();
    int found = textbuf->search_forward(pos, e->search, &pos);
    if (found) {
        // Found a match; select and update the position...
        textbuf->select(pos, pos+strlen(e->search));
        e->editor->insert_position(pos+strlen(e->search));
        e->editor->show_insert_position();
    } else fl_alert("No occurrences of \"%s\" found!", e->search);
}
```

If the search string cannot be found we use the `fl_alert()` convenience function to display a message to that effect.

8.7.7 new_cb()

This callback function will clear the editor widget and current filename. It also calls the `check_save()` function to give the user the opportunity to save the current file first as needed:

```c
void new_cb(Fl_Widget*, void*) {
    if (!check_save()) return;
    filename[0] = '\0';
    textbuf->select(0, textbuf->length());
    textbuf->remove_selection();
    changed = 0;
    textbuf->call_modify_callbacks();
}
```
8.7 Callbacks

8.7.8  open_cb()

This callback function will ask the user for a filename and then load the specified file into the input widget and current filename. It also calls the check_save() function to give the user the opportunity to save the current file first as needed:

```c
void open_cb(Fl_Widget*, void*) {
    if (!check_save()) return;
    char *newfile = fl_file_chooser("Open File?", ",", filename);
    if (newfile != NULL) load_file(newfile, -1);
}
```

We call the load_file() function to actually load the file.

8.7.9  paste_cb()

This callback function will call Fl_Text_Editor::kf_paste() to paste the clipboard at the current position:

```c
void paste_cb(Fl_Widget*, void*) {
    EditorWindow* e = (EditorWindow*)v;
    Fl_Text_Editor::kf_paste(0, e->editor);
}
```

8.7.10 quit_cb()

The quit callback will first see if the current file has been modified, and if so give the user a chance to save it. It then exits from the program:

```c
void quit_cb(Fl_Widget*, void*) {
    if (changed && !check_save())
        return;
    exit(0);
}
```

8.7.11 replace_cb()

The replace callback just shows the replace dialog:

```c
void replace_cb(Fl_Widget*, void*) {
    EditorWindow* e = (EditorWindow*)v;
    e->replace_dlg->show();
}
```

8.7.12 replace2_cb()

This callback will replace the next occurrence of the replacement string. If nothing has been entered for the replacement string, then the replace dialog is displayed instead:

```c
void replace2_cb(Fl_Widget*, void*) {
    EditorWindow* e = (EditorWindow*)v;
    const char *find = e->replace_find->value();
    const char *replace = e->replace_with->value();
    if (find[0] == '\0') {
        // Search string is blank; get a new one...
        e->replace_dlg->show();
        return;
    }
    e->replace_dlg->hide();
    int pos = e->editor->insert_position();
    int found = textbuf->search_forward(pos, find, &pos);
    if (!found) {
        // Found a match; update the position and replace text...
        textbuf->select(pos, pos+strlen(find));
        textbuf->remove_selection();
        textbuf->insert(pos, replace);
        textbuf->select(pos, pos+strlen(replace));
        e->editor->insert_position(pos+strlen(replace));
        e->editor->show_insert_position();
    } else fl_alert("No occurrences of \"%s\" found!", find);
}
```
8.7.13 replall_cb()

This callback will replace all occurrences of the search string in the file:

```c
void replall_cb(Fl_Widget*, void* v) {
    EditorWindow* e = (EditorWindow*)v;
    const char *find = e->replace_find->value();
    const char *replace = e->replace_with->value();
    if (find[0] == '\0') {  // Search string is blank; get a new one...
        e->replace_dlg->show();
        return;
    }
    e->replace_dlg->hide();
    e->editor->insert_position(0);
    int times = 0;
    for (int found = 1; found;) {
        int pos = e->editor->insert_position();
        if (found) {
            // Found a match; update the position and replace text...
            textbuf->select(pos, pos+strlen(find));
            textbuf->remove_selection();
            textbuf->insert(pos, replace);
            e->editor->insert_position(pos+strlen(replace));
            e->editor->show_insert_position();
            times++;
        }
        found = textbuf->search_forward(pos, find, &pos);
    }
    if (times) fl_message("Replaced %d occurrences.", times);
    else fl_alert("No occurrences of \"%s\" found!", find);
}
```

8.7.14 replcan_cb()

This callback just hides the replace dialog:

```c
void replcan_cb(Fl_Widget*, void* v) {
    EditorWindow* e = (EditorWindow*)v;
    e->replace_dlg->hide();
}
```

8.7.15 save_cb()

This callback saves the current file. If the current filename is blank it calls the "save as" callback:

```c
void save_cb(void) {
    if (filename[0] == '\0') {  // No filename - get one!
        saveas_cb();
        return;
    } else save_file(filename);
}
```

The `save_file()` function saves the current file to the specified filename.

8.7.16 saveas_cb()

This callback asks the user for a filename and saves the current file:

```c
void saveas_cb(void) {
    char *newfile;
    newfile = fl_file_chooser("Save File As?", "+", filename);
    if (newfile != NULL) save_file(newfile);
}
```

The `save_file()` function saves the current file to the specified filename.
8.8 Other Functions

Now that we've defined the callback functions, we need our support functions to make it all work:

8.8.1 check_save()

This function checks to see if the current file needs to be saved. If so, it asks the user if they want to save it:

```c
int check_save(void) {
  if (!changed) return 1;
  int r = fl_choice("The current file has not been saved.\n" "Would you like to save it now?", "Cancel", "Save", "Discard");
  if (r == 1) {
    save_cb(); // Save the file...
    return !changed;
  }
  return (r == 2) ? 1 : 0;
}
```

8.8.2 load_file()

This function loads the specified file into the `textbuf` variable:

```c
int loading = 0;
void load_file(char *newfile, int ipos) {
  loading = 1;
  int insert = (ipos != -1);
  changed = insert;
  if (!insert) strcpy(filename, "");
  int r;
  if (!insert) r = textbuf->loadfile(newfile);
  else r = textbuf->insertfile(newfile, ipos);
  if (r)
    fl_alert("Error reading from file \"%s\":\n%s.", newfile, strerror(errno));
  else
    if (!insert) strcpy(filename, newfile);
    loading = 0;
    textbuf->call_modify_callbacks();
}
```

When loading the file we use the `Fl_Text_Buffer::loadfile()` method to “replace” the text in the buffer, or the `Fl_Text_Buffer::insertfile()` method to insert text in the buffer from the named file.

8.8.3 save_file()

This function saves the current buffer to the specified file:

```c
void save_file(char *newfile) {
  if (textbuf->savefile(newfile))
    fl_alert("Error writing to file \"%s\":\n%s.", newfile, strerror(errno));
  else
    strcpy(filename, newfile);
    changed = 0;
    textbuf->call_modify_callbacks();
}
```

8.8.4 set_title()

This function checks the `changed` variable and updates the window label accordingly:

```c
void set_title(Fl_Window* w) {
  if (filename[0] == '\0') strcpy(title, "Untitled");
  else
    char *slash;
    slash = strrchr(filename, '/');
    #ifdef _WIN32
    if (slash == NULL) slash = strrchr(filename, '\');
    #endif
    if (slash == NULL) slash = strrchr(filename, '/');
    #endif
    if (slash != NULL) slash = slash + 1;
    #endif
    if (changed) strcat(title, " (modified)");
    w->label(title);
}
```
8.9 The main() Function

Once we've created all of the support functions, the only thing left is to tie them all together with the \texttt{main()} function. The \texttt{main()} function creates a new text buffer, creates a new view (window) for the text, shows the window, loads the file on the command-line (if any), and then enters the FLTK event loop:

\begin{verbatim}
int main(int argc, char **argv) {
    textbuf = new Fl_Text_Buffer;
    Fl_Window* window = new_view();
    window->show(1, argv);
    if (argc > 1) load_file(argv[1], -1);
    return Fl::run();
}
\end{verbatim}

8.10 Compiling the Editor

The complete source for our text editor can be found in the \texttt{test/editor.cxx} source file. Both the Makefile and Visual C++ workspace include the necessary rules to build the editor. You can also compile it using a standard compiler with:

\begin{verbatim}
CC -o editor editor.cxx -lfltk -lXext -lX11 -lm
\end{verbatim}

or by using the \texttt{fltk-config} script with:

\begin{verbatim}
fltk-config --compile editor.cxx
\end{verbatim}

As noted in Compiling Programs with Standard Compilers, you may need to include compiler and linker options to tell them where to find the FLTK library. Also, the \texttt{CC} command may also be called \texttt{gcc} or \texttt{c++} on your system.

Congratulations, you've just built your own text editor!

8.11 The Final Product

The final editor window should look like this:

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure8_2}
\caption{The completed editor window}
\end{figure}
8.12 Advanced Features

Now that we've implemented the basic functionality, it is time to show off some of the advanced features of the Fl_Text_Editor widget.

8.12.1 Syntax Highlighting

The Fl_Text_Editor widget supports highlighting of text with different fonts, colors, and sizes. The implementation is based on the excellent NEdit text editor core, from https://sourceforge.net/projects/nedit/, which uses a parallel "style" buffer which tracks the font, color, and size of the text that is drawn.

Styles are defined using the Fl_Text_Display::Style_Table_Entry structure defined in `<FL/Fl_Text_Display.H>`:

```c
struct Style_Table_Entry {
    Fl_Color color;
    Fl_Font font;
    int size;
    unsigned attr;
};
```

The `color` member sets the color for the text, the `font` member sets the FLTK font index to use, and the `size` member sets the pixel size of the text. The `attr` member is currently not used.

For our text editor we'll define 7 styles for plain code, comments, keywords, and preprocessor directives:

```c
Fl_Text_Display::Style_Table_Entry styletable[] = { // Style table
    { FL_BLACK, FL_COURIER, FL_NORMAL_SIZE }, // A - Plain
    { FL_DARK_GREEN, FL_COURIER_ITALIC, FL_NORMAL_SIZE }, // B - Line comments
    { FL_DARK_GREEN, FL_COURIER_ITALIC, FL_NORMAL_SIZE }, // C - Block comments
    { FL_BLUE, FL_COURIER, FL_NORMAL_SIZE }, // D - Strings
    { FL_DARK_RED, FL_COURIER, FL_NORMAL_SIZE }, // E - Directives
    { FL_DARK_RED, FL_COURIER_BOLD, FL_NORMAL_SIZE }, // F - Types
    { FL_BLUE, FL_COURIER_BOLD, FL_NORMAL_SIZE } // G - Keywords
};
```

You'll notice that the comments show a letter next to each style - each style in the style buffer is referenced using a character starting with the letter 'A'.

You call the `highlight_data()` method to associate the style data and buffer with the text editor widget:

```c
Fl_Text_Buffer *stylebuf;
w->editor->highlight_data(stylebuf, styletable,
    sizeof(styletable) / sizeof(styletable[0]),
    'A', style_unfinished_cb, 0);
```

Finally, you need to add a callback to the main text buffer so that changes to the text buffer are mirrored in the style buffer:

```c
textbuf->add_modify_callback(style_update, w->editor);
```

The `style_update()` function, like the `change_cb()` function described earlier, is called whenever text is added or removed from the text buffer. It mirrors the changes in the style buffer and then updates the style data as necessary:

```c
// 'style_update()' - Update the style buffer...
/
/
void
style_update(int pos, // I - Position of update
    int nInserted, // I - Number of inserted chars
    int nDeleted, // I - Number of deleted chars
    int nRestyled, // I - Number of restyled chars
    const char *deletedText, // I - Text that was deleted
    void *cbArg) { // I - Callback data
    int start, // Start of text
        end; // End of text
    char last, // Last style on line
        *style, // Style data
        *text; // Text data
    // If this is just a selection change, just unselect the style buffer...
    if (nInserted == 0 && nDeleted == 0) {
        stylebuf->unselect();
        return;
    }
```
Designing a Simple Text Editor

// Track changes in the text buffer...
if (nInserted > 0) {
    // Insert characters into the style buffer...
    style = new char[nInserted + 1];
    memset(style, 'A', nInserted);
    style[nInserted] = '\0';
    stylebuf->replace(pos, pos + nDeleted, style);
    delete[] style;
} else {
    // Just delete characters in the style buffer...
    stylebuf->remove(pos, pos + nDeleted);
}

// Select the area that was just updated to avoid unnecessary
// callbacks...
stylebuf->select(pos, pos + nInserted - nDeleted);
// Re-parse the changed region; we do this by parsing from the
// beginning of the line of the changed region to the end of
// the line of the changed region... Then we check the last
// style character and keep updating if we have a multi-line
// comment character...
start = textbuf->line_start(pos);
end = textbuf->line_end(pos + nInserted - nDeleted);
text = textbuf->text_range(start, end);
style = stylebuf->text_range(start, end);
last = style[end - start - 1];
style_parse(text, style, end - start);
stylebuf->replace(start, end, style);
((Fl_Text_Editor *)cbArg)->redisplay_range(start, end);
if (last != style[end - start - 1]) {
    // The last character on the line changed styles, so reparse the
    // remainder of the buffer...
    free(text);
    free(style);
    end = textbuf->length();
text = textbuf->text_range(start, end);
style = stylebuf->text_range(start, end);
style_parse(text, style, end - start);
stylebuf->replace(start, end, style);
((Fl_Text_Editor *)cbArg)->redisplay_range(start, end);
}
free(text);
free(style);
}

The style_parse() function scans a copy of the text in the buffer and generates the necessary style characters for display. It assumes that parsing begins at the start of a line:

/// 'style_parse()' - Parse text and produce style data.
///
void
style_parse(const char *text,
            char  *style,
            int    length)
{
current = *style;
col = 0;
last = 0;
buf[255],
*bufptr;
for (current = *text, col = 0, last = 0; length > 0; text ++)
{
    if (current == 'A') {
        // Check for directives, comments, strings, and keywords...
        if (col == 0) {
            // Set style to directive
            current = 'E';
        } else if (strcmp(text, "//", 2) == 0) {
            current = 'B';
        } else if (strcmp(text, "/*", 2) == 0) {
            current = 'C';
        } else if (strcmp(text, "\\", 2) == 0) {
            // Quoted quote...
            *style++ = current;
            *style++ = current;
            text ++;
            col += 2;
            continue;
        } else if (*text == '\') {
            current = 'D';
        } else if (!islower(*text)) { // Might be a keyword...
            temp = text, bufptr = buf;
            if (*text < (buf + sizeof(buf) - 1)) {
                bufptr++ = *temp++;
            }
        } else if (islower(*text)) {
            current = 'D';
        }
    }
    else if (islower(*text)) {
        // Might be a keyword...
        for (temp = text, bufptr = buf;
            islower(*temp) & bufptr < (buf + sizeof(buf) - 1);
            bufptr++ = *temp++);
        if (!(islower(*temp))}
8.12 Advanced Features

```c
bufptr = '\0';
bufptr = buf;
if (bsearch(&bufptr, code_types,
    sizeof(code_types) / sizeof(code_types[0]),
    sizeof(code_types[0]), compare_keywords)) {
    while (text < temp) {
        *style++ = 'P';
        text ++;
        length --;
        col ++;
    }
    text --;
    length ++;
    last = 1;
    continue;
} else if (bsearch(&bufptr, code_keywords,
    sizeof(code_keywords) / sizeof(code_keywords[0]),
    sizeof(code_keywords[0]), compare_keywords)) {
    while (text < temp) {
        *style++ = 'G';
        text ++;
        length --;
        col ++;
    }
    text --;
    length ++;
    last = 1;
    continue;
}
else if (current == 'C' && strncmp(text, "*/", 2) == 0) {
    // Close a C comment...
    *style++ = current;
    *style++ = current;
    text ++;
    length --;
    current = 'A';
    col *= 2;
    continue;
} else if (current == 'D') {
    // Continuing in string...
    if (strncmp(text, "\\\n", 2) == 0) {
        // Quoted end quote...
        *style++ = current;
        *style++ = current;
        text ++;
        length --;
        col *= 2;
        continue;
    } else if (*text == '\n') {
        // End quote...
        *style++ = current;
        col ++;
        current = 'A';
        continue;
    }
} else if (*text == '{' || *text == '}') {
    // Copy style info...
    if (current == 'A' && (*text == '{' || *text == '}'))
        *style++ = 'G';
    else *style++ = current;
    col ++;
    last = isalnum(*text) || *text == '.';
    if (*text == '{n}') {
        // Reset column and possibly reset the style
        col = 0;
    }
    if (current == 'B' || current == 'E') current = 'A';
}
...
Chapter 9

Fl_Terminal Technical Documentation

This chapter covers the vt100/xterm style "escape codes" used by Fl_Terminal for cursor positioning, text colors, and other display screen control features such as full or partial screen clearing, up/down scrolling, character insert/delete, etc.

9.1 The Escape Codes Fl_Terminal Supports

These are the escape codes Fl_Terminal actually supports, and is not the 'complete' list that e.g. xterm supports. Most of the important stuff has been implemented, but esoteric features (such as scroll regions) has not.

Features will be added as the widget matures.

--- The CSI (Control Sequence Introducer, or "ESC[@") ---

ESC[@ - (ICH) Insert blank Chars (default=1)
ESC[@A - (CUU) Cursor Up, no scroll/wrap
ESC[@B - (CUD) Cursor Down, no scroll/wrap
ESC[@C - (CUF) Cursor Forward, no wrap
ESC[@D - (CUB) Cursor Back, no wrap
ESC[@E - (CNL) Cursor Next Line (crlf) xterm, !gnome
ESC[@F - (CPL) Cursor Preceding Line: move to sol and up # lines
ESC[@G - (CHA) Cursor Horizontal Absolute positioning

ESC[@G - move to column 1 (start of line, sol)
ESC[@G - move to column #
ESC[@H - (CUP) Cursor Position (#’s are 1 based)

ESC[@H - go to row #
ESC[@#H - go to [row #] (default=1)
ESC[@#H - go to [row# ; col#]
ESC[@#I - (CHT) Cursor Horizontal Tab: tab forward

ESC[@#I - tab # times (default 1)
ESC[@#J - (ED) Erase in Display

ESC[@#J - clear to end of display (default)
ESC[@J - clear to start of display
ESC[@J - clear all lines
ESC[@J - clear screen history
ESC[@K - (EL) Erase in line

ESC[@K - clear to end of line (default)
ESC[@K - clear to start of line
ESC[@K - clear current line

ESC[@L - (IL) Insert # Lines (default=1)
ESC[@M - (DL) Delete # Lines (default=1)
ESC[@P - (DCH) Delete # Chars (default=1)
ESC[@S - (SU) Scroll Up # lines (default=1)
ESC[@T - (SD) Scroll Down # lines (default=1)
ESC[@W - (ECH) Erase Characters (default=1)
ESC[@Z - (CBT) Cursor Backwards Tab

ESC[@Z - backwards tab # times (default=1)
**9.2 Useful Terminal Escape Code Documentation**

Useful links for reference:
9.3 Fl_Terminal Design Document

When I started this project, I identified the key concepts needed to implement Fl_Terminal:

- Draw and manage multiline Unicode text in FLTK
- Allow per-character colors and attributes
- Efficient screen buffer to handle "scrollback history"
- Efficient scrolling with vertical scrollbar for even large screen history
- Mouse selection for copy/paste
- Escape code management to implement VT100 style / ANSI escape codes.

A class was created for each character, since characters can be either ASCII or Utf8 encoded byte sequences. This class is called Utf8Char, and handles the character, its fg and bg color, and any attributes like dim, bold, italic, etc.

For managing the screen, after various experiments, I decided a ring buffer was the best way to manage things, the ring split in two:

- 'screen history' which is where lines scrolled off the top are saved
- 'display screen' displayed to the user at all times, and where the cursor lives

Scrolling the display, either by scrollbar or by new text causing the display to scroll up one line, would simply change an 'offset' index# of where in the ring buffer the top of the screen is, automatically moving the top line into the history, all without moving memory around.

In fact the only time screen memory is moved around is during these infrequent operations:

- during scrolling "down"
- character insert/delete operations within a line
- changing the display size
- changing the history size

So a class "RingBuffer" is defined to manage the ring, and accessing its various parts, either as the entire entity ring, just the history, or just the display.

These three concepts, "ring", "history" and "display" are given abbreviated names in the RingBuffer class's API:
NOTE: Abbreviations "hist" and "disp"

"history" may be abbreviated as "hist", and "display" as "disp" in both this text and the source code. 4 character names are used so they line up cleanly in the source, e.g.

```c
ring_rows()  ring_cols()
hist_rows()  hist_cols()
disp_rows()  disp_cols()
```

4 characters

These concepts were able to fit into C++ classes:

**Utf8Char**

Each character on the screen is a "Utf8Char" which can manage the UTF-8 encoding of any character as one or more bytes. Also in that class is a byte for an attribute (underline, bold, etc), and two integers for fg/bg color.

**RingBuffer**

The RingBuffer class keeps track of the buffer itself, a single array of Utf8Chars called "ring_chars" whose width is ring_cols() and whose height is ring_rows().

The "top" part of the ring is the history, whose width is hist_cols() and whose height is hist_rows(). hist_use_rows() is used to define what part of the history is currently in use.

The "bottom" part of the ring is the display, whose width is disp_cols() and whose height is disp_rows().

An index number called "offset" points to where in the ring buffer the top of the ring currently is. This index changes each time the screen is scrolled, and affects both where the top of the display is, and where the top of the history is.

The memory layout of the Utf8Char character array is:

```c
ring_chars[]:
__________  |  __
|  _      |
|  _      |
|  H i s t o r y | hist_rows
|  _      |
|  _      |
|  D i s p l a y | disp_rows
|  __      |
|<------------------>
  ring_cols
  hist_cols
  disp_cols
```

So it's basically a single continuous array of Utf8Char instances where any character can generally be accessed by index# using the formula:
ring_chars[ (row*ring_cols) + col ]

..where 'row' is the desired row, 'col' is the desired column, and 'ring_cols' is how many columns "wide" the buffer is.

The "offset" index affects that formula as an extra row offset, and the resulting index is then clamped within the range of the ring buffer using modulus.

Methods are used to allow direct access to the characters in the buffer that automatically handle the offset and modulus formulas, namely:

- `u8c_ring_row(row, col)` // access the entire ring by row/col
- `u8c_hist_row(row, col)` // access just the history buffer
- `u8c_disp_row(row, col)` // access just the display buffer

A key concept is the use of the simple 'offset' index integer to allow the starting point of the history and display to be moved around to implement 'text scrolling', such as when crlf at the screen bottom causes a 'scroll up'.

This is simply an "index offset" integer applied to the hist and disp indexes when drawing the display. So after scrolling two lines up, the offset is just increased by 2, redefining where the top of the history and display are, e.g.

Offset is 0:  
  Offset now 2:  
  
  Display  
  History 
  |  
  2  
  |  
  Display  
  History

This 'offset' trivially implements "text scrolling", avoiding having to physically move memory around. Just the 'offset' changes, the text remains where it is in memory.

This also makes it appear the top line in the display is 'scrolled up' into the bottom of the scrollback 'history'.

If the offset exceeds the size of the ring buffer, it simply wraps around back to the beginning of the buffer with a modulo.

Indexes into the display and history are also modulo their respective rows, e.g.

```
act_ring_index = (hist_rows + disp_row + offset - scrollbar_pos) % ring_rows;
```

This way indexes for ranges can run beyond the bottom of the ring, and automatically wrap around the ring, e.g.
The dotted lines show where the display would be if not for the fact it extends beyond the bottom of the ring buffer (due to the current offset), and therefore wraps up to the top of the ring.

So to find a particular row in the display, in this case a 5 line display whose lines lie between 0 and 4, some simple math calculates the row position into the ring:

```
act_ring_index = (histrows + offset + disp_row) % ring_rows; // make sure the resulting index is within the ring buffer (0..ring_rows)
```

An additional bit of math makes sure if a negative result occurs, that negative value works relative to the end of the ring, e.g.

```
if (act_ring_index < 0) act_ring_index = ring_rows + act_ring_index;
```

This guarantees the `act_ring_index` is within the ring buffer’s address space, with all offsets applied.

The math that implements this can be found in the `u8c_xxxx_row()` methods, where “xxxx” is one of the concept regions “ring”, “hist” or “disp”:

```
Utf8Char *u8c;
```

- `u8c = u8c_ring_row(rrow);` // address within ring, `rrow` can be 0..(ring_rows-1)
- `u8c = u8c_hist_row(hrow);` // address within hist, `hrow` can be 0..(hist_rows-1)
- `u8c = u8c_disp_row(drow);` // address within disp, `drow` can be 0..(disp_rows-1)

The small bit of math is only involved whenever a new row address is needed, so in a display that’s 80x25, to walk all the characters in the screen, the math above would only be called 25 times, once for each row, and each column in the row is just a simple integer offset:

```
for ( int row=0; row<disp_rows(); row++ ) { // walk rows: disp_rows = 25
  Utf8Char *u8c = u8c_disp_row(row); // get first char in display 'row'
  for ( int col=0; col<disp_cols(); col++ ) { // walk cols: disp_cols = 80
    u8c[col].do_something(); // work with the char at row/col
  }
}
```

So to recap, the concepts here are:
• The ring buffer itself, a linear array that is conceptually split into a 2 dimensional array of rows and columns
  whose height and width are:

  - ring_rows -- how many rows in the entire ring buffer
  - ring_cols -- how many columns in the ring buffer
  - nchars -- total chars in ring, e.g. (ring_rows * ring_cols)

• The “history” within the ring. For simplicity this is thought of as starting relative to the top of the ring buffer,
  occupying ring buffer rows:

  0 .. hist_rows()-1

• The “display”, or “disp”, within the ring, just after the “history”. It occupies the ring buffer rows:

  hist_rows() .. hist_rows()+disp_rows()-1

  ..or similarly:

  (hist_rows)..(ring_rows-1)

  The following convenience methods provide access to the start and end indexes within the ring buffer for each
  entity:

  Entire ring ring_srow() – start row index of the ring buffer (always 0) ring_erow() – end row index of the ring buffer

  “history” part of ring hist_srow() – start row index of the screen history hist_erow() – end row index of the screen
  history

  “display” part of ring disp_srow() – start row index of the display disp_erow() – end row index of the display

  The values returned by these are as described above. For the hist_xxx() and disp_xxx() methods the ‘offset’ included
  into the forumula. (For this reason hist_srow() won’t always be zero the way ring_srow() is, due to the ‘offset’)

  The values returned by these methods can all be passed to the u8c_ring_row() function to access the actual char-
  acter buffer’s contents.

• An "offset" used to move the "history" and "display" around within the ring buffer to implement the "text
  scrolling" concept. The offset is applied when new characters are added to the buffer, and during drawing to
  find where the display actually is within the ring.

• The "scrollbar", which only is used when redrawing the screen the user sees, and is simply an additional
  offset to all the above, where a scrollbar value of zero (the scrollbar tab at the bottom) shows the display
  rows, and as the scrollbar values increase as the user moves the scrollbar tab upwards, +1 per line, this is
  subtracted from the normal starting index to let the user work their way backwards into the scrollback history.
  Again, negative numbers wrap around within the ring buffer automatically.

  The ring buffer allows new content to simply be appended to the ring buffer, and the index# for the start of the display
  and start of scrollback history are simply incremented. So the next time the display is "drawn", it starts at a different
  position in the ring.

  This makes scrolling content at high speed trivial, without memory moves. It also makes the concept of "scrolling"
  with the scrollbar simple as well, simply being an extra index offset applied during drawing.

**Mouse Selection**

Dragging the mouse across the screen should highlight the text, allowing the user to extend the selection either
beyond or before the point started. Extending the drag to the top of the screen should automatically 'scroll up' to
select more lines in the scrollback history, or below the bottom to do the opposite.

The mouse selection is implemented as a class to keep track of the start/end row/col positions of the selection, and
other details such as a flag indicating if a selection has been made, what color the fg/bg text should appear when
text is selected, and methods that allow setting and extending the selection, clearing the selection, and "scrolling"
the selection, to ensure the row/col indexes adjust correctly to track when the screen or scrollbar is scrolled.
Redraw Timer

Knowing when to redraw is tricky with a terminal, because sometimes high volumes of input will come in asynchronously, so in that case we need to determine when to redraw the screen to show the new content; too quickly will cause the screen to spend more time redrawing itself, preventing new input from being added. Too slowly, the user won't see new information appear in a timely manner.

To solve this, a rate timer is used to prevent too many redraws:

- When new data comes in, a 1/10 sec timer is started and a modify flag is set.
- redraw() is NOT called yet, allowing more data to continue to arrive quickly
- When the 1/10th second timer fires, the callback checks the modify flag:
  - if set, calls redraw(), resets the modify to 0, and calls Fl::repeat_timeout() to repeat the callback in another 1/10th sec.
  - if clear, no new data came in, so DISABLE the timer, done.

In this way, redraws don't happen more than 10x per second, and redraw() is called only when there's new content to see.

The redraw rate can be set by the user application using the Fl_Terminal::redraw_rate(), 0.10 being the default.

Some terminal operations necessarily call redraw() directly, such as interactive mouse selection, or during user scrolling the terminal's scrollbar, where it's important there's no delay in what the user sees while interacting directly with the widget.
Chapter 10

Drawing Things in FLTK

This chapter covers the drawing functions that are provided with FLTK.

10.1 When Can You Draw Things in FLTK?

There are only certain places you can execute FLTK code that draws to the computer's display. Calling these functions at other places will result in undefined behavior!

- The most common place is inside the virtual Fl_Widget::draw() method. To write code here, you must subclass one of the existing Fl_Widget classes and implement your own version of draw().

- You can also create custom boxtypes and labeltypes. These involve writing small procedures that can be called by existing Fl_Widget::draw() methods. These "types" are identified by an 8-bit index that is stored in the widget's box(), labeltype(), and possibly other properties.

- You can call Fl_Window::make_current() to do incremental update of a widget. Use Fl_Widget::window() to find the window.

In contrast, code that draws to other drawing surfaces than the display (i.e., instances of derived classes of the Fl_Surface_Device class, except Fl_Display_Device, such as Fl_Printer and Fl_Copy_Surface) can be executed at any time as follows:

1. Make your surface the new current drawing surface calling the Fl_Surface_Device::push_current(Fl_Surface_Device+) function.

2. Make a series of calls to any of the drawing functions described below; these will operate on the new current drawing surface;

3. Set the current drawing surface back to its previous state calling Fl_Surface_Device::pop_current().
10.2 What Units Do FLTK Functions Use?

Before version 1.4 all graphical quantities used by FLTK were in pixel units: a window of width 500 units was 500 pixels wide, a line of length 10 units was 10 pixels long, lines of text written using a 14-point font were 14 pixels below each other. This organization is not sufficient to support GUI apps that can be drawn on screens of varying pixel density, especially on High-DPI screens, because widgets become very small and text becomes unreadable.

FLTK version 1.4 introduces a new feature, a screen-specific scale factor which is a float number with a typical value in the 1-2.5 range and is used as follows: any graphical element with an FLTK value of $v$ units is drawn on the screen with $v \times \text{scale}$ units. Thus, a window with width 500 units is 500 $\times$ scale pixels wide, a line of length 10 units is 10 $\times$ scale pixels long, lines of text written using a 14-point font are 14 $\times$ scale pixels below each other. Consider a system with two screens, one with regular DPI and one with a twice higher DPI. If the first screen’s scale factor is set to 1 and that of the second screen to 2, the GUI of any FLTK app appears equally sized on the two screens.

FLTK uses several units to measure graphical elements:

- All quantities used by the public FLTK API to measure graphical elements (e.g., window widths, line lengths, font sizes, clipping regions, image widths and heights) are in FLTK units except if it’s explicitly documented another unit is used. FLTK units are both platform- and DPI-independent. An example of FLTK API using another unit is `Fl_Gl_Window::pixel_w()`.

- Just before drawing to a screen, the library internally multiplies all quantities expressed in FLTK units by the current value of the scale factor for the screen in use and obtains quantities in drawing units. The current scale factor value, for an `Fl_Window` named `window`, is given by

  ```c
  int screen = window->screen_num(); // the screen where window is mapped
  float s = Fl::screen_scale(nscreen); // this screen's scale factor
  ```

  One drawing unit generally corresponds to one screen pixel ...

- ... but not on macOS and for retina displays, where one drawing unit corresponds to two pixels.

- ... and not with the Wayland platform, where one drawing unit may correspond to 1, 2, or 3 pixels according to the current value of the Wayland-defined, integer-valued scale factor.

At application start time, FLTK attempts to detect the adequate scale factor value for each screen of the system. Here is how that's done under the X11, Windows, and Wayland platforms. If the resulting scale factor is not satisfactory, and also under the macOS platform, it’s possible to set the `FLTK_SCALING_FACTOR` environmental variable to the desired numerical value (e.g., 1.75) and any FLTK app will start scaled with that value. Furthermore, it’s possible to change the scale factor value of any screen at run time with `ctrl/+/-/0/` keystrokes which enlarge, shrink, and reset, respectively, all FLTK windows on a screen and their content. Under macOS, the corresponding GUI scaling shortcuts are `cmd/+/-/0/`.

GUI rescaling involves also image drawing: the screen area covered by the drawn image contains a number of pixels that grows with the scale factor. When FLTK draws images, it maps the image data (the size of these data is given by `Fl_Image::data_w()` and `Fl_Image::data_h()`) to the screen area whose size (in FLTK units) is given by `Fl_Image::w()` and `Fl_Image::h()`. How exactly such mapping is performed depends on the image type, the platform and some hardware features. The most common case for `Fl_RGB_Image`s is that FLTK uses a scaled drawing system feature that directly maps image data to screen pixels. An important feature of FLTK for image drawing is the `Fl_Image::scale()` member function, new in FLTK version 1.4. This function controls the image drawing size (in FLTK units, given by `Fl_Image::w()` and `Fl_Image::h()`) independently from the size of the image data (given by `Fl_Image::data_w()` and `Fl_Image::data_h()`). An image with large enough data size can thus be drawn at the full resolution of the screen even when the screen area covered by the image grows following the GUI scale factor.

The `Fl_Image_Surface` class is intended to create an `FL_RGB_Image` from a series of FLTK drawing operations. The `Fl_Image_Surface` constructor allows to control whether the size in pixels of the resulting image matches the FLTK units used when performing drawing operations, or matches the number of pixels corresponding to these FLTK units given the current value of the scale factor. The first result is obtained with `new Fl_Image_Surface(w, h)`, the second with `new Fl_Image_Surface(w, h, 1)`. When drawing to `Fl_Printer` or `Fl_PostScript_File_Device`, the drawing unit is initially one point, that is, 1/72 of an inch. This unit is changed by calls to `Fl_Paged_Device::scale()`.
10.3 Drawing Functions

To use the drawing functions you must first include the `<FL/fl_draw.H>` header file. FLTK provides the following types of drawing functions:

- Boxes
- Clipping
- Colors
- Line Dashes and Thickness
- Drawing Fast Shapes
- Drawing Complex Shapes
- Drawing Text
- Fonts
- Character Encoding
- Drawing Overlays
- Drawing Images
- Direct Image Drawing
- Direct Image Reading
- Image Classes
- Offscreen Drawing

10.3.1 Boxes

FLTK provides three functions that can be used to draw boxes for buttons and other UI controls. Each function uses the supplied upper-lefthand corner and width and height to determine where to draw the box.

```c
void fl_draw_box(Fl_Boxtype b, int x, int y, int w, int h, Fl_Color c)
```

The `fl_draw_box()` function draws a standard boxtype `b` in the specified color `c`.

```c
void fl_frame(const char *s, int x, int y, int w, int h)
void fl_frame2(const char *s, int x, int y, int w, int h)
```

The `fl_frame()` and `fl_frame2()` functions draw a series of line segments around the given box. The string `s` must contain groups of 4 letters which specify one of 24 standard grayscale values, where 'A' is black and 'X' is white. The results of calling these functions with a string that is not a multiple of 4 characters in length are undefined.

The only difference between `fl_frame()` and `fl_frame2()` is the order of the line segments:

- For `fl_frame()` the order of each set of 4 characters is: top, left, bottom, right.
- For `fl_frame2()` the order of each set of 4 characters is: bottom, right, top, left.

Note that `fl_frame(Fl_Boxtype b)` is described in the Box Types section.
10.3.2 Clipping

You can limit all your drawing to a rectangular region by calling `fl_push_clip()`, and put the drawings back by using `fl_pop_clip()`. This rectangle is measured in FLTK units and is unaffected by the current transformation matrix.

In addition, the system may provide clipping when updating windows which may be more complex than a simple rectangle.

```c
void fl_push_clip(int x, int y, int w, int h)
void fl_clip(int x, int y, int w, int h)
```

Intersect the current clip region with a rectangle and push this new region onto the stack.

The `fl_clip()` version is deprecated and will be removed from future releases.

```c
void fl_push_no_clip()
```

Promotes an empty clip region on the stack so nothing will be clipped.

```c
void fl_pop_clip()
```

Restore the previous clip region.

**Note:** You must call `fl_pop_clip()` once for every time you call `fl_push_clip()`. If you return to FLTK with the clip stack not empty unpredictable results occur.

```c
int fl_not_clipped(int x, int y, int w, int h)
```

Returns non-zero if any of the rectangle intersects the current clip region. If this returns 0 you don’t have to draw the object.

**Note:** Under X this returns 2 if the rectangle is partially clipped, and 1 if it is entirely inside the clip region.

```c
int fl_clip_box(int x, int y, int w, int h, int &X, int &Y, int &W, int &H)
```

Intersect the rectangle `x,y,w,h` with the current clip region and returns the bounding box of the result in `X,Y,W,H`. Returns non-zero if the resulting rectangle is different than the original. This can be used to limit the necessary drawing to a rectangle. `W` and `H` are set to zero if the rectangle is completely outside the region.

```c
void fl_clip_region(Fl_Region r)
Fl_Region fl_clip_region()
```

Replace the top of the clip stack with a clipping region of any shape. `Fl_Region` is an operating system specific type. The second form returns the current clipping region.
10.3.3 Colors

FLTK manages colors as 32-bit unsigned integers, encoded as RGBI. When the "RGB" bytes are non-zero, the value is treated as RGB. If these bytes are zero, the "I" byte will be used as an index into the colormap. Colors with both "RGB" set and an "I" >0 are reserved for special use.

Values from 0 to 255, i.e. the "I" index value, represent colors from the FLTK standard colormap and are allocated as needed on screens without TrueColor support. The Fl_Color enumeration type defines the standard colors and color cube for the first 256 colors. All of these are named with symbols in <FL/Enumerations.H>. Example:

![FLTK default colormap](image)

Color values greater than 255 are treated as 24-bit RGB values. These are mapped to the closest color supported by the screen, either from one of the 256 colors in the FLTK colormap or a direct RGB value on TrueColor screens.

Fl_Color fl_rgb_color(uchar r, uchar g, uchar b)
Fl_Color fl_rgb_color(uchar grayscale)

Generate Fl_Color out of specified 8-bit RGB values or one 8-bit grayscale value.

void fl_color(Fl_Color c)
void fl_color(int c)

Sets the color for all subsequent drawing operations. Please use the first form: the second form is only provided for back compatibility.
For colormapped displays, a color cell will be allocated out of `fl_colormap` the first time you use a color. If the colormap fills up then a least-squares algorithm is used to find the closest color.

```c
Fl_Color fl_color()
```

Returns the last color that was set using `fl_color()`. This can be used for state save/restore.

```c
void fl_color(uchar r, uchar g, uchar b)
```

Set the color for all subsequent drawing operations. The closest possible match to the RGB color is used. The RGB color is used directly on TrueColor displays. For colormap visuals the nearest index in the gray ramp or color cube is used.

```c
unsigned Fl::get_color(Fl_Color i)
void Fl::get_color(Fl_Color i, uchar &red, uchar &green, uchar &blue)
```

Generate RGB values from a colormap index value `i`. The first returns the RGB as a 32-bit unsigned integer, and the second decomposes the RGB into three 8-bit values.

```c
Fl::get_system_colors()
Fl::foreground()
Fl::background()
Fl::background2()
```

The first gets color values from the user preferences or the system, and the other routines are used to apply those values.

```c
Fl::own_colormap()
Fl::free_color(Fl_Color i, int overlay)
Fl::set_color(Fl_Color i, unsigned c)
```

`Fl::own_colormap()` is used to install a local colormap [X11 only].

`Fl::free_color()` and `Fl::set_color()` are used to remove and replace entries from the colormap.

There are two predefined graphical interfaces for choosing colors. The function `fl_show_colormap()` shows a table of colors and returns an `Fl_Color` index value. The `Fl_Color_Chooser` widget provides a standard RGB color chooser.

As the `Fl_Color` encoding maps to a 32-bit unsigned integer representing RBGI, it is also possible to specify a color using a hex constant as a color map index:
// COLOR MAP INDEX
color(0x000000ff)
----- |
|    | Color map index (8 bits)
|    | Must be zero
button->color(0x000000ff); // colormap index $255 (FL_WHITE)

or specify a color using a hex constant for the RGB components:

// RGB COLOR ASSIGNMENTS
color(0x000000ff)
    |    | Must be zero
    |    | Blue (8 bits)
    |    | Green (8 bits)
    |    | Red (8 bits)
button->color(0xff000000); // RGB: red
button->color(0x00ff0000); // RGB: green
button->color(0x0000ff00); // RGB: blue
button->color(0xffffff00); // RGB: white

Note
If TrueColor is not available, any RGB colors will be set to the nearest entry in the colormap.

10.3.4 Line Dashes and Thickness

FLTK supports drawing of lines with different styles and widths. Full functionality is not available under Windows 95, 98, and Me due to the reduced drawing functionality these operating systems provide.

void fl_line_style(int style, int width, char * dashes)

Set how to draw lines (the "pen"). If you change this it is your responsibility to set it back to the default with fl_line_style(0).

Note: Because of how line styles are implemented on MS Windows systems, you must set the line style after setting the drawing color. If you set the color after the line style you will lose the line style settings!

style is a bitmask which is a bitwise-OR of the following values. If you don’t specify a dash type you will get a solid line. If you don’t specify a cap or join type you will get a system-defined default of whatever value is fastest.
• FL_SOLID  ------
• FL_DASH  - - - -
• FL_DOT      ......
• FL_DASHDOT  -  .  -
• FL_DASHDOTDOT - .  -
• FL_CAP_FLAT
• FL_CAP_ROUND
• FL_CAP_SQUARE (extends past end point 1/2 line width)
• FL_JOIN_MITER (pointed)
• FL_JOIN_ROUND
• FL_JOIN_BEVEL (flat)

width is the number of FLTK units thick to draw the lines. Zero results in the system-defined default, which on both X and Windows is somewhat different and nicer than 1.

dashes is a pointer to an array of dash lengths, measured in FLTK units. The first location is how long to draw a solid portion, the next is how long to draw the gap, then the solid, etc. It is terminated with a zero-length entry. A NULL pointer or a zero-length array results in a solid line. Odd array sizes are not supported and result in undefined behavior.

Note: The dashes array does not work under Windows 95, 98, or Me, since those operating systems do not support complex line styles.

10.3.5 Drawing Fast Shapes

These functions are used to draw almost all the FLTK widgets. They draw on exact pixel boundaries and are as fast as possible. Their behavior is duplicated exactly on all platforms FLTK is ported. It is undefined whether these are affected by the transformation matrix, so you should only call these while the matrix is set to the identity matrix (the default).

void fl_point(int x, int y)

Draw a single pixel at the given coordinates.

void fl_rectf(int x, int y, int w, int h)
void fl_rectf(int x, int y, int w, int h, Fl_Color c)

Color a rectangle that exactly fills the given bounding box.

void fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b)
Color a rectangle with "exactly" the passed \(r, g, b\) color. On screens with less than 24 bits of color this is done by drawing a solid-colored block using `fl_draw_image()` so that the correct color shade is produced.

```c
void fl_rect(int x, int y, int w, int h)
void fl_rect(int x, int y, int w, int h, Fl_Color c)
```

Draw a 1-pixel border inside this bounding box.

```c
void fl_rounded_rect(int x, int y, int w, int h, int radius)
void fl_rounded_rectf(int x, int y, int w, int h, int radius)
```

Draw an outlined or filled rectangle with rounded corners.

```c
void fl_line(int x, int y, int x1, int y1)
void fl_line(int x, int y, int x1, int y1, int x2, int y2)
```

Draw one or two lines between the given points.

```c
void fl_loop(int x, int y, int x1, int y1, int x2, int y2)
void fl_loop(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
```

Outline a 3 or 4-sided polygon with lines.

```c
void fl_polygon(int x, int y, int x1, int y1, int x2, int y2)
void fl_polygon(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
```

Fill a 3 or 4-sided polygon. The polygon must be convex.

```c
void fl_xyline(int x, int y, int x1)
void fl_xyline(int x, int y, int x1, int y2)
void fl_xyline(int x, int y, int x1, int y2, int x3)
```

Draw horizontal and vertical lines. A horizontal line is drawn first, then a vertical, then a horizontal.

```c
void fl_yxline(int x, int y, int y1)
void fl_yxline(int x, int y, int y1, int x2)
void fl_yxline(int x, int y, int y1, int x2, int y3)
```

Draw vertical and horizontal lines. A vertical line is drawn first, then a horizontal, then a vertical.

```c
void fl_arc(int x, int y, int w, int h, double a1, double a2)
void fl_pie(int x, int y, int w, int h, double a1, double a2)
```
Draw ellipse sections using integer coordinates. These functions match the rather limited circle drawing code provided by X and MS Windows. The advantage over using fl_arc() with floating point coordinates is that they are faster because they often use the hardware, and they draw much nicer small circles, since the small sizes are often hard-coded bitmaps.

If a complete circle is drawn it will fit inside the passed bounding box. The two angles are measured in degrees counter-clockwise from 3'o'clock and are the starting and ending angle of the arc, a2 must be greater or equal to a1.

\[ a2 \geq a1 \]

![Figure 10.2 fl_pie() and fl_arc()](image)

fl_arc() draws a series of lines to approximate the arc. Notice that the integer version of fl_arc() has a different number of arguments to the other fl_arc() function described later in this chapter.

fl_pie() draws a filled-in pie slice. This slice may extend outside the line drawn by fl_arc(); to avoid this use \( w-1 \) and \( h-1 \).

```c
void fl_scroll(int X, int Y, int W, int H, int dx, int dy, void (draw_area)(void, int, int, int, int), void* data)
```

Scroll a rectangle and draw the newly exposed portions. The contents of the rectangular area is first shifted by \( dx \) and \( dy \) FLTK units. The callback is then called for every newly exposed rectangular area,
10.3 Drawing Functions

10.3.6 Drawing Complex Shapes

The complex drawing functions let you draw arbitrary shapes with 2-D linear transformations. The functionality matches that found in the Adobe® PostScript™ language. The exact pixels that are filled are less defined than for the fast drawing functions so that FLTK can take advantage of drawing hardware. On both X and MS Windows the transformed vertices are rounded to integers before drawing the line segments: this severely limits the accuracy of these functions for complex graphics, so use OpenGL when greater accuracy and/or performance is required.

void fl_load_matrix(double a, double b, double c, double d, double x, double y) void fl_load_identity()

Set the current transformation.

void fl_push_matrix() void fl_pop_matrix()

Save and restore the current transformation. The maximum depth of the stack is 32 entries.

void fl_scale(double x, double y) void fl_scale(double x) void fl_translate(double x, double y) void fl_rotate(double d) void fl_mult_matrix(double a, double b, double c, double d, double x, double y)

Concatenate another transformation onto the current one. The rotation angle is in degrees (not radians) and is counter-clockwise.

double fl_transform_x(double x, double y) double fl_transform_y(double x, double y) double fl_transform_dx(double x, double y) double fl_transform_dy(double x, double y) void fl_transformed_vertex(double xf, double yf)

Transform a coordinate or a distance using the current transformation matrix. After transforming a coordinate pair, it can be added to the vertex list without any further translations using fl_transformed_vertex().

void fl_begin_points() void fl_end_points()

Start and end drawing a list of points. Points are added to the list with fl_vertex().

void fl_begin_line() void fl_end_line()
Start and end drawing lines.

```c
void fl_begin_loop()
void fl_end_loop()
```

Start and end drawing a closed sequence of lines.

```c
void fl_begin_polygon()
void fl_end_polygon()
```

Start and end drawing a convex filled polygon.

```c
void fl_begin_complex_polygon()
void fl_gap()
void fl_end_complex_polygon()
```

Start and end drawing a complex filled polygon. This polygon may be concave, may have holes in it, or may be several disconnected pieces. Call `fl_gap()` to separate loops of the path. It is unnecessary but harmless to call `fl_gap()` before the first vertex, after the last one, or several times in a row.

`fl_gap()` should only be called between `fl_begin_complex_polygon()` and `fl_end_complex_polygon()`. To outline the polygon, use `fl_begin_loop()` and replace each `fl_gap()` with a `fl_end_loop(); fl_begin_loop()` pair.

**Note:** For portability, you should only draw polygons that appear the same whether "even/odd" or "non-zero" winding rules are used to fill them. Holes should be drawn in the opposite direction of the outside loop.

```c
void fl_vertex(double x, double y)
```

Add a single vertex to the current path.

```c
void fl_curve(double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3)
```

Add a series of points on a Bézier curve to the path. The curve ends (and two of the points are) at $X_0, Y_0$ and $X_3, Y_3$.

```c
void fl_arc(double x, double y, double r, double start, double end)
```
Add a series of points to the current path on the arc of a circle; you can get elliptical paths by using scale and rotate before calling `fl_arc()`. The center of the circle is given by \( x \) and \( y \), and \( r \) is its radius. `fl_arc()` takes \( \text{start} \) and \( \text{end} \) angles that are measured in degrees counter-clockwise from 3 o'clock. If \( \text{end} \) is less than \( \text{start} \) then it draws the arc in a clockwise direction.

![Figure 10.3 fl_arc(x,y,r,a1,a2)](image)

```c
void fl_circle(double x, double y, double r)
```

`fl_circle(x,y,r)` is equivalent to `fl_arc(x,y,r,0,360)` but may be faster. It must be the only thing in the path: if you want a circle as part of a complex polygon you must use `fl_arc()`.

**Note:** `fl_circle()` draws incorrectly if the transformation is both rotated and non-square scaled.

### 10.3.7 Drawing Text

All text is drawn in the current font. It is undefined whether this location or the characters are modified by the current transformation.

```c
void fl_draw(const char *, int x, int y)
void fl_draw(const char *, int n, int x, int y)
```

Draw a null-terminated string or an array of \( n \) bytes starting at the given location. In both cases, the text must be UTF-8 encoded. Text is aligned to the left and to the baseline of the font. To align to the bottom, subtract `fl_descent()` from \( y \). To align to the top, subtract `fl_descent()` and add `fl_height()`. This version of `fl_draw()` provides direct access to the text drawing function of the underlying OS. It does not apply any special handling to control characters.

```c
void fl_rtl_draw(const char *str, int n, int x, int y)
```
Draw a UTF-8 string of length n bytes right to left starting at the given x, y location.

```c
void fl_draw(const char* str, int x, int y, int w, int h, Fl_Align align, Fl_IMAGE* img, int draw_symbols)
```

Fancy string drawing function which is used to draw all the labels. The string is formatted and aligned inside the passed box. Handles ‘\t’ and ‘\n’, expands all other control characters to ‘\X’, and aligns inside or against the edges of the box described by x, y, w and h. See Fl_Widget::align() for values for align. The value FL_ALIGN_INSIDE is ignored, as this function always prints inside the box.

If `img` is provided and is not NULL, the image is drawn above or below the text as specified by the align value.

The `draw_symbols` argument specifies whether or not to look for symbol names starting with the "@" character.

```c
void fl_measure(const char* str, int& w, int& h, int draw_symbols)
```

Measure how wide and tall the string will be when printed by the `fl_draw(...align)` function. This includes leading/trailing white space in the string, kerning, etc.

If the incoming `w` is non-zero it will wrap to that width.

This will probably give unexpected values unless you have called `fl_font()` explicitly in your own code. Refer to the full documentation for `fl_measure()` for details on usage and how to avoid common pitfalls.

See also

- `fl_text_extents()` – measure the ‘inked’ area of a string
- `fl_width()` – measure the width of a string or single character
- `fl_height()` – measure the height of the current font
- `fl_descent()` – the height of the descender for the current font

```c
int fl_height()
```

Recommended minimum line spacing for the current font. You can also just use the value of `size` passed to `fl_font()`.
10.3 Drawing Functions

See also

\texttt{fl\_text\_extents()}, \texttt{fl\_measure()}, \texttt{fl\_width()}, \texttt{fl\_descent()}

\texttt{int fl\_descent()}

Recommended distance above the bottom of a \texttt{fl\_height()} tall box to draw the text at so it looks centered vertically in that box.

\texttt{double fl\_width(const char * txt)}
\texttt{double fl\_width(const char * txt, int n)}
\texttt{double fl\_width(unsigned int unicode\_char)}

Return the width of a nul-terminated string, a sequence of \texttt{n} characters, or a single character in the current font.

See also

\texttt{fl\_measure()}, \texttt{fl\_text\_extents()}, \texttt{fl\_height()}, \texttt{fl\_descent()}

\texttt{void fl\_text\_extents(const char * txt, int& dx, int& dy, int& w, int& h)}

Determines the minimum dimensions of a nul-terminated string, ie. the 'inked area'.

Given a string "txt" drawn using \texttt{fl\_draw(txt, x, y)} you would determine its extents in FLTK units on the display using \texttt{fl\_text\_extents(txt, dx, dy, wo, ho)} such that a bounding box that exactly fits around the inked area of the text could be drawn with \texttt{fl\_rect(x+dx, y+dy, wo, ho)}.

Refer to the full documentation for \texttt{fl\_text\_extents()} for details on usage.

See also

\texttt{fl\_measure()}, \texttt{fl\_width()}, \texttt{fl\_height()}, \texttt{fl\_descent()}

\texttt{const char* fl\_shortcut\_label(int shortcut)}

Unparse a shortcut value as used by \texttt{Fl\_Button} or \texttt{Fl\_Menu\_Item} into a human-readable string like "Alt+N". This only works if the shortcut is a character key or a numbered function key. If the shortcut is zero an empty string is returned. The return value points at a static buffer that is overwritten with each call.
10.3.8 Fonts

FLTK supports a set of standard fonts based on the Times, Helvetica/Arial, Courier, and Symbol typefaces, as well as custom fonts that your application may load. Each font is accessed by an index into a font table.

Initially only the first 16 faces are filled in. There are symbolic names for them: FL_HELVETICA, FL_TIMES, FL_COURIER, and modifier values FL_BOLD and FL_ITALIC which can be added to these, and FL_SYMBOL and FL_ZAPF_DINGBATS. Faces greater than 255 cannot be used in Fl_Widget labels, since Fl_Widget stores the index as a byte.

One important thing to note about 'current font' is that there are so many paths through the GUI event handling code as widgets are partially or completely hidden, exposed and then re-drawn and therefore you can not guarantee that 'current font' contains the same value that you set on the other side of the event loop. Your value may have been superseded when a widget was redrawn. You are strongly advised to set the font explicitly before you draw any text or query the width and height of text strings, etc.

void fl_font(int face, int size)

Set the current font, which is then used by the routines described above. You may call this outside a draw context if necessary to call fl_width(), but on X this will open the display.

The font is identified by a face and a size. The size of the font is measured in FLTK units and not "points". Lines should be spaced size FLTK units apart or more.

int fl_font()
int fl_size()

Returns the face and size set by the most recent call to fl_font(a,b). This can be used to save/restore the font.

10.3.9 Character Encoding

FLTK 1.3 and later versions expect all text in Unicode UTF-8 encoding. UTF-8 is ASCII compatible for the first 128 characters. International characters are encoded in multibyte sequences.

FLTK expects individual characters, characters that are not part of a string, in UCS-4 encoding, which is also ASCII compatible, but requires 4 bytes to store a Unicode character.

FLTK can draw accurately any Unicode-supported script for which the system contains relevant fonts. Under X11 platforms, this requires to build the library with the OPTION_USE_PANGO CMake option turned On (or with configure --enable-pango).

Plain text drawing starting at a user-given coordinate is well supported by FLTK, including for right-to-left scripts. Further text-related operations (i.e., selection, formatting, input, and editing) are functional with left-to-right scripts only.

For more information about character encodings, see the chapter on Unicode and UTF-8 Support.
10.3.10 Drawing Overlays

These functions allow you to draw interactive selection rectangles without using the overlay hardware. FLTK will XOR a single rectangle outline over a window.

```c
void fl_overlay_rect(int x, int y, int w, int h)
void fl_overlay_clear()
```

`fl_overlay_rect()` draws a selection rectangle, erasing any previous rectangle by XOR'ing it first. `fl_overlay_clear()` will erase the rectangle without drawing a new one.

Using these functions is tricky. You should make a widget with both a `handle()` and `draw()` method. `draw()` should call `fl_overlay_clear()` before doing anything else. Your `handle()` method should call `window()->make_current()` and then `fl_overlay_rect()` after FL_DRAG events, and should call `fl_overlay_clear()` after a FL_RELEASE event.

10.4 Drawing Images

To draw images, you can either do it directly from data in your memory, or you can create a `Fl_Image` object. The advantage of drawing directly is that it is more intuitive, and it is faster if the image data changes more often than it is redrawn. The advantage of using the object is that FLTK will cache translated forms of the image (on X it uses a server pixmap) and thus redrawing is much faster.

10.4.1 Direct Image Drawing

The behavior when drawing images when the current transformation matrix is not the identity is not defined, so you should only draw images when the matrix is set to the identity.

```c
void fl_draw_image(const uchar *buf, int X, int Y, int W, int H, int D, int L)
void fl_draw_image_mono(const uchar *buf, int X, int Y, int W, int H, int D, int L)
```

Draw an 8-bit per color RGB or luminance image. The pointer points at the "r" data of the top-left pixel. Color data must be in r, g, b order. The top left corner is given by X and Y and the size of the image is given by W and H. D is the delta to add to the pointer between pixels, it may be any value greater or equal to 3, or it can be negative to flip the image horizontally. L is the delta to add to the pointer between lines (if 0 is passed it uses W*D), and may be larger than W*D to crop data, or negative to flip the image vertically.

It is highly recommended that you put the following code before the first `show()` of any window in your program to get rid of the dithering if possible:

```c
Fl::visual(FL_RGB);
```

Gray scale (1-channel) images may be drawn. This is done if abs(D) is less than 3, or by calling `fl_draw_image_mono()`. Only one 8-bit sample is used for each pixel, and on screens with different numbers of bits for red, green, and blue only gray colors are used. Setting D greater than 1 will let you display one channel of a color image.
Note: The X version does not support all possible visuals. If FLTK cannot draw the image in the current visual it will abort. FLTK supports any visual of 8 bits or less, and all common TrueColor visuals up to 32 bits.

typedef void (∗Fl_Draw_Image_Cb)(void ∗data, int x, int y, int w, uchar ∗buf)
void fl_draw_image(Fl_Draw_Image_Cb cb, void ∗data, int X, int Y, int W, int H, int D)
void fl_draw_image_mono(Fl_Draw_Image_Cb cb, void ∗data, int X, int Y, int W, int H, int D)

Call the passed function to provide each scan line of the image. This lets you generate the image as it is being drawn, or do arbitrary decompression of stored data, provided it can be decompressed to individual scan lines easily.

The callback is called with the void* user data pointer which can be used to point at a structure of information about the image, and the x, y, and w of the scan line desired from the image. 0,0 is the upper-left corner of the image, not X, Y. A pointer to a buffer to put the data into is passed. You must copy w pixels from scanline y, starting at pixel x, to this buffer.

Due to cropping, less than the whole image may be requested. So x may be greater than zero, the first y may be greater than zero, and w may be less than W. The buffer is long enough to store the entire W*D pixels, this is for convenience with some decompression schemes where you must decompress the entire line at once: decompress it into the buffer, and then if x is not zero, copy the data over so the x'th pixel is at the start of the buffer.

You can assume the y’s will be consecutive, except the first one may be greater than zero.

If D is 4 or more, you must fill in the unused bytes with zero.

int fl_draw_pixmap(char ∗const ∗data, int x, int y, Fl_Color bg)
int fl_draw_pixmap(const char ∗const ∗cdata, int x, int y, Fl_Color bg)

Draws XPM image data, with the top-left corner at the given position. The image is dithered on 8-bit displays so you won't lose color space for programs displaying both images and pixmaps. This function returns zero if there was any error decoding the XPM data.

To use an XPM, do:

# include "foo.xpm"
...
fl_draw_pixmap(foo, X, Y);

Transparent colors are replaced by the optional Fl_Color argument. To draw with true transparency you must use the Fl_Pixmap class.

int fl_measure_pixmap(char ∗const ∗data, int ∗&w, int ∗&h)
int fl_measure_pixmap(const char ∗const ∗cdata, int ∗&w, int ∗&h)

An XPM image contains the dimensions in its data. This function finds and returns the width and height. The return value is non-zero if the dimensions were parsed ok and zero if there was any problem.
10.4 Drawing Images

10.4.2 Direct Image Reading

FLTK provides a single function for reading from the current window or off-screen buffer into a RGB(A) image buffer.

`uchar* fl_read_image(uchar *p, int X, int Y, int W, int H, int alpha)`

Read a RGB(A) image from the current window or off-screen buffer. The `p` argument points to a buffer that can hold the image and must be at least `W*H*3` bytes when reading RGB images and `W*H*4` bytes when reading RGBA images. If NULL, `fl_read_image()` will create an array of the proper size which can be freed using `delete[]`.

The `alpha` parameter controls whether an alpha channel is created and the value that is placed in the alpha channel. If 0, no alpha channel is generated.

10.4.3 Image Classes

FLTK provides a base image class called `Fl_Image` which supports creating, copying, and drawing images of various kinds, along with some basic color operations. Images can be used as labels for widgets using the `image()` and `deimage()` methods or drawn directly. Images can be drawn scaled to any size, independently from the size of the image's data (see `Fl_Image::scale()`).

The `Fl_Image` class does almost nothing by itself, but is instead supported by three basic image types:

- `Fl_Bitmap`
- `Fl_Pixmap`
- `Fl_RGB_Image`

The `Fl_Bitmap` class encapsulates a mono-color bitmap image. The `draw()` method draws the image using the current drawing color.

The `Fl_Pixmap` class encapsulates a colormapped image. The `draw()` method draws the image using the colors in the file, and masks off any transparent colors automatically.

The `Fl_RGB_Image` class encapsulates a full-color (or grayscale) image with 1 to 4 color components. Images with an even number of components are assumed to contain an alpha channel that is used for transparency. The transparency provided by the `draw()` method is either a 24-bit blend against the existing window contents or a "screen door" transparency mask, depending on the platform and screen color depth.

`char fl_can_do_alpha_blending()`
fl_can_do_alpha_blending() will return 1, if your platform supports true alpha blending for RGBA images, or 0, if FLTK will use screen door transparency.

FLTK also provides several image classes based on the three standard image types for common file formats:

- Fl_GIF_Image
- Fl_Anim_GIF_Image
- Fl_JPEG_Image
- Fl_PNG_Image
- Fl_PNM_Image
- Fl_XBM_Image
- Fl_XPM_Image
- Fl_SVG_Image
- Fl_BMP_Image
- Fl_ICO_Image

Each of these image classes loads a named file of the corresponding format. The Fl_Shared_Image class can be used to load any type of image file - the class examines the file and constructs an image of the appropriate type.

Finally, FLTK provides a special image class called Fl_Tiled_Image to tile another image object in the specified area. This class can be used to tile a background image in a Fl_Group widget, for example.

```cpp
virtual Fl_Image* Fl_Image::copy()
virtual Fl_Image* Fl_Image::copy(int W, int H) const
```

The `copy()` method creates a copy of the image. The second form specifies the new size of the image - the image is resized using the nearest-neighbor algorithm (this is the default).

*Note*

As of FLTK 1.3.3 the image resizing algorithm can be changed. See `Fl_Image::RGB_scaling(Fl_RGB_Scaling method)`

```cpp
virtual void Fl_Image::draw(int x, int y, int w, int h, int ox, int oy)
```

The `draw()` method draws the image object. `x, y, w, h` indicates the destination rectangle. `ox, oy, w, h` is the source rectangle. This source rectangle is copied to the destination. The source rectangle may extend outside the image, i.e. `ox` and `oy` may be negative and `w` and `h` may be bigger than the image, and this area is left unchanged.

*Note*

See exceptions for Fl_Tiled_Image::draw() regarding arguments `ox, oy, w,` and `h`.

```cpp
virtual void Fl_Image::draw(int x, int y)
```

Draws the image with the upper-left corner at `x, y`. This is the same as doing `img->draw(x, y, img->w(), img->h(), 0, 0)` where `img` is a pointer to any Fl_Image type.
10.5 Offscreen Drawing

Sometimes it can be very useful to generate a complex drawing in memory first and copy it to the screen at a later point in time. This technique can significantly reduce the amount of repeated drawing. Offscreen drawing functions are declared in `<FL/fl_draw.H>`.

**Fl_Double_Window** uses offscreen rendering to avoid flickering on systems that don’t support double-buffering natively.

FLTK can draw into an offscreen buffer at any time. There is no need to wait for an **Fl_Widget::draw()** to occur.

**Note**

In FLTK 1.3.x and earlier versions all offscreen drawing functions described below were implemented as macros and created certain temporary variables to save context information. You needed to create local scope blocks with curly braces `{ ... }` if you used offscreen functions more than once in a function or method. This is no longer necessary since offscreen drawing is now implemented in real functions (no macros).

**Example:**
```c
Fl_Offscreen oscr = fl_create_offscreen(120, 120);
fl_begin_offscreen(oscr);
fl_color(FL_WHITE);
fl_rectf(0, 0, 120, 120);
fl_end_offscreen();   // other code here
fl_begin_offscreen(oscr);
fl_color(FL_BLACK);
fl_rectf(10, 10, 100, 100);
fl_end_offscreen();   // other code here
fl_delete_offscreen(oscr);
```

**Fl_Offscreen** **fl_create_offscreen**(int w, int h)

Create an RGB offscreen buffer containing as many pixels as in a screen area of size \( w \times h \) FLTK units.

**void** **fl_delete_offscreen**(Fl_Offscreen)

Delete a previously created offscreen buffer. All drawings are lost.

**void** **fl_begin_offscreen**(Fl_Offscreen)

Send all subsequent drawing commands to this offscreen buffer.

**void** **fl_end_offscreen**()

Quit sending drawing commands to this offscreen buffer.

**void** **fl_copy_offscreen**(int x, int y, int w, int h, Fl_Offscreen osrc, int srcx, int srcy)

Copy a rectangular area of the size \( w \times h \) from \( \text{srcx,srcy} \) in the offscreen buffer into the current drawing surface at \( \text{x,y} \).

**void** **fl_rescale_offscreen**(Fl_Offscreen &osrc)

Adapts the offscreen's size in pixels to a changed value of the scale factor while keeping the offscreen's graphical content.
Chapter 11

Handling Events

This chapter discusses the FLTK event model and how to handle events in your program or widget.

11.1 The FLTK Event Model

Every time a user moves the mouse pointer, clicks a button, or presses a key, an event is generated and sent to your application. Events can also come from other programs like the window manager.

Events are identified by the integer argument passed to a handle() method that overrides the Fl_Widget::handle() virtual method. Other information about the most recent event is stored in static locations and acquired by calling the Fl::event_*() methods. This static information remains valid until the next event is read from the window system, so it is ok to look at it outside of the handle() method.

Event numbers can be converted to their actual names using the fl_eventnames[] array defined in #include <FL/names.h>; see next chapter for details.

In the next chapter, the MyClass::handle() example shows how to override the Fl_Widget::handle() method to accept and process specific events.

11.2 Mouse Events

11.2.1 FL_PUSH

A mouse button has gone down with the mouse pointing at this widget. You can find out what button by calling Fl::event_button(). You find out the mouse position by calling Fl::event_x() and Fl::event_y().

A widget indicates that it "wants" the mouse click by returning non-zero from its handle() method, as in the MyClass::handle() example. It will then become the Fl::pushed() widget and will get FL_DRAG and the matching FL_RELEASE events. If handle() returns zero then FLTK will try sending the FL_PUSH to another widget.

11.2.2 FL_DRAG

The mouse has moved with a button held down. The current button state is in Fl::event_state(). The mouse position is in Fl::event_x() and Fl::event_y().

In order to receive FL_DRAG events, the widget must return non-zero when handling FL_PUSH.
11.2.3 **FL_RELEASE**

A mouse button has been released. You can find out what button by calling `Fl::event_button()`.

In order to receive the `FL_RELEASE` event, the widget must return non-zero when handling `FL_PUSH`.

11.2.4 **FL_MOVE**

The mouse has moved without any mouse buttons held down. This event is sent to the `Fl::belowmouse()` widget.

In order to receive `FL_MOVE` events, the widget must return non-zero when handling `FL_ENTER`.

11.2.5 **FL_MOUSEWHEEL**

The user has moved the mouse wheel. The `Fl::event_dx()` and `Fl::event_dy()` methods can be used to find the amount to scroll horizontally and vertically.

11.3 **Focus Events**

11.3.1 **FL_ENTER**

The mouse has been moved to point at this widget. This can be used for highlighting feedback. If a widget wants to highlight or otherwise track the mouse, it indicates this by returning non-zero from its `handle()` method. It then becomes the `Fl::belowmouse()` widget and will receive `FL_MOVE` and `FL_LEAVE` events.

11.3.2 **FL_LEAVE**

The mouse has moved out of the widget.

In order to receive the `FL_LEAVE` event, the widget must return non-zero when handling `FL_ENTER`.

11.3.3 **FL_FOCUS**

This indicates an attempt to give a widget the keyboard focus.

If a widget wants the focus, it should change itself to display the fact that it has the focus, and return non-zero from its `handle()` method. It then becomes the `Fl::focus()` widget and gets `FL_KEYDOWN`, `FL_KEYUP`, and `FL_UNFOCUS` events.

The focus will change either because the window manager changed which window gets the focus, or because the user tried to navigate using tab, arrows, or other keys. You can check `Fl::event_key()` to figure out why it moved. For navigation it will be the key pressed and for interaction with the window manager it will be zero.

11.3.4 **FL_UNFOCUS**

This event is sent to the previous `Fl::focus()` widget when another widget gets the focus or the window loses focus.
11.4 Keyboard Events

11.4.1 FL_KEYBOARD, FL_KEYDOWN, FL_KEYUP

A key was pressed (FL_KEYDOWN) or released (FL_KEYUP). FL_KEYBOARD is a synonym for FL_KEYDOWN, and both names are used interchangeably in this documentation.

The key can be found in Fl::event_key(). The text that the key should insert can be found with Fl::event_text() and its length is in Fl::event_length().

If you use the key, then handle() should return 1. If you return zero then FLTK assumes you ignored the key and will then attempt to send it to a parent widget. If none of them want it, it will change the event into a FL_SHORTCUT event. FL_KEYBOARD events are also generated by the character palette/map.

To receive FL_KEYBOARD events you must also respond to the FL_FOCUS and FL_UNFOCUS events by returning 1. This way FLTK knows whether to bother sending your widget keyboard events. (Some widgets don’t need them, e.g. Fl_Box.)

If you are writing a text-editing widget you may also want to call the Fl::compose() function to translate individual keystrokes into characters.

FL_KEYUP events are sent to the widget that currently has focus. This is not necessarily the same widget that received the corresponding FL_KEYDOWN event because focus may have changed between events.

Todo Add details on how to detect repeating keys, since on some X servers a repeating key will generate both FL_KEYUP and FL_KEYDOWN, such that to tell if a key is held, you need Fl::event_key(int) to detect if the key is being held down during FL_KEYUP or not.

11.4.2 FL_SHORTCUT

If the Fl::focus() widget is zero or ignores an FL_KEYBOARD event then FLTK tries sending this event to every widget it can, until one of them returns non-zero. FL_SHORTCUT is first sent to the Fl::belowmouse() widget, then its parents and siblings, and eventually to every widget in the window, trying to find an object that returns non-zero. FLTK tries really hard to not to ignore any keystrokes!

You can also make “global” shortcuts by using Fl::add_handler(). A global shortcut will work no matter what windows are displayed or which one has the focus.

11.5 Widget Events

11.5.1 FL_DEACTIVATE

This widget is no longer active, due to deactivate() being called on it or one of its parents. Please note that although active() may still return true for this widget after receiving this event, it is only truly active if active() is true for both it and all of its parents. (You can use active_r() to check this).

11.5.2 FL_ACTIVATE

This widget is now active, due to activate() being called on it or one of its parents.
11.5.3 **FL_HIDE**

This widget is no longer visible, due to `hide()` being called on it or one of its parents, or due to a parent window being minimized. Please note that although `visible()` may still return true for this widget after receiving this event, it is only truly visible if `visible()` is true for both it and all of its parents. (You can use `visible_r()` to check this).

11.5.4 **FL_SHOW**

This widget is visible again, due to `show()` being called on it or one of its parents, or due to a parent window being restored. A child `Fl_Window` will respond to this by actually creating the window if not done already, so if you subclass a window, be sure to pass `FL_SHOW` to the base class `handle()` method!

**Note**

The events in this chapter ("Widget Events"), i.e. `FL_ACTIVATE`, `FL_DEACTIVATE`, `FL_SHOW`, and `FL_HIDE`, are the only events deactivated and invisible widgets can usually get, depending on their states. Under certain circumstances, there may also be `FL_LEAVE` or `FL_UNFOCUS` events delivered to deactivated or hidden widgets.

11.6 **Clipboard Events**

11.6.1 **FL_PASTE**

You should get this event some time after you call `Fl::paste()`. The contents of `Fl::event_text()` is the text to insert and the number of characters is in `Fl::event_length()`.

11.6.2 **FL_SELECTIONCLEAR**

The `Fl::selection_owner()` will get this event before the selection is moved to another widget. This indicates that some other widget or program has claimed the selection. Motif programs used this to clear the selection indication. Most modern programs ignore this.

11.7 **Drag and Drop Events**

FLTK supports drag and drop of text and files from any application on the desktop to an FLTK widget. Text is transferred using UTF-8 encoding.

See `Fl::dnd()` for drag and drop from an FLTK widget.

The drag and drop data is available in `Fl::event_text()` at the concluding `FL_PASTE`. On some platforms, the event text is also available for the `FL_DND_*` events, however application must not depend on that behavior because it depends on the protocol used on each platform.

`FL_DND_*` events cannot be used in widgets derived from `Fl_Group` or `Fl_Window`.

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11.7.1 Dropped filenames

Files are received as a list of full path and file names.

- On some X11 platforms, files are received as a URL-encoded UTF-8 string, that is, non-ASCII bytes (and a few others such as space and %) are replaced by the 3 bytes “%XY” where XY are the byte’s hexadecimal value. The fl_decode_uri() function can be used to transform in-place the received string into a proper UTF-8 string. On these platforms, strings corresponding to dropped files are further prepended by file:// (or other prefixes such as computer://).
- Other X11 situations put all dropped filenames in a single line, separated by spaces.
- On non-X11 platforms, including Wayland, files dropped are received one pathname per line, with no \n after the last pathname.

11.7.2 FL_DND_ENTER

The mouse has been moved to point at this widget. A widget that is interested in receiving drag’n’drop data must return 1 to receive FL_DND_DRAG, FL_DND_LEAVE and FL_DND_RELEASE events.

11.7.3 FL_DND_DRAG

The mouse has been moved inside a widget while dragging data. A widget that is interested in receiving drag’n’drop data should indicate the possible drop position.

11.7.4 FL_DND_LEAVE

The mouse has moved out of the widget.

11.7.5 FL_DND_RELEASE

The user has released the mouse button dropping data into the widget. If the widget returns 1, it will receive the data in the immediately following FL_PASTE event.

11.8 Other events

11.8.1 FL_SCREEN_CONFIGURATION_CHANGED

Sent whenever the screen configuration changes (a screen is added/removed, a screen resolution is changed, screens are moved). Use Fl::add_handler() to be notified of this event.

11.8.2 FL_FULLSCREEN

The application window has been changed from normal to fullscreen, or from fullscreen to normal. If you are using a X window manager which supports Extended Window Manager Hints, this event will not be delivered until the change has actually happened.
11.9 Fl::event_∗() methods

FLTK keeps the information about the most recent event in static storage. This information is good until the next event is processed. Thus it is valid inside handle() and callback() methods.

These are all trivial inline functions and thus very fast and small:

- Fl::event_button()
- Fl::event_clicks()
- Fl::event_dx()
- Fl::event_dy()
- Fl::event_inside()
- Fl::event_is_click()
- Fl::event_key()
- Fl::event_length()
- Fl::event_state()
- Fl::event_text()
- Fl::event_x()
- Fl::event_x_root()
- Fl::event_y()
- Fl::event_y_root()
- Fl::get_key()
- Fl::get_mouse()
- Fl::test_shortcut()

11.10 Event Propagation

Widgets receive events via the virtual handle() function. The argument indicates the type of event that can be handled. The widget must indicate if it handled the event by returning 1. FLTK will then remove the event and wait for further events from the host. If the widget's handle function returns 0, FLTK may redistribute the event based on a few rules.

Most events are sent directly to the handle() method of the Fl_Window that the window system says they belong to. The window (actually the Fl_Group that Fl_Window is a subclass of) is responsible for sending the events on to any child widgets. To make the Fl_Group code somewhat easier, FLTK sends some events (FL_DRAG, FL_RELEASE, FL_KEYBOARD, FL_SHORTCUT, FL_UNFOCUS, and FL_LEAVE) directly to leaf widgets. These procedures control those leaf widgets:

- Fl::add_handler()
- Fl::belowmouse()
- Fl::focus()
FLTK propagates events along the widget hierarchy depending on the kind of event and the status of the UI. Some events are injected directly into the widgets, others may be resent as new events to a different group of receivers.

Mouse click events are first sent to the window that caused them. The window then forwards the event down the hierarchy until it reaches the widget that is below the click position. If that widget uses the given event, the widget is marked "pushed" and will receive all following mouse motion (FL_DRAG) events until the mouse button is released.

Mouse motion (FL_MOVE) events are sent to the Fl::belowmouse() widget, i.e. the widget that returned 1 on the last FL_ENTER event.

Mouse wheel events are sent to the window that caused the event. The window propagates the event down the tree, first to the widget that is below the mouse pointer, and if that does not succeed, to all other widgets in the group. This ensures that scroll widgets work as expected with the widget furthest down in the hierarchy getting the first opportunity to use the wheel event, but also giving scroll bars, that are not directly below the mouse a chance.

Keyboard events are sent directly to the widget that has keyboard focus. If the focused widget rejects the event, it is resent as a shortcut event, first to the top-most window, then to the widget below the mouse pointer, propagating up the hierarchy to all its parents. Those send the event also to all widgets that are not below the mouse pointer. Now if that did not work out, the shortcut is sent to all registered shortcut handlers.

If we are still unsuccessful, the event handler flips the case of the shortcut letter and starts over. Finally, if the key is "escape", FLTK sends a close event to the top-most window.

All other events are pretty much sent right away to the window that created the event.

Widgets can "grab" events. The grabbing window gets all events exclusively, but usually by the same rules as described above.

Windows can also request exclusivity in event handling by making the window modal.

### 11.11 FLTK Compose-Character Sequences

The character composition done by Fl_Input widget requires that you call the Fl::compose() function if you are writing your own text editor widget.

Currently, all characters made by single key strokes with or without modifier keys, or by system-defined character compose sequences (that can involve dead keys or a compose key) can be input. You should call Fl::compose() in case any enhancements to this processing are done in the future. The interface has been designed to handle arbitrary UTF-8 encoded text.

The following methods are provided for character composition:

- Fl::compose()
- Fl::compose_reset()
Chapter 12

Adding and Extending Widgets

This chapter describes how to add your own widgets or extend existing widgets in FLTK.

12.1 Subclassing

New widgets are created by subclassing an existing FLTK widget, typically Fl_Widget for controls and Fl_Group for composite widgets.

A control widget typically interacts with the user to receive and/or display a value of some sort.

A composite widget holds a list of child widgets and handles moving, sizing, showing, or hiding them as needed. Fl_Group is the main composite widget class in FLTK, and all of the other composite widgets (Fl_Pack, Fl_Scroll, Fl_Tabs, Fl_Tile, Fl_Window, Fl_Flex, Fl_Grid, etc.) are subclasses of it.

You can also subclass other existing widgets to provide a different look or user-interface. For example, the button widgets are all subclasses of Fl_Button since they all interact with the user via a mouse button click. The only difference is the code that draws the face of the button.

12.2 Making a Subclass of Fl_Widget

Your subclasses can directly descend from Fl_Widget or any subclass of Fl_Widget. Fl_Widget has only four virtual methods, and overriding some or all of these may be necessary.

12.3 The Constructor

The constructor should have the following arguments:

MyClass(int x, int y, int w, int h, const char *label = 0);

This will allow the class to be used in FLUID without problems.

The constructor must call the constructor for the base class and pass the same arguments:

MyClass::MyClass(int x, int y, int w, int h, const char *label)
: Fl_Widget(x, y, w, h, label) {
    // do initialization stuff...
}

Generated by Doxygen
Fl_Widget’s protected constructor sets \( x(), y(), w(), h() \), and \( \text{label}() \) to the passed values and initializes the other instance variables to:

\[
\begin{align*}
\text{type}() &= 0; \\
\text{box}(\text{FL_NO_BOX}); \\
\text{color}(\text{FL_BACKGROUND_COLOR}); \\
\text{selection\_color}(\text{FL\_BACKGROUND\_COLOR}); \\
\text{labeltype}(\text{FL\_NORMAL\_LABEL}); \\
\text{labelstyle}(\text{FL\_NORMAL\_STYLE}); \\
\text{labelsize}(\text{FL\_NORMAL\_SIZE}); \\
\text{labelcolor}(\text{FL\_FOREGROUND\_COLOR}); \\
\text{align}(\text{FL\_ALIGN\_CENTER}); \\
\text{callback}(\text{default\_callback}, 0); \\
\text{flags}(\text{ACTIVE}\|\text{VISIBLE}); \\
\text{image}(0); \\
\text{deimage}(0);
\end{align*}
\]

### 12.4 Protected Methods of Fl_Widget

The following methods are provided for subclasses to use:

- \( \text{clear\_visible()} \)
- \( \text{damage()} \)
- \( \text{draw\_box()} \)
- \( \text{draw\_focus()} \)
- \( \text{draw\_label()} \)
- \( \text{set\_flag()} \)
- \( \text{set\_visible()} \)
- \( \text{test\_shortcut()} \)
- \( \text{type()} \)

\[
\begin{align*}
\text{void Fl\_Widget::damage(uchar mask)} \\
\text{void Fl\_Widget::damage(uchar mask, int x, int y, int w, int h)} \\
\text{uchar Fl\_Widget::damage()} \\
\end{align*}
\]

The first form indicates that a partial update of the object is needed. The bits in mask are OR'd into \( \text{damage()} \).

Your \( \text{draw()} \) routine can examine these bits to limit what it is drawing. The public method \( \text{Fl\_Widget::redraw()} \) simply does \( \text{Fl\_Widget::damage(FL\_DAMAGE\_ALL)} \), but the implementation of your widget can call the public \( \text{damage(n)} \).

The second form indicates that a region is damaged. If only these calls are done in a window (no calls to \( \text{damage(n)} \)) then FLTK will clip to the union of all these calls before drawing anything. This can greatly speed up incremental displays. The mask bits are OR’d into \( \text{damage()} \) unless this is a \( \text{Fl\_Window} \) widget.

The third form returns the bitwise-OR of all \( \text{damage(n)} \) calls done since the last \( \text{draw()} \).
When redrawing your widgets you should look at the damage bits to see what parts of your widget need redrawing. The handle() method can then set individual damage bits to limit the amount of drawing that needs to be done:

```cpp
MyClass::handle(int event) {
    ...
    if (change_to_part1) damage(1);
    if (change_to_part2) damage(2);
    if (change_to_part3) damage(4);
}
MyClass::draw() {
    if (damage() & FL_DAMAGE_ALL) {
        ... draw frame/box and other static stuff ...
    }
    if (damage() & (FL_DAMAGE_ALL | 1)) draw_part1();
    if (damage() & (FL_DAMAGE_ALL | 2)) draw_part2();
    if (damage() & (FL_DAMAGE_ALL | 4)) draw_part3();
}
```

Todo Clarify Fl_Widget::damage(uchar) handling - seems confused/wrong? ORing value doesn't match setting behavior in Fl_Widget.H!

```cpp
void Fl_Widget::draw_box() const
void Fl_Widget::draw_box(Fl_Boxtype t, Fl_Color c) const
```

The first form draws this widget's box(), using the dimensions of the widget. The second form uses t as the box type and c as the color for the box.

```cpp
void Fl_Widget::draw_focus()
void Fl_Widget::draw_focus(Fl_Boxtype t, int x, int y, int w, int h) const
```

Draws a focus box inside the widget's bounding box. The second form allows you to specify a different bounding box.

```cpp
void Fl_Widget::draw_label() const
void Fl_Widget::draw_label(int x, int y, int w, int h) const
void Fl_Widget::draw_label(int x, int y, int w, int h, Fl_Align align) const
```

The first form is the usual function for a draw() method to call to draw the widget's label. It does not draw the label if it is supposed to be outside the box (on the assumption that the enclosing group will draw those labels).

The second form uses the passed bounding box instead of the widget's bounding box. This is useful so "centered" labels are aligned with some feature, like a moving slider.

The third form draws the label anywhere. It acts as though FL_ALIGN_INSIDE has been forced on so the label will appear inside the passed bounding box. This is designed for parent groups to draw labels with.

```cpp
void Fl_Widget::set_flag(int c)
```
Calling `set_flag(SHORTCUT_LABEL)` modifies the behavior of `draw_label()` so that ‘&’ characters cause an underscore to be printed under the next letter.

```cpp
void Fl_Widget::set_visible()
void Fl_Widget::clear_visible()
```

Fast inline versions of `Fl_Widget::hide()` and `Fl_Widget::show()`. These do not send the `FL_HIDE` and `FL_SHOW` events to the widget.

```cpp
int Fl_Widget::test_shortcut()
static int Fl_Widget::test_shortcut(const char *s)
```

The first version tests `Fl_Widget::label()` against the current event (which should be a `FL_SHORTCUT` event). If the label contains a ‘&’ character and the character after it matches the keypress, this returns true. This returns false if the `SHORTCUT_LABEL` flag is off, if the label is `NULL`, or does not have a ‘&’ character in it, or if the keypress does not match the character.

The second version lets you do this test against an arbitrary string.

```cpp
uchar Fl_Widget::type() const
void Fl_Widget::type(uchar t)
```

The property `Fl_Widget::type()` can return an arbitrary 8-bit identifier, and can be set with the protected method `Fl_Widget::type(uchar t)`. This value had to be provided for Forms compatibility, but you can use it for any purpose you want. Try to keep the value less than 100 to not interfere with reserved values.

FLTK does not use RTTI (Run Time Typing Information) to enhance portability. But this may change in the near future if RTTI becomes standard everywhere.

If you don’t have RTTI you can use the clumsy FLTK mechanism, by having `type()` use a unique value. These unique values must be greater than the symbol `FL_RESERVED_TYPE` (which is 100) and less than `FL_WINDOW` (unless you make a subclass of `Fl_Window`). Look through the header files for `FL_RESERVED_TYPE` to find an unused number. If you make a subclass of `Fl_Window` you must use `FL_WINDOW + n` (where `n` must be in the range 1 to 7).
12.5 Handling Events

The virtual method `Fl_Widget::handle(int event)` is called to handle each event passed to the widget. It can:

- Change the state of the widget.
- Call `Fl_Widget::redraw()` if the widget needs to be redisplayed.
- Call `Fl_Widget::damage(uchar c)` if the widget needs a partial-update (assuming you provide support for this in your `draw()` method).
- Call `Fl_Widget::do_callback()` if a callback should be generated.
- Call `Fl_Widget::handle()` on child widgets.

Events are identified by the integer argument. Other information about the most recent event is stored in static locations and acquired by calling the `Fl::event_*()` methods. This information remains valid until another event is handled.

Here is a sample `handle()` method for a widget that acts as a pushbutton and also accepts the keystroke 'x' to cause the callback:

```c
int MyClass::handle(int event) {
    switch(event) {
        case FL_PUSH:
            highlight = 1;
            redraw();
            return 1;
        case FL_DRAG: {
            int t = Fl::event_inside(this);
            if (t != highlight) {
                highlight = t;
                redraw();
            }
        }
            return 1;
        case FL_RELEASE:
            if (highlight) {
                highlight = 0;
                redraw();
                do_callback();
                // never do anything after a callback, as the callback
                // may delete the widget!
            }
            return 1;
        case FL_SHORTCUT:
            if (Fl::event_key() == 'x') { 
                do_callback();
                return 1;
            }
            return 0;
        default:
            return Fl_Widget::handle(event);
    }
}
```

You must return non-zero if your `handle()` method uses the event. If you return zero, the parent widget will try sending the event to another widget.

For debugging purposes, event numbers can be printed as their actual event names using the `fl_eventnames[]` array, e.g.:

```c
#include <FL/names.h>   // defines fl_eventnames[]
[..]
int MyClass::handle(int e) {
    printf("Event was %s (%d)\n", fl_eventnames[e], e);  // e.g. "Event was FL_PUSH (1)"
[..]
```
12.6 Drawing the Widget

The `draw()` virtual method is called when FLTK wants you to redraw your widget. It will be called if and only if `damage()` is non-zero, and `damage()` will be cleared to zero after it returns. The `draw()` method should be declared protected so that it can't be called from non-drawing code.

The `damage()` value contains the bitwise-OR of all the `damage(n)` calls to this widget since it was last drawn. This can be used for minimal update, by only redrawing the parts whose bits are set. FLTK will turn on the `FL_DAMAGE_ALL` bit if it thinks the entire widget must be redrawn, e.g. for an expose event.

Expose events (and the `damage(mask,x,y,w,h)` function described above) will cause `draw()` to be called with FLTK's clipping turned on. You can greatly speed up redrawing in some cases by testing `fl_not_clipped(x,y,w,h)` or `fl_clip_box()` and skipping invisible parts.

Besides the protected methods described above, FLTK provides a large number of basic drawing functions, which are described in the chapter Drawing Things in FLTK.

12.7 Resizing the Widget

The `resize(x,y,w,h)` method is called when the widget is being resized or moved. The arguments are the new position, width, and height. `x()`, `y()`, `w()`, and `h()` still remain the old size. You must call `resize()` on your base class with the same arguments to get the widget size to actually change.

This should not call `redraw()`, at least if only the `x()` and `y()` change. This is because composite widgets like `Fl_Scroll` may have a more efficient way of drawing the new position.

12.8 Making a Composite Widget

A "composite" widget contains one or more "child" widgets. To make a composite widget you should subclass `Fl_Group`. It is possible to make a composite object that is not a subclass of `Fl_Group`, but you'll have to duplicate the code in `Fl_Group` anyways.

Instances of the child widgets may be included in the parent:

```cpp
class MyClass : public Fl_Group {
    Fl_Button the_button;
    Fl_Slider the_slider;
    ...
};
```

The constructor has to initialize these instances. They are automatically added to the group, since the `Fl_Group` constructor does `Fl_Group::begin()`. Don't forget to call `Fl_Group::end()` or use the `Fl_End` pseudo-class:

```cpp
MyClass::MyClass(int x, int y, int w, int h) :
    Fl_Group(x, y, w, h),
    the_button(x + 5, y + 5, 100, 20),
    the_slider(x, y + 50, w, 20)
{...
    // don't forget to do this!
}
```

The child widgets need callbacks. These will be called with a pointer to the children, but the widget itself may be found in the `parent()` pointer of the child. Usually these callbacks can be static private methods, with a matching private method:

```cpp
void MyClass::static_slider_cb(Fl_Widget* v, void *) { // static method
    ((MyClass*)(v->parent()))->slider_cb();
}
void MyClass::slider_cb() { // normal method
    use(the_slider->value());
}
```
If you make the `handle()` method, you can quickly pass all the events to the children using the `Fl_Group::handle()` method. You don't need to override `handle()` if your composite widget does nothing other than pass events to the children:

```cpp
text
int MyClass::handle(int event) {
  if (Fl_Group::handle(event)) return 1;
  ... handle events that children don't want ...
}
```

If you override `draw()` you need to draw all the children. If `redraw()` or `damage()` is called on a child, `damage(FL_DAMAGE_CHILD)` is done to the group, so this bit of `damage()` can be used to indicate that a child needs to be drawn. It is fastest if you avoid drawing anything else in this case:

```cpp
text
int MyClass::draw() {
Fl_Widget *const*a = array();
if (damage() == FL_DAMAGE_CHILD) { // only redraw some children
  for (int i = children(); i --; a ++) update_child(**a);
} else { // total redraw
  ... draw background graphics ...
  // now draw all the children atop the background:
  for (int i = children_; i --; a ++) {
    draw_child(**a);
    draw_outside_label(**a); // you may not need to do this
  }
}
```

`Fl_Group` provides some protected methods to make drawing easier:

- `draw_child()`
- `draw_children()`
- `draw_outside_label()`
- `update_child()`

```cpp
text
void Fl_Group::draw_child(Fl_Widget &widget) const

This will force the child's `damage()` bits all to one and call `draw()` on it, then clear the `damage()`. You should call this on all children if a total redraw of your widget is requested, or if you draw something (like a background box) that damages the child. Nothing is done if the child is not `visible()` or if it is clipped.

```cpp
text
void Fl_Group::draw_children()

A convenience function that draws all children of the group. This is useful if you derived a widget from `Fl_Group` and want to draw a special border or background. You can call `draw_children()` from the derived `draw()` method after drawing the box, border, or background.

```cpp
text
void Fl_Group::draw_outside_label(const Fl_Widget &widget) const

Draw the labels that are not drawn by `draw_label()`. If you want more control over the label positions you might want to call `child->draw_label(x,y,w,h,a)`.

```cpp
text
void Fl_Group::update_child(Fl_Widget& widget) const

Draws the child only if its `damage()` is non-zero. You should call this on all the children if your own damage is equal to `FL_DAMAGE_CHILD`. Nothing is done if the child is not `visible()` or if it is clipped.

```
12.9 Cut and Paste Support

FLTK provides routines to cut and paste UTF-8 encoded text between applications:

- Fl::copy()
- Fl::paste()
- Fl::selection()
- Fl::selection_owner()

It is also possible to copy and paste image data between applications:

- Fl_Copy_Surface
- Fl::clipboard_contains()
- Fl::paste()

It may be possible to cut/paste other kinds of data by using Fl::add_handler(). Note that handling events beyond those provided by FLTK may be operating system specific. See Operating System Issues for more details.

12.10 Drag And Drop Support

FLTK provides routines to drag and drop UTF-8 encoded text between applications:

Drag’n’drop operations are initiated by copying data to the clipboard and calling the function Fl::dnd().

Drop attempts are handled via the following events, already described under Drag and Drop Events in a previous chapter:

- FL_DND_ENTER
- FL_DND_DRAG
- FL_DND_LEAVE
- FL_DND_RELEASE
- FL_PASTE

12.11 Making a subclass of Fl_Window

You may want your widget to be a subclass of Fl_Window, Fl_Double_Window, or Fl_Gl_Window. This can be useful if your widget wants to occupy an entire window, and can also be used to take advantage of system-provided clipping, or to work with a library that expects a system window ID to indicate where to draw.

Subclassing Fl_Window is almost exactly like subclassing Fl_Group, and in fact you can easily switch a subclass back and forth. Watch out for the following differences:

1. Fl_Window is a subclass of Fl_Group so make sure your constructor calls end() unless you actually want children added to your window.
2. When handling events and drawing, the upper-left corner is at 0,0, not x(), y() as in other Fl_Widget's. For instance, to draw a box around the widget, call draw_box(0,0,w(),h()), rather than draw_box(x(),y(),w(),h()).

You may also want to subclass Fl_Window in order to get access to different visuals or to change other attributes of the windows. See the Operating System Issues chapter for more information.
Chapter 13

Using OpenGL

This chapter discusses using FLTK for your OpenGL applications.

13.1 Using OpenGL in FLTK

The easiest way to make an OpenGL display is to subclass Fl_Gl_Window. Your subclass must implement a draw() method which uses OpenGL calls to draw the display. Your main program should call redraw() when the display needs to change, and (somewhat later) FLTK will call draw().

With a bit of care you can also use OpenGL to draw into normal FLTK windows (see Using OpenGL in Normal FLTK Windows below). This allows you to use Gouraud shading for drawing your widgets. To do this you use the gl_start() and gl_finish() functions around your OpenGL code.

You must include FLTK's <FL/gl.h> header file. It will include the file <GL/gl.h> (on macOS: <OpenGL/gl.h>), define some extra drawing functions provided by FLTK, and include the <windows.h> header file needed by Windows applications.

Some simple coding rules (see OpenGL and support of HighDPI displays) allow to write cross-platform code that will support OpenGL run on HighDPI displays (including the 'retina' displays of Apple hardware).

13.2 Making a Subclass of Fl_Gl_Window

To make a subclass of Fl_Gl_Window, you must provide:

- A class definition.
- A draw() method.
- A handle() method if you need to receive input from the user.

If your subclass provides static controls in the window, they must be redrawn whenever the FL_DAMAGE_ALL bit is set in the value returned by damage(). For double-buffered windows you will need to surround the drawing code with the following code to make sure that both buffers are redrawn:

```c
#ifndef MESA
glDrawBuffer(GL_FRONT_AND_BACK);
#endif // !MESA
... draw stuff here ...
#ifndef MESA
glDrawBuffer(GL_BACK);
#endif // !MESA
```
Note:
If you are using the Mesa graphics library, the call to `glDrawBuffer()` is not required and will slow down drawing considerably. The preprocessor instructions shown above will optimize your code based upon the graphics library used.

13.2.1 Defining the Subclass

To define the subclass you just subclass the `Fl_Gl_Window` class:
```cpp
class MyWindow : public Fl_Gl_Window {
  void draw();
  int handle(int);

  public:
    MyWindow(int X, int Y, int W, int H, const char *L)
    : Fl_Gl_Window(X, Y, W, H, L) {};
};
```

The `draw()` and `handle()` methods are described below. Like any widget, you can include additional private and public data in your class (such as scene graph information, etc.)

13.2.2 The draw() Method

The `draw()` method is where you actually do your OpenGL drawing:
```cpp
void MyWindow::draw() {
  if (!valid())
    ... set up projection, viewport, etc ...
    ... window size is in w() and h().
    ... valid() is turned on by FLTK after draw() returns
    ...
    ... draw ...
}
```

13.2.3 The handle() Method

The `handle()` method handles mouse and keyboard events for the window:
```cpp
int MyWindow::handle(int event) {
  switch(event) {
    case FL_PUSH:
      ... mouse down event ...
      ... position in Fl::event_x() and Fl::event_y()
      return 1;
    case FL_DRAG:
      ... mouse moved while down event ...
      return 1;
    case FL_RELEASE:
      ... mouse up event ...
      return 1;
    case FL_FOCUS:
    case FL_UNFOCUS:
      ... Return 1 if you want keyboard events, 0 otherwise
      return 1;
    case FL_KEYBOARD:
      ... keypress, key is in Fl::event_key(), ascii in Fl::event_text()
      ... Return 1 if you understand/use the keyboard event, 0 otherwise...
      return 1;
    case FL_SHORTCUT:
      ... shortcut, key is in Fl::event_key(), ascii in Fl::event_text()
      ... Return 1 if you understand/use the shortcut event, 0 otherwise...
      return 1;
    default:
      // pass other events to the base class...
      return Fl_Gl_Window::handle(event);
  }
}
```
When `handle()` is called, the OpenGL context is not set up! If your display changes, you should call `redraw()` and let `draw()` do the work. Don't call any OpenGL drawing functions from inside `handle()`!

You can call *some* OpenGL stuff like hit detection and texture loading functions by doing:

```c
... FL_PUSH:
  make_current();    // make OpenGL context current
  if (valid()) {
    ... set up projection exactly the same as draw ...
    valid();          // stop it from doing this next time
  }
... ok to call NON-DRAWING OpenGL code here, such as hit detection, loading textures, etc...
```

Your main program can now create one of your windows by doing `new MyWindow(...)`.

You can also use your new window class in FLUID by:

1. Putting your class definition in a `MyWindow.H` file.
2. Creating a `Fl_Box` widget in FLUID.
3. In the widget panel fill in the "class" field with `MyWindow`. This will make FLUID produce constructors for your new class.
4. In the "Extra Code" field put `#include "MyWindow.H"`, so that the FLUID output file will compile.

You must put `glwindow->show()` in your main code after calling `show()` on the window containing the OpenGL window.

### 13.3 OpenGL and support of HighDPI displays

HighDPI displays (including the so-called 'retina' displays of Apple hardware) are supported by FLTK in such a way that 1 unit of an FLTK quantity (say, the value given by `Fl_Gl_Window::w()`) corresponds to more than 1 pixel on the display. Conversely, when a program specifies the width and height of the OpenGL viewport, it is necessary to use an API that returns quantities expressed in pixels. That can be done as follows:

```c
Fl_Gl_Window *glw = ...;
glViewport(0, 0, glw->pixel_w(), glw->pixel_h());
```

which makes use of the `Fl_Gl_Window::pixel_w()` and `Fl_Gl_Window::pixel_h()` methods giving the size in pixels of an `Fl_Gl_Window` that is potentially mapped to a HighDPI display. Method `Fl_Gl_Window::pixels_per_unit()` can also be useful in this context.

**Note**

A further coding rule is necessary to properly support retina displays and OpenGL under macOS (see OpenGL and 'retina' displays)

### 13.4 Using OpenGL in Normal FLTK Windows

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Note

Drawing both with OpenGL and Quartz in a normal FLTK window is not possible with the macOS platform. This technique is therefore not useful under macOS because it permits nothing more than what is possible with class Fl_Gl_Window.

You can put OpenGL code into the `draw()` method, as described in Drawing the Widget in the previous chapter, or into the code for a `boxtype` or other places with some care.

Most importantly, before you show any windows, including those that don't have OpenGL drawing, you must initialize FLTK so that it knows it is going to use OpenGL. You may use any of the symbols described for `Fl_Gl_Window` to describe how you intend to use OpenGL:

```cpp
Fl::gl_visual(FL_RGB);
```

You can then put OpenGL drawing code anywhere you can draw normally by surrounding it with `gl_start()` and `gl_finish()` to set up, and later release, an OpenGL context with an orthographic projection so that 0,0 is the lower-left corner of the window and each pixel is one unit. The current clipping is reproduced with OpenGL `glScissor()` commands. These functions also synchronize the OpenGL graphics stream with the drawing done by other X, Windows, or FLTK functions.

```cpp
gl_start();
... put your OpenGL code here ...
gl_finish();
```

The same context is reused each time. If your code changes the projection transformation or anything else you should use `glPushMatrix()` and `glPopMatrix()` functions to put the state back before calling `gl_finish()`.

You may want to use `Fl_Window::current()->h()` to get the drawable height so that you can flip the Y coordinates.

Unfortunately, there are a bunch of limitations you must adhere to for maximum portability:

- You must choose a default visual with `Fl::gl_visual()`.
- You cannot pass `FL_DOUBLE` to `Fl::gl_visual()`.
- You cannot use `Fl_Double_Window` or `Fl_Overlay_Window`.

Do not call `gl_start()` or `gl_finish()` when drawing into an `Fl_Gl_Window`!

### 13.5 Using FLTK widgets in OpenGL Windows

FLTK widgets can be added to `Fl_Gl_Window`s just as they would be added to `Fl_Window`s. They are rendered as an overlay over the user defined OpenGL graphics using `fl_..` graphics calls that are implemented in GL.

```cpp
Fl_Gl_Window does not add subsequent widgets as children by default as Fl_Window does. Call myGlWindow->begin() after creating the GL window to automatically add following widgets. Remember to call myGlWindow->end().

```
13.6 OpenGL Drawing Functions

FLTK provides some useful OpenGL drawing functions. They can be freely mixed with any OpenGL calls, and are defined by including `<FL/gl.h>` which you should include instead of the OpenGL header `<GL/gl.h>`.

void gl_color(Fl_Color)

Sets the current OpenGL color to a FLTK color. For color-index modes it will use `fl_xpixel(c)`, which is only right if this window uses the default colormap!

void gl_rect(int x, int y, int w, int h)
void gl_rectf(int x, int y, int w, int h)

Outlines or fills a rectangle with the current color. If `Fl_Gl_Window::ortho()` has been called, then the rectangle will exactly fill the pixel rectangle passed.

void gl_font(Fl_Font fontid, int size)

Sets the current OpenGL font to the same font you get by calling `fl_font()`.

int gl_height()
int gl_descent()
float gl_width(const char *s)
float gl_width(const char *s, int n)
float gl_width(uchar c)
Returns information about the current OpenGL font.

```c
void gl_draw(const char *s)
void gl_draw(const char *s, int n)
```

Draws a nul-terminated string or an array of \( n \) characters in the current OpenGL font at the current raster position.

```c
void gl_draw(const char *s, int x, int y)
void gl_draw(const char *s, int n, int x, int y)
void gl_draw(const char *s, float x, float y)
void gl_draw(const char *s, int n, float x, float y)
```

Draws a nul-terminated string or an array of \( n \) characters in the current OpenGL font at the given position.

```c
void gl_draw(const char *s, int x, int y, int w, int h, Fl_Align)
```

Draws a string formatted into a box, with newlines and tabs expanded, other control characters changed to \(^X\), and aligned with the edges or center. Exactly the same output as `fl_draw()`.

### 13.7 Speeding up OpenGL

Performance of `Fl_Gl_Window` may be improved on some types of OpenGL implementations, in particular MESA and other software emulators, by setting the `GL_SWAP_TYPE` environment variable. This variable declares what is in the backbuffer after you do a swapbuffers.

- `setenv GL_SWAP_TYPE COPY`

  This indicates that the back buffer is copied to the front buffer, and still contains its old data. This is true of many hardware implementations. Setting this will speed up emulation of overlays, and widgets that can do partial update can take advantage of this as `damage()` will not be cleared to -1.

- `setenv GL_SWAP_TYPE NODAMAGE`

  This indicates that nothing changes the back buffer except drawing into it. This is true of MESA and Win32 software emulation and perhaps some hardware emulation on systems with lots of memory.

- All other values for `GL_SWAP_TYPE`, and not setting the variable, cause FLTK to assume that the back buffer must be completely redrawn after a swap.

This is easily tested by running the `gl_overlay` demo program and seeing if the display is correct when you drag another window over it or if you drag the window off the screen and back on. You have to exit and run the program again for it to see any changes to the environment variable.
13.8 Using OpenGL Optimizer with FLTK

OpenGL Optimizer is a scene graph toolkit for OpenGL available from Silicon Graphics for IRIX and Microsoft Windows. It allows you to view large scenes without writing a lot of OpenGL code.

OptimizerWindow Class Definition

To use OpenGL Optimizer with FLTK you'll need to create a subclass of Fl_Gl_Window that includes several state variables:

```cpp
class OptimizerWindow : public Fl_Gl_Window {
  csContext *context_; // Initialized to 0 and set by draw()...
  csDrawAction *draw_action_; // Draw action...
  csGroup *scene_; // Scene to draw...
  csCamera *camera_; // Viewport for scene...
  void draw();
public:
  OptimizerWindow(int X, int Y, int W, int H, const char *L)
      : Fl_Gl_Window(X, Y, W, H, L) {
    context_ = (csContext *)0;
    draw_action_ = (csDrawAction *)0;
    scene_ = (csGroup *)0;
    camera_ = (csCamera *)0;
  }
  void scene(csGroup *g) { scene_ = g; redraw(); }
  void camera(csCamera *c) {
    camera_ = c;
    if (context_) { 
      draw_action_->setCamera(camera_);
      camera_->draw(draw_action_);
      redraw();
    }
  }
};
```

The camera() Method

The camera() method sets the camera (projection and viewpoint) to use when drawing the scene. The scene is redrawn after this call.

The draw() Method

The draw() method performs the needed initialization and does the actual drawing:

```cpp
void OptimizerWindow::draw() {
  if (!context_) {
    // This is the first time we've been asked to draw; create the // Optimizer context for the scene...
    #ifdef _WIN32
    context_ = new csContext((HDC)fl_getHDC());
    context_->ref();
    context_->makeCurrent((HDC)fl_getHDC());
    #else
    context_ = new csContext(fl_display, fl_visual);
    context_->ref();
    context_->makeCurrent(fl_display, fl_window);
    #endif // _WIN32
  }
```
... perform other context setup as desired ...  
// Then create the draw action to handle drawing things...  
draw_action_ = new csDrawAction;  
if (camera_) {  
draw_action_->setCamera(camera_);  
camera_->draw(draw_action_);  
}  
} else {  
#ifdef _WIN32  
context_->makeCurrent((HDC)fl_getHDC());  
#else  
class context: public Fl_Context{  
context_->makeCurrent(fl_display, fl_window);  
#endif // _WIN32  
if (!valid()) {  
// Update the viewport for this context...  
context_->setViewport(0, 0, w(), h());  
}  
// Clear the window...  
context_->clear(csContext::COLOR_CLEAR | csContext::DEPTH_CLEAR,  
0.0f, // Red  
0.0f, // Green  
0.0f, // Blue  
1.0f); // Alpha  
// Then draw the scene {if any}...  
if (scene_)  
draw_action_->apply(scene_);  
}

The scene() Method

The scene() method sets the scene to be drawn. The scene is a collection of 3D objects in a csGroup. The scene is redrawn after this call.

13.9 Using OpenGL 3.0 (or higher versions)

The examples subdirectory contains OpenGL3test.cxx, a toy program showing how to use OpenGL 3.0 (or higher versions) with FLTK in a cross-platform fashion. It contains also OpenGL3-glut-test.cxx which shows how to use FLTK's GLUT compatibility and OpenGL 3.

To access OpenGL 3.0 (or higher versions), use the FL_OPENGL3 flag when calling Fl_Gl_Window::mode(int a) or glutInitDisplayMode().

On the Windows and Linux platforms, FLTK creates contexts implementing the highest OpenGL version supported by the hardware. Such contexts may also be compatible with lower OpenGL versions. Access to functions from OpenGL versions above 1.1 requires to load function pointers at runtime on these platforms. FLTK recommends to use the GLEW library to perform this. It is therefore necessary to install the GLEW library (see below).

On the macOS platform, MacOS 10.7 or above is required; GLEW is possible but not necessary. FLTK creates contexts for OpenGL versions 1 and 2 without the FL_OPENGL3 flag and for OpenGL versions 3.2 and above (but not below) with it.

GLEW installation (Linux and Windows platforms)

FLTK needs a header file, GL/glew.h, and a library, libGLEW.* or equivalent, to support OpenGL 3 and above. These can be obtained for most Linux distributions by installing package libglew-dev. For the Windows platform:

• the header and a Visual Studio static library (glew32.lib) can be downloaded from http://glew.sourceforge.net/;
Using OpenGL 3.0 (or higher versions)

- A MinGW-style static library (libglew32.a) can be built from source (same web site) with the make command. Alternatively, pre-built files are available for these architectures:
  - x86: download files glew.h and libglew32.a;
  - x86_64: install GLEW as an MSYS2 package with command:
    `pacman -S mingw-w64-x86_64-glew`

Source-level changes for OpenGL 3:

- Put this in all OpenGL-using source files (instead of, or before if needed, #include `<FL/gl.h>`, and before #include `<FL/glut.h>` if you use GLUT):
  ```
  #if defined(__APPLE__)  
  # include <OpenGL/gl3.h> // defines OpenGL 3.0+ functions
  #else
  # if defined(_WIN32)
  # define GLEW_STATIC 1
  # endif
  # include <GL/glew.h>
  #endif
  ```
- Add the FL_OPENGL3 flag when calling `Fl_Gl_Window::mode(int a)` or `glutInitDisplayMode()`.
- Put this in the handle(int event) member function of the first to be created among your Fl_Gl←_Window-derived classes:
  ```
  #ifndef __APPLE__  
  static int first = 1;  
  if (first && event == FL_SHOW && shown()) {  
    first = 0;  
    make_current();  
    glewInit(); // defines pters to functions of OpenGL V 1.2 and above
  }
  #endif
  ```
- Alternatively, if you use GLUT, put
  ```
  #ifndef __APPLE__
  glewInit(); // defines pters to functions of OpenGL V 1.2 and above
  #endif
  ```
  after the first `glutCreateWindow()` call.

If GLEW is installed on the Mac OS development platform, it is possible to use the same code for all platforms, with one exception: put
```
#if defined __APPLE__
  glewExperimental = GL_TRUE;
#endif
``` before the glewinit() call.

Testing for success of the glewinit() call

Testing whether the glewinit() call is successful is to be done as follows:
```
#include <FL/platform.H> // defines FLTK_USE_WAYLAND under the Wayland platform
#include <FL/Fl.H> // for Fl::warning()
#if defined __APPLE__  
#define GLEW_STATIC 1
#else
#define GLEW_STATIC 1
#endif
```  ```
GLenum err = glewInit(); // defines pters to functions of OpenGL V 1.2 and above
  if (err == GLEW_OK) {  
    Fl::warning("glewInit() failed returning %u", err);  
  }  
#endif
```  ```
Changes in the build process

Link with libGLEW.so (with X11 or Wayland), libglew32.a (with MinGW) or glew32.lib (with MS Visual Studio); no change is needed on the Mac OS platform.
Chapter 14

Programming with FLUID

This chapter shows how to use the Fast Light User-Interface Designer ("FLUID") to create your GUIs.

Subchapters:

• What is FLUID?
• Running FLUID Under UNIX
• Running FLUID Under Microsoft Windows
• Compiling .fl Files
• A Short Tutorial
• FLUID Reference
• FLUID Templates
• Internationalization with FLUID
• Known Limitations
• Keyboard Shortcuts
• Licenses

14.1 What is FLUID?

The Fast Light User Interface Designer, or FLUID, is a graphical editor that is used to produce FLTK source code. FLUID edits and saves its state in .fl files. These files are text, and you can (with care) edit them in a text editor, perhaps to get some special effects. The .fl file format is explained in detail in fluid/README_fl.txt

FLUID can "compile" the .fl file into a .cxx and .h file. The .cxx file defines all the objects from the .fl file and the .h file declares all the global ones. FLUID also supports localization (Internationalization) of label strings and tooltips using message files and the GNU gettext or POSIX catgets interfaces.

A simple program can be made by putting all your code (including a main() function) into the .fl file and thus making the .cxx file a single source file to compile. Most programs are more complex than this, so you write other .cxx files that call the FLUID functions. These .cxx files must #include the .h file or they can #include the .cxx file so it still appears to be a single source file.
Normally the FLUID file defines one or more functions or classes which output C++ code. Each function defines one or more FLTK windows and all the widgets that go inside those windows.

Widgets created by FLUID are either "named", "complex named" or "unnamed". A named widget has a legal C++ variable identifier as its name (i.e. only alphanumeric and underscore). In this case FLUID defines a global variable or class member that will point at the widget after the function defining it is called. A complex named object has punctuation such as '.' or '->' or any other symbols in its name. In this case FLUID assigns a pointer to the widget to the name, but does not attempt to declare it. This can be used to get the widgets into structures. An unnamed widget has a blank name and no pointer is stored.

Widgets may either call a named callback function that you write in another source file, or you can supply a small piece of C++ source and FLUID will write a private callback function into the .cxx file.

### 14.2 Running FLUID Under UNIX

To run FLUID under UNIX, type:

```
fluid filename.fl &
```

to edit the .fl file filename.fl. If the file does not exist you will get an error pop-up, but if you dismiss it you will be editing a blank file of that name. You can run FLUID without any name, in which case you will be editing an unnamed blank setup (but you can use save-as to write it to a file).

You can provide any of the standard FLTK switches before the filename:

- `-display hostin.n`
- `-geometry WxH+X+Y`
- `-title windowtitle`
- `-name classname`
- `-iconic`
- `-fg color`
- `-bg color`
- `-bg2 color`
- `-scheme schemename`

Changing the colors may be useful to see what your interface will look at if the user calls it with the same switches. Similarly, using "-scheme plastic" will show how the interface will look using the "plastic" scheme.

In the current version, if you don’t put FLUID into the background with ‘&’ then you will be able to abort FLUID by typing CTRL-C on the terminal. It will exit immediately, losing any changes.

### 14.3 Running FLUID Under Microsoft Windows

To run FLUID under Windows, double-click on the FLUID.exe file. You can also run FLUID from the Command Prompt window. FLUID always runs in the background under Windows.
14.4 Compiling .fl Files

FLUID can also be called as a command-line "compiler" to create the .cxx and .h file from a .fl file. To do this type:

```
fluid -c filename.fl
```

This is the same as the menu 'File/Write Code...'. It will read the filename.fl file and write filename.cxx and filename.h. Any leading directory on filename.fl will be stripped, so they are always written to the current directory. If there are any errors reading or writing the files, FLUID will print the error and exit with a non-zero code. You can use the following lines in a makefile to automate the creation of the source and header files:

```
Fluid -c my_panels.fl
```

Most versions of make support rules that cause .fl files to be compiled:

```
.SUFFIXES: .fl .cxx .h
.fl.h .fl.cxx:
    fluid -c $<
```

If you use

```
fluid -cs filename.fl
```

FLUID will also write the "strings" for internationalization in file 'filename.txt' (menu: 'File/Write Strings...').

Finally there is another option which is useful for program developers who have many .fl files and want to upgrade them to the current FLUID version. FLUID will read the filename.fl file, save it, and exit immediately. This writes the file with current syntax and options and the current FLTK version in the header of the file. Use

```
fluid -u filename.fl
```

to 'upgrade' filename.fl. You may combine this with '-c' or '-cs'.

Note

All these commands overwrite existing files w/o warning. You should particularly take care when running 'fluid -u' since this overwrites the original .fl source file.

14.5 A Short Tutorial

FLUID is an amazingly powerful little program. However, this power comes at a price as it is not always obvious how to accomplish seemingly simple tasks with it. This tutorial will show you how to generate a complete user interface class with FLUID that is used for the CubeView program provided with FLTK.
The window is of class CubeViewUI, and is completely generated by FLUID, including class member functions. The central display of the cube is a separate subclass of Fl_Gl_Window called CubeView. CubeViewUI manages CubeView using callbacks from the various sliders and rollers to manipulate the viewing angle and zoom of CubeView.

At the completion of this tutorial you will (hopefully) understand how to:

1. Use FLUID to create a complete user interface class, including constructor and any member functions necessary.
2. Use FLUID to set callback member functions of custom widget classes.
3. Subclass an Fl_Gl_Window to suit your purposes.

### 14.5.1 The CubeView Class

The CubeView class is a subclass of Fl_Gl_Window. It has methods for setting the zoom, the x and y pan, and the rotation angle about the x and y axes.

You can safely skip this section as long as you realize that CubeView is a subclass of Fl_Gl_Window and will respond to calls from CubeViewUI, generated by FLUID.
The CubeView Class Definition

Here is the CubeView class definition, as given by its header file "test/CubeView.h":

```cpp
#include <FL/Fl.H>
#include <FL/Fl_Gl_Window.H>
#include <FL/gl.h>

class CubeView : public Fl_Gl_Window {
public:
  CubeView(int x, int y, int w, int h, const char *l = 0);
  // This value determines the scaling factor used to draw the cube.
  double size;
  // Set the rotation about the vertical (y) axis.
  double size;
  // Set the rotation about the vertical (y) axis.
  void v_angle(double angle) { vAng = angle; }
  // The rotation about the vertical (y) axis.
  double v_angle() const { return vAng; }
  // Set the rotation about the horizontal (x) axis.
  void h_angle(double angle) { hAng = angle; }
  // The rotation about the horizontal (x) axis.
  double h_angle() const { return hAng; }
  // Sets the x shift of the cube view camera.
  void panx(double x) { xshift = x; }
  // Sets the y shift of the cube view camera.
  void pany(double y) { yshift = y; }
  // The widget class draw() override.
  void draw();
private:
  // Draw the cube boundaries.
  void drawCube();
  double vAng, hAng;
  double xshift, yshift;
  float boxv0[3]; float boxv1[3];
  float boxv2[3]; float boxv3[3];
  float boxv4[3]; float boxv5[3];
  float boxv6[3]; float boxv7[3];
};
```

The CubeView Class Implementation

Here is the CubeView implementation. It is very similar to the "CubeView" demo included with FLTK.

```cpp
#include "CubeView.h"
#include <math.h>

CubeView::CubeView(int x, int y, int w, int h, const char *l)
  : Fl_Gl_Window(x, y, w, h, l)
  , Fl::use_high_res_GL(1)
  , vAng = 0.0
  , hAng = 0.0
  , xshift = 0.0
  , size = 10.0
};
```
yshift = 0.0;
/* The cube definition. These are the vertices of a unit cube
centered on the origin.*/
boxv0[0] = -0.5; boxv0[1] = -0.5; boxv0[2] = -0.5;
boxv1[0] = 0.5; boxv1[1] = -0.5; boxv1[2] = -0.5;
boxv2[0] = 0.5; boxv2[1] = 0.5; boxv2[2] = -0.5;
boxv3[0] = -0.5; boxv3[1] = 0.5; boxv3[2] = -0.5;
boxv4[0] = -0.5; boxv4[1] = -0.5; boxv4[2] = 0.5;
boxv5[0] = 0.5; boxv5[1] = -0.5; boxv5[2] = 0.5;
boxv6[0] = 0.5; boxv6[1] = 0.5; boxv6[2] = 0.5;
boxv7[0] = -0.5; boxv7[1] = 0.5; boxv7[2] = 0.5;
}

void CubeView::drawCube() {
    /* Draw a colored cube */
    #define ALPHA 0.5
    glShadeModel (GL_FLAT);
    glBegin (GL_QUADS);
    glColor4f (0.0, 0.0, 1.0, ALPHA);
    glVertex3fv (boxv0);
    glVertex3fv (boxv1);
    glVertex3fv (boxv2);
    glVertex3fv (boxv3);
    glColor4f (1.0, 1.0, 0.0, ALPHA);
    glVertex3fv (boxv0);
    glVertex3fv (boxv4);
    glVertex3fv (boxv5);
    glVertex3fv (boxv1);
    glColor4f (0.0, 1.0, 1.0, ALPHA);
    glVertex3fv (boxv2);
    glVertex3fv (boxv6);
    glVertex3fv (boxv7);
    glVertex3fv (boxv3);
    glColor4f (1.0, 0.0, 0.0, ALPHA);
    glVertex3fv (boxv4);
    glVertex3fv (boxv5);
    glVertex3fv (boxv6);
    glVertex3fv (boxv7);
    glColor4f (1.0, 0.0, 1.0, ALPHA);
    glVertex3fv (boxv0);
    glVertex3fv (boxv3);
    glVertex3fv (boxv7);
    glVertex3fv (boxv4);
    glColor4f (0.0, 1.0, 0.0, ALPHA);
    glVertex3fv (boxv1);
    glVertex3fv (boxv5);
    glVertex3fv (boxv6);
    glVertex3fv (boxv2);
    glEnd();
    glBegin (GL_LINES);
    glVertex3fv (boxv0);
    glVertex3fv (boxv1);
    glVertex3fv (boxv1);
    glVertex3fv (boxv2);
    glVertex3fv (boxv2);
    glVertex3fv (boxv3);
    glVertex3fv (boxv3);
    glVertex3fv (boxv0);
    glVertex3fv (boxv4);
    glVertex3fv (boxv5);
    glVertex3fv (boxv5);
    glVertex3fv (boxv6);
    glVertex3fv (boxv6);
    glVertex3fv (boxv7);
    glVertex3fv (boxv7);
    glVertex3fv (boxv4);
    glVertex3fv (boxv0);
    glVertex3fv (boxv4);
    glVertex3fv (boxv1);
    glVertex3fv (boxv5);
    glVertex3fv (boxv2);
    glVertex3fv (boxv6);
    glVertex3fv (boxv3);
    glVertex3fv (boxv7);
    glEnd();
}

// drawCube void CubeView::draw() {
    if (!valid()) {
        glLoadIdentity();
        glViewport (0, 0, pixel_w(), pixel_h());
        glOrtho(-10, 10, -10, 10, -20050, 10000);
        glEnable(GL_BLEND);
        glBlendFunc (GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
        glClear (GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
        glPushMatrix();
        glTranslatef ((GLfloat)xshift, (GLfloat)yshift, 0);
        if (!valid()) {
            loadIdentity();
            glViewport (0, 0, pixel_w(), pixel_h());
            glOrtho (-10, 10, -10, 10, -20050, 10000);
            glEnable (GL_BLEND);
            glBlendFunc (GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
        }
        glClear (GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
        glPushMatrix();
        glTranslatef ((GLfloat)xshift, (GLfloat)yshift, 0);
14.5.2 The CubeViewUI Class

We will completely construct a window to display and control the CubeView defined in the previous section using FLUID.

Defining the CubeViewUI Class

Once you have started FLUID, the first step in defining a class is to create a new class within FLUID using the New->Code->Class menu item. Name the class "CubeViewUI" and leave the subclass blank. We do not need any inheritance for this window. You should see the new class declaration in the FLUID browser window.

![Figure 14.3 FLUID file for CubeView](image)

Adding the Class Constructor

Click on the CubeViewUI class in the FLUID window and add a new method by selecting New->Code->Function/Method. The name of the function will also be CubeViewUI. FLUID will understand that this will be the constructor for the class and will generate the appropriate code. Make sure you declare the constructor public.

Then add a window to the CubeViewUI class. Highlight the name of the constructor in the FLUID browser window and click on New->Group->Window. In a similar manner add the following to the CubeViewUI constructor:

- A horizontal roller named hrot
• A vertical roller named \texttt{vrot}
• A horizontal slider named \texttt{xpan}
• A vertical slider named \texttt{ypan}
• A horizontal value slider named \texttt{zoom}

None of these additions need be public. And they shouldn’t be unless you plan to expose them as part of the interface for CubeViewUI.

When you are finished you should have something like this:

![Figure 14.4 FLUID window containing CubeView demo](image)

We will talk about the \texttt{show()} method that is highlighted shortly.

Adding the CubeView Widget

What we have is nice, but does little to show our cube. We have already defined the CubeView class and we would like to show it within the CubeViewUI.

The CubeView class inherits the \texttt{Fl_Gl_Window} class, which is created in the same way as an \texttt{Fl_Box} widget. Use \texttt{New->Other->Box} to add a square box to the main window. This will be no ordinary box, however.

The Box properties window will appear. The key to letting CubeViewUI display CubeView is to enter CubeView in the \texttt{Class}: text entry box. This tells FLUID that it is not an \texttt{Fl_Box}, but a similar widget with the same constructor.

In the \texttt{Extra Code}: field enter \texttt{#include "CubeView.h"}

This \texttt{#include} is important, as we have just included CubeView as a member of CubeViewUI, so any public CubeView methods are now available to CubeViewUI.
Defining the Callbacks

Each of the widgets we defined before adding CubeView can have callbacks that call CubeView methods. You can call an external function or put a short amount of code in the Callback field of the widget panel. For example, the callback for the ypan slider is:

```c
cube->pany(((Fl_Slider *)o)->value());
cube->redraw();
```

We call `cube->redraw()` after changing the value to update the CubeView window. CubeView could easily be modified to do this, but it is nice to keep this exposed. In the case where you may want to do more than one view change only redrawing once saves a lot of time.

There is no reason to wait until after you have added CubeView to enter these callbacks. FLUID assumes you are smart enough not to refer to members or functions that don't exist.

Adding a Class Method

You can add class methods within FLUID that have nothing to do with the GUI. As an example add a show function so that CubeViewUI can actually appear on the screen.

Make sure the top level CubeViewUI is selected and select New->Code->Function/Method. Just use the name `show()`. We don't need a return value here, and since we will not be adding any widgets to this method FLUID will assign it a return type of `void`. 
Once the new method has been added, highlight its name and select **New->Code->Code**. Enter the method's code in the code window.

### 14.5.3 Adding Constructor Initialization Code

If you need to add code to initialize a class, for example setting initial values of the horizontal and vertical angles in the CubeView, you can simply highlight the constructor and select **New->Code->Code**. Add any required code.

### 14.5.4 Generating the Code

Now that we have completely defined the CubeViewUI, we have to generate the code. There is one last trick to ensure this all works. Open the preferences dialog from **Edit->Preferences**.

At the bottom of the preferences dialog box is the key: **"Include Header from Code"**. Select that option and set your desired file extensions and you are in business. You can include the CubeViewUI.h (or whatever extension you prefer) as you would any other C++ class.

### 14.6 FLUID Reference

The following sections describe each of the windows in FLUID.
14.6 FLUID Reference

14.6.1 The Widget Browser

The main window shows a menu bar and a scrolling browser of all the defined widgets. The name of the .fl file being edited is shown in the window title.

The widgets are stored in a hierarchy. You can open and close a level by clicking the "triangle" at the left of a widget. The leftmost widgets are the parents, and all the widgets listed below them are their children. Parents don't have to have any children.

The top level of the hierarchy is composed of functions and classes. Each of these will produce a single C++ public function or class in the output .cxx file. Calling the function or instantiating the class will create all of the child widgets.

The second level of the hierarchy contains the windows. Each of these produces an instance of class Fl_Window.

Below that are either widgets (subclasses of Fl_Widget) or groups of widgets (including other groups). Plain groups are for layout, navigation, and resize purposes. Tab groups provide the well-known file-card tab interface.

Widgets are shown in the browser by either their name (such as "main_panel" in the example), or by their type and label (such as "Button "the green"").

You select widgets by clicking on their names, which highlights them (you can also select widgets from any displayed window). You can select many widgets by dragging the mouse across them, or by using Shift+Click to toggle them on and off. To select no widgets, click in the blank area under the last widget. Note that hidden children may be selected even when there is no visual indication of this.

You open widgets by double-clicking on them, or (to open several widgets you have picked) by typing the F1 key. A control panel will appear so you can change the widget(s).

14.6.2 Menu Items

The menu bar at the top is duplicated as a pop-up menu on any displayed window. The shortcuts for all the menu items work in any window. The menu items are:

File/Open... (Ctrl+o)

Discards the current editing session and reads in a different .fl file. You are asked for confirmation if you have changed the current file.

FLUID can also read .fd files produced by the Forms and XForms "fdesign" programs. It is best to File/← Merge them instead of opening them. FLUID does not understand everything in a .fd file, and will print a warning message on the controlling terminal for all data it does not understand. You will probably need to edit the resulting setup to fix these errors. Be careful not to save the file without changing the name, as FLUID will write over the .fd file with its own format, which fdesign cannot read!

File/Insert... (Ctrl+i)
Inserts the contents of another .fl file, without changing the name of the current .fl file. All the functions (even if they have the same names as the current ones) are added, and you will have to use cut/paste to put the widgets where you want.

File/Save (Ctrl+s)

Writes the current data to the .fl file. If the file is unnamed then FLUID will ask for a filename.

File/Save As... (Ctrl+Shift+S)

Asks for a new filename and saves the file.

File/Save A Copy...

Save a copy of the .fl data to a different file.

File/Revert...

Revert the .fl data to a previously saved state.

File/New From Template...

Create a new user interface design from a previously saved template. This can be useful for including a predefined enterprise copyright message for projects, or for managing boilerplate code for repeating project code.

File/Save As Template...
Save the current project as a starting point for future projects.

**File/Print... (Ctrl-P)**

Generate a printout containing all currently open windows within your project.

**File/Write Code (Ctrl+Shift+C)**

"Compiles" the data into a `.cxx` and `.h` file. These are exactly the same as the files you get when you run FLUID with the `-c` switch.

The output file names are the same as the `.fl` file, with the leading directory and trailing ".fl" stripped, and ".h" or ".cxx" appended.

**File/Write Strings (Ctrl+Shift+W)**

Writes a message file for all of the text labels defined in the current file.

The output file name is the same as the `.fl` file, with the leading directory and trailing ".fl" stripped, and ".txt", ".po", or ".msg" appended depending on the Internationalization Mode.

**File/Quit (Ctrl+q)**

Exits FLUID. You are asked for confirmation if you have changed the current file.

**Edit/Undo (Ctrl+z) and Redo (Shift+Ctrl+z)**
FLUID saves the project state for undo and redo operations after every major change.

**Edit/Cut (Ctrl+x)**

Deletes the selected widgets and all of their children. These are saved to a "clipboard" file and can be pasted back into any FLUID window.

**Edit/Copy (Ctrl+c)**

Copies the selected widgets and all of their children to the "clipboard" file.

**Edit/Paste (Ctrl+v)**

Pastes the widgets from the clipboard file.

If the widget is a window, it is added to whatever function is selected, or contained in the current selection.

If the widget is a normal widget, it is added to whatever window or group is selected. If none is, it is added to the window or group that is the parent of the current selection.

To avoid confusion, it is best to select exactly one widget before doing a paste.

Cut/paste is the only way to change the parent of a widget.

**Edit/Select All (Ctrl+a)**

Selects all widgets in the same group as the current selection.
If they are all selected already then this selects all widgets in that group's parent. Repeatedly typing Ctrl+a will select larger and larger groups of widgets until everything is selected.

Edit/Properties... (F1 or double click)

Displays the current widget in the attributes panel. If the widget is a window and it is not visible then the window is shown instead.

Edit/Sort

Sorts the selected widgets into left to right, top to bottom order. You need to do this to make navigation keys in FLTK work correctly. You may then fine-tune the sorting with "Earlier" and "Later". This does not affect the positions of windows or functions.

Edit/Earlier (F2)

Moves all of the selected widgets one earlier in order among the children of their parent (if possible). This will affect navigation order, and if the widgets overlap it will affect how they draw, as the later widget is drawn on top of the earlier one. You can also use this to reorder functions, classes, and windows within functions.

Edit/Later (F3)

Moves all of the selected widgets one later in order among the children of their parent (if possible).

Edit/Group (F7)

Creates a new FL_Group and make all the currently selected widgets children of it.

Edit/Ungroup (F8)
Deletes the parent group if all the children of a group are selected.

Edit/Show or Hide Overlays (Ctrl+Shift+O)

Toggles the display of the red overlays off, without changing the selection. This makes it easier to see box borders and how the layout looks. The overlays will be forced back on if you change the selection.

Edit/Show or Hide Guides (Ctrl+Shift+G)

Guides can be used to arrange a widget layout easily and consistently. They indicating preferred widget positions and sizes with user definable margins, grids, and gap sizes. See the "Layout" tab in the "Settings" dialog.

This menu item enables and disable guides and the snapping action when dragging widgets and their borders.

Edit/Show or Hide Restricted (Ctrl+Shift+R)

It is recommended to ensure that user interface elements within FLTK do not exceed the size of their container group or overlap with each other. By activating this button, a hatch pattern is enabled, visually highlighting areas where restricted or undefined behavior may occur.

Edit/Show or Hide Widget Bin (Alt+B)

The widget bin provides quick access to all widget types supported by FLUID. Layouts can be created by clicking on elements in the widget bin, or by dragging them from the bin to their position within the layout. This button shows or hides the widget bin.

Edit/Show or Hide Source Code (Shift+Alt+S)
This button shows or hides the source code preview window. Any change to the layout or code in the layout editores can be previewed and verified immediately in the Code View window.

Edit/Settings... (Alt+p)

Displays the FLUID settings panel. The settings panel contains tabs for general FLUID settings, project setting, layout preferences, custom shell commands, and the internationalisation settings for GNU Gettext and POSIX catgets.

Under the "Project" tab you control the extensions or names of the files that are generated by FLUID. If you check the "Include Header from Code" button the code file will include the header file automatically.

Under the "Locale" tab are the internationalization options, described later in this chapter.
New/Code/Function

Creates a new C function. You will be asked for a name for the function. This name should be a legal C++ function template, without the return type. You can pass arguments which can be referred to by code you type into the individual widgets.

If the function contains any unnamed windows, it will be declared as returning an Fl_Window pointer. The unnamed window will be returned from it (more than one unnamed window is useless). If the function contains only named windows, it will be declared as returning nothing (void).

It is possible to make the .cxx output be a self-contained program that can be compiled and executed. This is done by deleting the function name so main(argc,argv) is used. The function will call show() on all the windows it creates and then call Fl::run(). This can also be used to test resize behavior or other parts of the user interface.

You can change the function name by double-clicking on the function.
Creates a new Fl_Window widget. The window is added to the currently selected function, or to the function containing the currently selected item. The window will appear, sized to 100x100. You can resize it to whatever size you require.

The widget panel will also appear and is described later in this chapter.

New/...

All other items on the New menu are subclasses of Fl_Widget. Creating them will add them to the currently selected group or window, or the group or window containing the currently selected widget. The initial dimensions and position are chosen by copying the current widget, if possible.

When you create the widget you will get the widget's control panel, which is described later in this chapter.

Layout/Align/...

Align all selected widgets to the first widget in the selection.

Layout/Space Evenly/...

Space all selected widgets evenly inside the selected space. Widgets will be sorted from first to last.

Layout/Make Same Size/...

Make all selected widgets the same size as the first selected widget.

Layout/Center in Group/...
Center all selected widgets relative to their parent widget.

Layout/Grid and Size Settings... (Ctrl+g)

Displays the grid settings panel.

This panel controls dimensions that all widgets snap to when you move and resize them, and for the "snap" which is how far a widget has to be dragged from its original position to actually change.

Layout preferences are defined using margins to parent groups and window, gaps between widget, and/or by overlaying a grid over a group or window. A layout comes as a suite of three presets, one for the main application window, one for dialog boxes, and one for toolboxes.

FLUID comes with two include layout suites. FLTK was used to design FLUID and other included apps, and Grid is a more rigid grid layout. Users can add more suites, import and export them, and include them into their .fl project files.
Figure 14.9 FLUID Layout/Grid Settings Window

Shell/Execute Command... (Alt+x)

Displays the shell command panel. The shell command is commonly used to run a 'make' script to compile the FLTK output.
14.6.3 The Widget Panel

When you double-click on a widget or a set of widgets you will get the “widget attribute panel”.

When you change attributes using this panel, the changes are reflected immediately in the window. It is useful to hit the "Hide Overlays" button (or type Ctrl+Shift+O) to hide the red overlay so you can see the widgets more accurately, especially when setting the box type.

If you have several widgets selected, they may have different values for the fields. In this case the value for one of the widgets is shown. But if you change this value, all of the selected widgets are changed to the new value.

Hitting "OK" makes the changes permanent. Selecting a different widget also makes the changes permanent. FLUID checks for simple syntax errors such as mismatched parenthesis in any code before saving any text.
14.7 GUI Attributes

Not all fields in the Widget attributes dialog will be visible for all types of widgets.

Label (text field)

String to print next to or inside the button. You can put newlines into the string to make multiple lines. The easiest way is by typing Ctrl+j.

Symbols can be added to the label using the at sign ("@").

Label (pull down menu)

How to draw the label. Normal, shadowed, engraved, and embossed change the appearance of the text.
The active image for the widget. Click on the **Browse**... button to pick an image file using the file chooser.

The inactive image for the widget. Click on the **Browse**... button to pick an image file using the file chooser.

**Alignment (buttons)**

Where to draw the label. The arrows put it on that side of the widget, you can combine them to put it in the corner. The "box" button puts the label inside the widget, rather than outside.

The **clip** button clips the label to the widget box, the **wrap** button wraps any text in the label, and the **text image** button puts the text over the image instead of under the image.

**Position (text fields)**

The position fields show the current position and size of the widget box. Enter new values to move and/or resize a widget.

These fields understand basic math and variables. Appending +10 to the X coordinate will move a widget 10 units to the right without having to reenter the value. Entering the formula \( w+3 \) in the **Width** field will widen all selected Widgets by 3 units. The formula \( py+i*20 \) in the Y field will order all selected widgets vertically in their group by increments of 20 units.

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>zero based counter of selected widgets</td>
</tr>
<tr>
<td>x, y, w, h</td>
<td>position and size of the current widget</td>
</tr>
<tr>
<td>px, py, pw, ph</td>
<td>dimensions of the parent widget</td>
</tr>
<tr>
<td>sx, sy, sw, sh</td>
<td>dimensions of the previous sibling</td>
</tr>
<tr>
<td>ex, ey, ew, eh</td>
<td>bounding box of all children</td>
</tr>
</tbody>
</table>
Values (text fields)

The values and limits of the current widget. Depending on the type of widget, some or all of these fields may be inactive.

Shortcut

The shortcut key to activate the widget. Click on the shortcut button and press any key sequence to set the shortcut.

Attributes (buttons)

The **Visible** button controls whether the widget is visible (on) or hidden (off) initially. Don’t change this for windows or for the immediate children of a Tabs group.

The **Active** button controls whether the widget is activated (on) or deactivated (off) initially. Most widgets appear greyed out when deactivated.

The **Resizable** button controls whether the window is resizeable. In addition all the size changes of a window or group will go "into" the resizable child. If you have a large data display surrounded by buttons, you probably want that data area to be resizable. You can get more complex behavior by making invisible boxes the resizable widget, or by using hierarchies of groups. Unfortunately the only way to test it is to compile the program. Resizing the FLUID window is not the same as what will happen in the user program.

The **Hotspot** button causes the parent window to be positioned with that widget centered on the mouse. This position is determined *when the FLUID function is called*, so you should call it immediately before showing the window. If you want the window to hide and then reappear at a new position, you should have your program set the hotspot itself just before `show()`.

The **Border** button turns the window manager border on or off. On most window managers you will have to close the window and reopen it to see the effect.
X Class (text field)

The string typed into here is passed to the X window manager as the class. This can change the icon or window decorations. On most (all?) window managers you will have to close the window and reopen it to see the effect.

![Figure 14.11 The FLUID widget Style attributes](image)

### 14.7.1 Style Attributes

**Label Font (pulldown menu)**

Font to draw the label in. Ignored by symbols, bitmaps, and pixmaps. Your program can change the actual font used by these "slots" in case you want some font other than the 16 provided.

**Label Size (pulldown menu)**

Pixel size (height) for the font to draw the label in. Ignored by symbols, bitmaps, and pixmaps. To see the result without dismissing the panel, type the new number and then Tab.
Label Color (button)

Color to draw the label. Ignored by pixmaps (bitmaps, however, do use this color as the foreground color).

Box (pulldown menu)

The boxtype to draw as a background for the widget.

Many widgets will work, and draw faster, with a “frame” instead of a “box”. A frame does not draw the colored interior, leaving whatever was already there visible. Be careful, as FLUID may draw this ok but the real program may leave unwanted stuff inside the widget.

If a window is filled with child widgets, you can speed up redrawing by changing the window’s box type to "NO_BOX". FLUID will display a checkerboard for any areas that are not colored in by boxes. Note that this checkerboard is not drawn by the resulting program. Instead random garbage will be displayed.

Down Box (pulldown menu)

The boxtype to draw when a button is pressed or for some parts of other widgets like scrollbars and valuators.

Color (button)

The color to draw the box with.

Select Color (button)

Some widgets will use this color for certain parts. FLUID does not always show the result of this: this is the color buttons draw in when pushed down, and the color of input fields when they have the focus.
Text Font, Size, and Color

Some widgets display text, such as input fields, pull-down menus, and browsers.

![FLUID widget C++ attributes](image)

**Figure 14.12 The FLUID widget C++ attributes**

### 14.7.2 C++ Attributes

**Class**

This is how you use your own subclasses of `Fl_Widget`. Whatever identifier you type in here will be the class that is instantiated.

In addition, no `#include` header file is put in the `.h` file. You must provide a `#include` line as the first line of the "Extra Code" which declares your subclass.

The class must be similar to the class you are spoofing. It does not have to be a subclass. It is sometimes useful to change this to another FLTK class. For windows you can select either `Single` or `Double` in the drop-down box right to the "Class:" field to get a normal window (`Fl_Window`) or a double-buffered window (`Fl_Double_Window`), respectively.
14.7 GUI Attributes

Type (upper-right pulldown menu)

Some classes have subtypes that modify their appearance or behavior. You pick the subtype off of this menu.

Name (text field)

Name of a variable to declare, and to store a pointer to this widget into. This variable will be of type "<class>∗". If the name is blank then no variable is created.

You can name several widgets with "name[0]", "name[1]", "name[2]", etc. This will cause FLUID to declare an array of pointers. The array is big enough that the highest number found can be stored. All widgets in the array must be the same type.

Public (button)

Controls whether the widget is publicly accessible. When embedding widgets in a C++ class, this controls whether the widget is public or private in the class. Otherwise it controls whether the widget is declared static or global (extern).

Extra Code (text fields)

These four fields let you type in literal lines of code to dump into the .h or .cxx files.

If the text starts with a # or the word extern then FLUID thinks this is an "include" line, and it is written to the .h file. If the same include line occurs several times then only one copy is written.

All other lines are "code" lines. The current widget is pointed to by the local variable o. The window being constructed is pointed to by the local variable w. You can also access any arguments passed to the function here, and any named widgets that are before this one.

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FLUID will check for matching parenthesis, braces, and quotes, but does not do much other error checking. Be careful here, as it may be hard to figure out what widget is producing an error in the compiler. If you need more than four lines you probably should call a function in your own .cxx code.

Callback (text field)

This can either be the name of a function, or a small snippet of code. If you enter anything other than letters, numbers, and the underscore then FLUID treats it as code.

A name refers to a function in your own code. It must be declared as `void name(<class>*, void*)`.

A code snippet is inserted into a static function in the .cxx output file. The function prototype is `void name(class *o, void *v)` so that you can refer to the widget as `o` and the `user_data()` as `v`. FLUID will check for matching parenthesis, braces, and quotes, but does not do much other error checking. Be careful here, as it may be hard to figure out what widget is producing an error in the compiler.

If the callback is blank then no callback is set.

User Data (text field)

This is a value for the `user_data()` of the widget. If blank the default value of zero is used. This can be any piece of C code that can be cast to a `void` pointer.

Type (text field)

The `void*` in the callback function prototypes is replaced with this. You may want to use `long` for old XForms code. Be warned that anything other than `void*` is not guaranteed to work! However on most architectures other pointer types are ok, and `long` is usually ok, too.

When (pulldown menu)

When to do the callback. This can be `Never`, `Changed`, `Release`, or `Enter Key`. The value of `Enter Key` is only useful for text input fields.

There are other rare but useful values for the `when()` field that are not in the menu. You should use the extra code fields to put these values in.

No Change (button)

The **No Change** button means the callback is done on the matching event even if the data is not changed.
14.8 Selecting and Moving Widgets

Double-clicking a window name in the browser will display it, if not displayed yet. From this display you can select
data, sets of data, and move or resize them. To close a data either double-click it or type \texttt{ESC}.

To select a data, click it. To select several data drag a rectangle around them. Holding down shift will toggle
the selection of the data instead.

You cannot pick hidden data. You also cannot choose some data if they are completely overlapped by later
data. Use the browser to select these data.

The selected data are shown with a red "overlay" line around them. You can move the data by dragging this
box. Or you can resize them by dragging the outer edges and corners. Hold down the Alt key while dragging the
mouse to defeat the snap-to-grid effect for fine positioning.

If there is a tab box displayed you can change which child is visible by clicking on the file tabs. The child you pick is
selected.

The arrow, tab, and shift+tab keys "navigate" the selection. Left, right, tab, or shift+tab move to the next or previous
data in the hierarchy. Hit the right arrow enough and you will select every data in the window. Up/down data
move to the previous/next data that overlap horizontally. If the navigation does not seem to work you probably
need to "Sort" the data. This is important if you have input fields, as FLTK uses the same rules when using arrow
keys to move between input fields.

To "open" a data, double click it. To open several data select them and then type F1 or pick "Edit/Open" off the
pop-up menu.

Type Ctrl+o to temporarily toggle the overlay off without changing the selection, so you can see the data borders.

You can resize the window by using the window manager border controls. FLTK will attempt to round the window
size to the nearest multiple of the grid size and makes it big enough to contain all the data (it does this using
illegal X methods, so it is possible it will barf with some window managers!). Notice that the actual window in your
program may not be resizable, and if it is, the effect on child data may be different.

The panel for the window (which you get by double-clicking it) is almost identical to the panel for any other \texttt{Fl_Widget}.
There are three extra items:

14.9 Image Labels

The contents of the image files in the \texttt{Image} and \texttt{Inactive} text fields are written to the \texttt{.cxx} file. If many data
share the same image then only one copy is written. Since the image data is embedded in the generated source
code, you need only distribute the C++ code and not the image files themselves.

However, the filenames are stored in the \texttt{.fl} file so you will need the image files as well to read the \texttt{.fl} file.
Filenames are relative to the location of the \texttt{.fl} file and not necessarily the current directory. We recommend you
either put the images in the same directory as the \texttt{.fl} file, or use absolute path names.

Notes for All Image Types
FLUID runs using the default visual of your X server. This may be 8 bits, which will give you dithered images. You may get better results in your actual program by adding the code "Fl::visual(FL_RGB)" to your code right before the first window is displayed.

All widgets with the same image on them share the same code and source X pixmap. Thus once you have put an image on a widget, it is nearly free to put the same image on many other widgets.

If you edit an image at the same time you are using it in FLUID, the only way to convince FLUID to read the image file again is to remove the image from all widgets that are using it or re-load the .fl file.

Don't rely on how FLTK crops images that are outside the widget, as this may change in future versions! The cropping of inside labels will probably be unchanged.

To more accurately place images, make a new "box" widget and put the image in that as the label.

XBM (X Bitmap) Files

FLUID reads X bitmap files which use C source code to define a bitmap. Sometimes they are stored with the ".h" or ".bm" extension rather than the standard ".xbm" extension.

FLUID writes code to construct an Fl_Bitmap image and use it to label the widget. The '1' bits in the bitmap are drawn using the label color of the widget. You can change this color in the FLUID widget attributes panel. The '0' bits are transparent.

The program "bitmap" on the X distribution does an adequate job of editing bitmaps.

XPM (X Pixmap) Files

FLUID reads X pixmap files as used by the libxpm library. These files use C source code to define a pixmap. The filenames usually have the ".xpm" extension.
FLUID writes code to construct an Fl_Pixmap image and use it to label the widget. The label color of the widget is ignored, even for 2-color images that could be a bitmap. XPM files can mark a single color as being transparent, and FLTK uses this information to generate a transparency mask for the image.

We have not found any good editors for small iconic pictures. For pixmaps we have used XPaint and the KDE icon editor.

BMP Files

FLUID reads Windows BMP image files which are often used in Windows applications for icons. FLUID converts BMP files into (modified) XPM format and uses an Fl_BMP_Image image to label the widget. Transparency is handled the same as for XPM files. All image data is uncompressed when written to the source file, so the code may be much bigger than the .bmp file.

GIF Files

FLUID reads GIF image files which are often used in HTML documents to make icons. FLUID converts GIF files into (modified) XPM format and uses an Fl_GIF_Image image to label the widget. Transparency is handled the same as for XPM files. All image data is uncompressed when written to the source file, so the code may be much bigger than the .gif file. Only the first image of an animated GIF file is used.

JPEG Files

If FLTK is compiled with JPEG support, FLUID can read JPEG image files which are often used for digital photos. FLUID uses an Fl_JPEG_Image image to label the widget, and writes uncompressed RGB or grayscale data to the source file.

PNG (Portable Network Graphics) Files

If FLTK is compiled with PNG support, FLUID can read PNG image files which are often used in HTML documents. FLUID uses a Fl_PNG_Image image to label the widget, and writes uncompressed RGB or grayscale data to the source file. PNG images can provide a full alpha channel for partial transparency, and FLTK supports this as best as possible on each platform.
14.10 FLUID Templates

Fluid can store a number of project templates. Project templates are great for storing often used boilerplate code for fast access. A common use would be projects with readily prepared copyright messages.

A sample template for FLTK projects is included with Fluid.

Choose "File > New From Template..." to create a new project based on a template file. In the template dialog, select one of the existing templates. All occurrences of the word "@INSTANCE@" in the template are replaced with the text in the "Instance" field. To create the new project click "New".

To add your current project as a new template, choose "File > Save As Template...", fill in a name, and click "Save".

To delete a template, open the template dialog using "New from Template" or "Save As Template", then select any existing template, and click "Delete Template".

14.11 Internationalization with FLUID

FLUID supports internationalization (I18N for short) of label strings and tooltips used by widgets. The GNU gettext option also supports deferred translation of statically initialised menu item labels. The preferences window (Ctrl+p) provides access to the I18N options.

14.11.1 I18N Methods

FLUID supports three methods of I18N: none, GNU gettext, and POSIX catgets. The "none" method is the default and just passes the label strings as-is to the widget constructors.

The "GNU gettext" method uses GNU gettext (or a similar text-based I18N library) to retrieve a localized string before calling the widget constructor.

The "POSIX catgets" method uses the POSIX catgets function to retrieve a numbered message from a message catalog before calling the widget constructor.
14.11 Internationalization with FLUID

14.11.2 Using GNU gettext for I18N

FLUID’s code support for GNU gettext is limited to calling a function or macro to retrieve the localized label; you still need to call \texttt{setlocale()} and \texttt{textdomain()} or \texttt{bindtextdomain()} to select the appropriate language and message file.

To use GNU gettext for I18N, open the preferences window and choose “GNU gettext” from the \textbf{Use:} chooser. Four new input fields will then appear to control the include file and function/macro names to use when retrieving localized label strings in dynamic allocation and static initialisation.

![Internationalization using GNU gettext](image)

The \texttt{#include} field controls the header file to include for I18N; by default this is \texttt{<libintl.h>}, the standard I18N file for GNU gettext.

If the \textbf{Conditional:} field contains a macro name, i18n will only be compiled into the product if this macro is defined. The build system should define the macro only if all required headers and libraries are available. If the macro is not defined, no headers are included and \texttt{gettext} passes text through untranslated.

The \textbf{Function:} field controls the function (or macro) that will retrieve the localized message; by default the \texttt{gettext} function will be called.

The \textbf{Static Function:} field names a macro that will mark static text fields for extraction with the \texttt{xgettext} tool. The default macro name is \texttt{gettext\_noop} and will be defined as \texttt{#define gettext\_noop(text) text} right after the \texttt{#include} statement. Fluid will do its best to call \texttt{gettext} on static texts later, after the \texttt{textdomain} was set by the user.

See also

\texttt{GNU gettext special cases}

14.11.3 Using POSIX catgets for I18N

FLUID’s code support for POSIX catgets allows you to use a global message file for all interfaces or a file specific to each \texttt{.fl} file; you still need to call \texttt{setlocale()} to select the appropriate language.
To use POSIX catgets for I18N, open the preferences window and choose “POSIX catgets” from the **Use:** chooser. Three new input fields will then appear to control the include file, catalog file, and set number for retrieving the localized label strings.

![FLUID Settings](image)

**Figure 14.14 Internationalization using POSIX catgets**

The **#include** field controls the header file to include for I18N; by default this is `<nl_types.h>`, the standard I18N file for POSIX catgets.

The **File:** field controls the name of the catalog file variable to use when retrieving localized messages; by default the file field is empty which forces a local (static) catalog file to be used for all of the windows defined in your `.fl` file.

The **Set:** field controls the set number in the catalog file. The default set is 1 and rarely needs to be changed.

### 14.12 Known Limitations

Declaration Blocks can be used to temporarily block out already designed code using `#if 0` and `#endif` type construction. This will effectively avoid compilation of blocks of code. However, static code and data generated by this segment (menu items, images, include statements, etc.) will still be generated and likely cause compile-time warnings.

### 14.13 Keyboard Shortcuts

On Apple computers, use the Apple Command key instead of Ctrl.

<table>
<thead>
<tr>
<th>Key Combo</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>widget properties dialog</td>
</tr>
<tr>
<td>F2</td>
<td>move widget earlier in tree</td>
</tr>
<tr>
<td>F3</td>
<td>move widget later in tree</td>
</tr>
<tr>
<td>F7</td>
<td>group widgets</td>
</tr>
<tr>
<td>F8</td>
<td>ungroup widgets</td>
</tr>
<tr>
<td><strong>Delete</strong></td>
<td>delete selected widgets</td>
</tr>
</tbody>
</table>

Generated by Doxygen
## 14.14 Licenses

FLUID uses graphical images based on the Zendesk Garden Stroke icon set: [https://github.com/zendeskgarden](https://github.com/zendeskgarden). Garden Stroke is licensed under the Apache License, Version 2.0: [https://](https://)

<table>
<thead>
<tr>
<th>Key Combo</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl-1..9</td>
<td>load project from history</td>
</tr>
<tr>
<td>Alt-1</td>
<td>label text tiny</td>
</tr>
<tr>
<td>Alt-2</td>
<td>label text small</td>
</tr>
<tr>
<td>Alt-3</td>
<td>label text normal</td>
</tr>
<tr>
<td>Alt-4</td>
<td>label text medium</td>
</tr>
<tr>
<td>Alt-5</td>
<td>label text large</td>
</tr>
<tr>
<td>Alt-6</td>
<td>label text huge</td>
</tr>
<tr>
<td>Ctrl-A</td>
<td>select all</td>
</tr>
<tr>
<td>Shift-Ctrl-A</td>
<td>select none</td>
</tr>
<tr>
<td>Alt-B</td>
<td>widget bin</td>
</tr>
<tr>
<td>Ctrl-C</td>
<td>copy widgets</td>
</tr>
<tr>
<td>Shift-Ctrl-C</td>
<td>generate C code</td>
</tr>
<tr>
<td>Ctrl-G</td>
<td>grid setting dialog</td>
</tr>
<tr>
<td>Alt-G</td>
<td>execute again</td>
</tr>
<tr>
<td>Shift-Alt-G</td>
<td>FLTK settings dialog</td>
</tr>
<tr>
<td>Ctrl-I</td>
<td>insert design into project</td>
</tr>
<tr>
<td>Ctrl-N</td>
<td>new design</td>
</tr>
<tr>
<td>Shift-Ctrl-N</td>
<td>new design from template</td>
</tr>
<tr>
<td>Ctrl-O</td>
<td>open design file</td>
</tr>
<tr>
<td>Shift-Ctrl-O</td>
<td>toggle overlays</td>
</tr>
<tr>
<td>Ctrl-P</td>
<td>print all windows</td>
</tr>
<tr>
<td>Alt-P</td>
<td>project settings</td>
</tr>
<tr>
<td>Shift-Alt-P</td>
<td>Fluid settings dialog</td>
</tr>
<tr>
<td>Ctrl-Q</td>
<td>quit Fluid</td>
</tr>
<tr>
<td>Ctrl-S</td>
<td>save design</td>
</tr>
<tr>
<td>Shift-Ctrl-S</td>
<td>save design with new name</td>
</tr>
<tr>
<td>Shift-Alt-S</td>
<td>source view window</td>
</tr>
<tr>
<td>Ctrl-U</td>
<td>duplicate widgets</td>
</tr>
<tr>
<td>Ctrl-V</td>
<td>paste widgets</td>
</tr>
<tr>
<td>Shift-Ctrl-W</td>
<td>write text strings</td>
</tr>
<tr>
<td>Ctrl-X</td>
<td>cut selected Widgets</td>
</tr>
<tr>
<td>Alt-X</td>
<td>show ‘execute command’ dialog</td>
</tr>
<tr>
<td>Ctrl-Z</td>
<td>undo</td>
</tr>
<tr>
<td>Shift-Ctrl-Z</td>
<td>redo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Combo</th>
<th>Function in interactive Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMB</td>
<td>select one widget</td>
</tr>
<tr>
<td>Shift-LMB</td>
<td>extend widget selection</td>
</tr>
<tr>
<td>Shift-LMB-Drag</td>
<td>window only: resize proportional</td>
</tr>
<tr>
<td>Tab</td>
<td>select next</td>
</tr>
<tr>
<td>Shift-Tab</td>
<td>select previous</td>
</tr>
<tr>
<td>Arrow</td>
<td>move by one unit</td>
</tr>
<tr>
<td>Shift-Arrow</td>
<td>resize by one unit</td>
</tr>
<tr>
<td>Ctrl-Arrow</td>
<td>move by grid units</td>
</tr>
<tr>
<td>Shift-Ctrl-Arrow</td>
<td>resize by grid units</td>
</tr>
</tbody>
</table>
://www.apache.org/licenses/LICENSE-2.0.html.
Chapter 15

FLTK Runtime Options

In this chapter, we will cover how to access and alter settings for applications created using FLTK, both as an administrator and as a regular user.

Subchapters:

- Runtime Options
- Obtaining Current Settings
- Administrative Tool
- List of Options

15.1 Runtime Options

FLTK keeps track of various aspects of the user interface in a system-wide database. Users have the ability to set their own preferences and override default or system settings. For instance, FLTK will display a dotted rectangle around the widget with current focus. This might not be desirable for users who do not use keyboard navigation and do not need the rectangle. This can be turned off by setting the OPTION_VISIBLE_FOCUS option to 'off' for that user, which will disable the focus rectangle in all FLTK-based applications.

15.2 Obtaining Current Settings

Options are kept in preference files using the signature `Fl_Preferences::CORE_SYSTEM, "fltk.org", "fltk"` for system-wide settings and `Fl_Preferences::CORE_USER, "fltk.org", "fltk"` for individual users. They can be accessed by using the function `bool Fl::option(Fl_Option opt)`. If an application needs to temporarily override user or system settings, it can use the function `void option(Fl_← Option opt, bool val)`.

To make changes to options permanently, FLTK provides an administrative tool called fltk-options.
15.3 Administrative Tool

`fltk-options` is a hybrid app that is part of FLTK and can be installed on the target system. It includes an up-to-date man page.

When `fltk-options` is called without any command-line arguments, it opens in interactive mode and provides a user interface to view and alter all system and current user options.

Starting the tool from a shell, the command-line options `-S` and `-U` can be used to display or change system or user options. On MS-Windows, `fltk-options` is also available as `fltk-options-cmd.exe`.

15.4 List of Options

Calling `fltk-options --help` gives a list of all available commands, and options and their values. `fltk-options --help OPTION` prints more detailed information for OPTION if available. In interactive mode, tooltips provide this additional information.

A full list of options can be found in the manual at Fl::Fl_Option.
Chapter 16

Advanced FLTK

This chapter explains advanced programming and design topics that will help you to get the most out of FLTK.

16.1 Multithreading

FLTK can be used to implement a GUI for a multithreaded application but, as with multithreaded programming generally, there are some concepts and caveats that must be kept in mind.

Key amongst these is that, for many of the target platforms on which FLTK is supported, only the `main()` thread of the process is permitted to handle system events, create or destroy windows and open or close windows. Further, only the `main()` thread of the process can safely write to the display.

To support this in a portable way, all FLTK `draw()` methods are executed in the `main()` thread. A worker thread may update the state of an existing widget, but it may not do any rendering directly, nor create or destroy a window. (NOTE: A special case exists for `Fl_Gl_Window` where it can, with suitable precautions, be possible to safely render to an existing GL context from a worker thread.)

Creating portable threads

We do not provide a threading interface as part of the library. A simple example showing how threads can be implemented, for all supported platforms, can be found in `test/threads.h` and `test/threads.cxx`.

FLTK has been used with a variety of thread interfaces, so if the simple example shown in `test/threads.cxx` does not cover your needs, you might want to select a third-party library that provides the features you require.

16.2 FLTK multithread locking - Fl::lock() and Fl::unlock()

In a multithreaded program, drawing of widgets (in the `main()` thread) happens asynchronously to widgets being updated by worker threads, so no drawing can occur safely whilst a widget is being modified (and no widget should be modified whilst drawing is in progress).

FLTK supports multithreaded applications using a locking mechanism internally. This allows a worker thread to lock the rendering context, preventing any drawing from taking place, whilst it changes the value of its widget.
Note

The converse is also true; whilst a worker thread holds the lock, the main() thread may not be able to process any drawing requests, nor service any events. So a worker thread that holds the FLTK lock must contrive to do so for the shortest time possible or it could impair operation of the application.

The lock operates broadly as follows.

Using the FLTK library, the main() thread holds the lock whenever it is processing events or redrawing the display. It acquires (locks) and releases (unlocks) the FLTK lock automatically and no "user intervention" is required. Indeed, a function that runs in the context of the main() thread ideally should not acquire / release the FLTK lock explicitly. (Though note that the lock calls are recursive, so calling Fl::lock() from a thread that already holds the lock, including the main() thread, is benign. The only constraint is that every call to Fl::lock() must be balanced by a corresponding call to Fl::unlock() to ensure the lock count is preserved.)

The main() thread must call Fl::lock() once before any windows are shown, to enable the internal lock (it is "off" by default since it is not useful in single-threaded applications) but thereafter the main() thread lock is managed by the library internally.

A worker thread, when it wants to alter the value of a widget, can acquire the lock using Fl::lock(), update the widget, then release the lock using Fl::unlock(). Acquiring the lock ensures that the worker thread can update the widget, without any risk that the main() thread will attempt to redraw the widget whilst it is being updated.

Note that acquiring the lock is a blocking action; the worker thread will stall for as long as it takes to acquire the lock. If the main() thread is engaged in some complex drawing operation this may block the worker thread for a long time, effectively serializing what ought to be parallel operations. (This frequently comes as a surprise to coders less familiar with multithreaded programming issues; see the discussion of "lockless programming" later for strategies for managing this.)

To incorporate the locking mechanism in the library, FLTK must be compiled with --enable-threads set during the configure process. IDE-based versions of FLTK are automatically compiled with the locking mechanism incorporated if possible. Since version 1.3, the configure script that builds the FLTK library also sets --enable-threads by default.

16.3 Simple multithreaded examples using Fl::lock

In main(), call Fl::lock() once before Fl::run() or Fl::wait() to enable the lock and start the runtime multithreading support for your program. All callbacks and derived functions like handle() and draw() will now be properly locked.

This might look something like this:

```c
int main(int argc, char **argv) {
    /* Create your windows and widgets here */
    Fl::lock(); /* "start" the FLTK lock mechanism */
    /* show your window */
    main_win->show(argc, argv);
    /* start your worker threads */
    ... start threads ...
    /* Run the FLTK main loop */
    int result = Fl::run();
    /* terminate any pending worker threads */
    ... stop threads ...
    return result;
}
```

You can start as many threads as you like. From within a thread (other than the main() thread) FLTK calls must be wrapped with calls to Fl::lock() and Fl::unlock().

```c
void my_thread(void) {
    while (thread_still_running) {
        /* do thread work */
        /* compute new values for widgets */
        Fl::lock(); // acquire the lock
        my_widget->update(values);
        Fl::unlock(); // release the lock; allow other threads to access FLTK again
        Fl::awake(); // use Fl::awake() to signal main thread to refresh the GUI
    }
}
```

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Note

To trigger a refresh of the GUI from a worker thread, the worker code should call Fl::awake().

Using Fl::awake thread messages

You can send messages from worker threads to the main() thread using Fl::awake(void* message). If using this thread message interface, your main() might look like this:

```c
int main(int argc, char **argv) {
    /* Create your windows and widgets here */
    Fl::lock(); /* "start" the FLTK lock mechanism */
    /* show your window */
    main_win->show(argc, argv);
    /* start your worker threads */
    ... start threads ...
    /* Run the FLTK loop and process thread messages */
    while (Fl::wait() > 0) {
        if ((next_message = Fl::thread_message()) != NULL) {
            /* process your data, update widgets, etc. */
            ...
        }
    }
    /* terminate any pending worker threads */
    ... stop threads ...
    return 0;
}
```

Your worker threads can send messages to the main() thread using Fl::awake(void* message):

```c
void *msg; // "msg" is a pointer to your message
Fl::awake(msg); // send "msg" to main thread
```

A message can be anything you like. The main() thread can retrieve the message by calling Fl::thread_message().

Using Fl::awake callback messages

You can also request that the main() thread call a function on behalf of the worker thread by using Fl::awake(Fl_Awake_Handler cb, void* userdata).

The main() thread will execute the callback “as soon as possible” when next processing the pending events. This can be used by a worker thread to perform operations (for example showing or hiding windows) that are prohibited in a worker thread.

```c
void do_something_cb(void *userdata) {
    // Will run in the context of the main thread
    ... do_stuff ...
}
```

// running in worker thread

```c
void *data; // "data" is a pointer to your user data
Fl::awake(do_something_cb, data); // call to execute cb in main thread
```

Note

The main() thread will execute the Fl_Awake_Handler callback do_something_cb asynchronously to the worker thread, at some short but indeterminate time after the worker thread registers the request. When it executes the Fl_Awake_Handler callback, the main() thread will use the contents of *userdata at the time of execution, not necessarily the contents that *userdata had at the time that the worker thread posted the callback request. The worker thread should therefore contrive not to alter the contents of *userdata once it posts the callback, since the worker thread does not know when the main() thread will consume that data. It is often useful that userdata point to a struct, one member of which the main() thread can modify to indicate that it has consumed the data, thereby allowing the worker thread to re-use or update userdata.
Warning

The mechanisms used to deliver `Fl::awake(void* message)` and `Fl::awake(Fl_Awake_Handler cb, void* userdata)` events to the `main()` thread can interact in unexpected ways on some platforms. Therefore, for reliable operation, it is advised that a program use either `Fl::awake(Fl_Awake_Handler cb, void* userdata)` or `Fl::awake(void* message)`, but that they never be intermixed. Calling `Fl::awake()` with no parameters should be safe in either case.

If you have to choose between using the `Fl::awake(void* message)` and `Fl::awake(Fl_Awake_Handler cb, void* userdata)` mechanisms and don't know which to choose, then try the `Fl::awake(Fl_Awake_Handler cb, void* userdata)` method first as it tends to be more powerful in general.

16.4 FLTK multithreaded "lockless programming"

The simple multithreaded examples shown above, using the FLTK lock, work well for many cases where multiple threads are required. However, when that model is extended to more complex programs, it often produces results that the developer did not anticipate.

A typical case might go something like this. A developer creates a program to process a huge data set. The program has a `main()` thread and 7 worker threads and is targeted to run on an 8-core computer. When it runs, the program divides the data between the 7 worker threads, and as they process their share of the data, each thread updates its portion of the GUI with the results, locking and unlocking as they do so.

But when this program runs, it is much slower than expected and the developer finds that only one of the eight CPU cores seems to be utilised, despite there being 8 threads in the program. What happened?

The threads in the program all run as expected, but they end up being serialized (that is, not able to run in parallel) because they all depend on the single FLTK lock. Acquiring (and releasing) that lock has an associated cost, and is a blocking action if the lock is already held by any other worker thread or by the `main()` thread.

If the worker threads are acquiring the lock "too often", then the lock will always be held somewhere and every attempt by any other thread (even `main()`) to lock will cause that other thread (including `main()`) to block. And blocking `main()` also blocks event handling, display refresh...

As a result, only one thread will be running at any given time, and the multithreaded program is effectively reduced to being a (complicated and somewhat less efficient) single thread program.

A "solution" is for the worker threads to lock "less often", such that they do not block each other or the `main()` thread. But judging what constitutes locking "too often" for any given configuration, and hence will block, is a very tricky question. What works well on one machine, with a given graphics card and CPU configuration may behave very differently on another target machine.

There are "interesting" variations on this theme, too: for example it is possible that a "faulty" multithreaded program such as described above will work adequately on a single-core machine (where all threads are inherently serialized anyway and so are less likely to block each other) but then stall or even deadlock in unexpected ways on a multicore machine when the threads do interfere with each other. (I have seen this - it really happens.)

The "better" solution is to avoid using the FLTK lock so far as possible. Instead, the code should be designed so that the worker threads do not update the GUI themselves and therefore never need to acquire the FLTK lock. This would be FLTK multithreaded "lockless programming".

There are a number of ways this can be achieved (or at least approximated) in practice but the most direct approach is for the worker threads to make use of the `Fl::awake(Fl_Awake_Handler cb, void* userdata)` method so that GUI updates can all run in the context of the `main()` thread, alleviating the need for the worker thread to ever lock. The onus is then on the worker threads to manage the `userdata` so that it is delivered safely to the `main()` thread, but there are many ways that can be done.
Note

Using Fl::awake is not, strictly speaking, entirely "lockless" since the awake handler mechanism incorporates resource locking internally to protect the queue of pending awake messages. These resource locks are held transiently and generally do not trigger the pathological blocking issues described here.

However, aside from using Fl::awake, there are many other ways that a "lockless" design can be implemented, including message passing, various forms of IPC, etc.

If you need high performing multithreaded programming, then take some time to study the options and understand the advantages and disadvantages of each; we can't even begin to scratch the surface of this huge topic here!

And of course occasional, sparse, use of the FLTK lock from worker threads will do no harm; it is "excessive" locking (whatever that might be) that triggers the failing behaviour.

It is always a Good Idea to update the GUI at the lowest rate that is acceptable when processing bulk data (or indeed, in all cases!) Updating at a few frames per second is probably adequate for providing feedback during a long calculation. At the upper limit, anything faster than the frame rate of your monitor and the updates will never even be displayed; why waste CPU computing pixels that you will never show?

16.5 FLTK multithreaded Constraints

FLTK supports multiple platforms, some of which allow only the main() thread to handle system events and open or close windows. The safe thing to do is to adhere to the following rules for threads on all operating systems:

• Don't show() or hide() anything that contains Fl_Window based widgets from a worker thread. This includes any windows, dialogs, file choosers, subwindows or widgets using Fl_Gl_Window. Note that this constraint also applies to non-window widgets that have tooltips, since the tooltip will contain a Fl_Window object. The safe and portable approach is never to call show() or hide() on any widget from the context of a worker thread. Instead you can use the Fl_Awake_Handler variant of Fl::awake() to request the main() thread to create, destroy, show or hide the widget on behalf of the worker thread.

• Don't call Fl::run(), Fl::wait(), Fl::flush(), Fl::check() or any related methods that will handle system messages from a worker thread

• Don't intermix use of Fl::awake(Fl_Awake_Handler cb, void* userdata) and Fl::awake(void* message) calls in the same program as they may interact unpredictably on some platforms; choose one or other style of Fl::awake(<thing>) mechanism and use that. (Intermixing calls to Fl::awake() should be safe with either however.)

• Starting with FLTK 1.4, it's possible to start (or cancel) a timer from a worker thread under the condition that the call to Fl::add_timeout (or Fl::remove_timeout) is wrapped in Fl::lock() and Fl::unlock().

• Don't change window decorations or titles from a worker thread

• The make_current() method will probably not work well for regular windows, but should always work for a Fl_Gl_Window to allow for high speed rendering on graphics cards with multiple pipelines. Managing thread-safe access to the GL pipelines is left as an exercise for the reader! (And may be target specific...)

See also: Fl::lock(), Fl::unlock(), Fl::awake(), Fl::awake(Fl_Awake_Handler cb, void* userdata), Fl::awake(void* message), Fl::thread_message().
Chapter 17

Unicode and UTF-8 Support

This chapter explains how FLTK handles international text via Unicode and UTF-8.

Unicode support was added to FLTK starting with version 1.3.0 and is still incomplete but mostly functional. This chapter is Work in Progress, reflecting the current state of Unicode support.

17.1 About Unicode, ISO 10646 and UTF-8

The summary of Unicode, ISO 10646 and UTF-8 given below is deliberately brief and provides just enough information for the rest of this chapter.

For further information, please see:

- https://unicode.org
- https://iso.org
- https://www.cl.cam.ac.uk/~mgk25/unicode.html

The Unicode Standard

The Unicode Standard was originally developed by a consortium of mainly US computer manufacturers and developers of multi-lingual software. It has now become a de facto standard for character encoding and is supported by most of the major computing companies in the world.

Before Unicode, many different systems, on different platforms, had been developed for encoding characters for different languages, but no single encoding could satisfy all languages. Unicode provides access to over 130,000 characters used in all the major languages written today, and is independent of platform and language.

Unicode also provides higher-level concepts needed for text processing and typographic publishing systems, such as algorithms for sorting and comparing text, composite character and text rendering, right-to-left and bi-directional text handling.
ISO 10646

The International Organisation for Standardization (ISO) had also been trying to develop a single unified character set. Although both ISO and the Unicode Consortium continue to publish their own standards, they have agreed to coordinate their work so that specific versions of the Unicode and ISO 10646 standards are compatible with each other.

The international standard ISO 10646 defines the Universal Character Set (UCS) which contains the characters required for almost all known languages. The standard also defines three different implementation levels specifying how these characters can be combined.

In UCS, characters have a unique numerical code and an official name, and are usually shown using 'U+' and the code in hexadecimal, e.g. U+0041 is the "Latin capital letter A". The UCS characters U+0000 to U+007F correspond to US-ASCII, and U+0000 to U+00FF correspond to ISO 8859-1 (Latin1).

ISO 10646 was originally designed to handle a 31-bit character set from U+00000000 to U+7FFFFFFF, but the current idea is that 21 bits will be sufficient for all future needs, giving characters up to U+10FFFF. The complete character set is sub-divided into planes. Plane 0, also known as the Basic Multilingual Plane (BMP), ranges from U+0000 to U+FFFFD and consists of the most commonly used characters from previous encoding standards. Other planes contain characters for specialist applications.

Todo FLTK 1.3 and later supports the full Unicode range (21 bits), but there are a few exceptions, for instance binary shortcut values in menus (Fl_Shortcut) can only be used with characters from the BMP (16 bits). This may be extended in a future FLTK version.

The UCS also defines various methods of encoding characters as a sequence of bytes. UCS-2 encodes Unicode characters into two bytes, which is wasteful if you are only dealing with ASCII or Latin1 text, and insufficient if you need characters above U+00FFFF. UCS-4 uses four bytes, which lets it handle higher characters, but this is even more wasteful for ASCII or Latin1.

UTF-8

The Unicode standard defines various UCS Transformation Formats (UTF). UTF-16 and UTF-32 are based on units of two and four bytes. UCS characters requiring more than 16 bits are encoded using "surrogate pairs" in UTF-16.

UTF-8 encodes all Unicode characters into variable length sequences of bytes. Unicode characters in the 7-bit ASCII range map to the same value and are represented as a single byte, making the transformation to Unicode quick and easy.

All UCS characters above U+007F are encoded as a sequence of several bytes. The top bits of the first byte are set to show the length of the byte sequence, and subsequent bytes are always in the range 0x80 to 0xBF. This combination provides some level of synchronisation and error detection.
17.2 Unicode in FLTK

**Todo**  Work through the code and this documentation to harmonize the [OksiD] and [fltk2] functions.

FLTK will be entirely converted to Unicode using UTF-8 encoding. If a different encoding is required by the underlying operating system, FLTK will convert the string as needed.

It is important to note that the initial implementation of Unicode and UTF-8 in FLTK involves three important areas:

- provision of Unicode character tables and some simple related functions;
- conversion of char∗ variables and function parameters from single byte per character representation to UTF-8 variable length sequences;
- modifications to the display font interface to accept general Unicode character or UCS code numbers instead of just ASCII or Latin1 characters.

The current implementation of Unicode / UTF-8 in FLTK will impose the following limitations:

- An implementation note in the [OksiD] code says that all functions are LIMITED to 24 bit Unicode values, but also says that only 16 bits are really used under linux and win32. [Can we verify this?]
- The [fltk2] fl_utf8encode() and fl_utf8decode() functions are designed to handle Unicode characters in the range U+000000 to U+10FFFF inclusive, which covers all UTF-16 characters, as specified in RFC 3629. Note that the user must first convert UTF-16 surrogate pairs to UCS.
- FLTK will only handle single characters, so composed characters consisting of a base character and floating accent characters will be treated as multiple characters.
- FLTK will only compare or sort strings on a byte by byte basis and not on a general Unicode character basis.
- FLTK will not handle right-to-left or bi-directional text.

**Todo**  Verify 16/24 bit Unicode limit for different character sets? OksiD’s code appears limited to 16-bit whereas the FLTK2 code appears to handle a wider set. What about illegal characters? See comments in fl_utf8fromwc() and fl_utf8toUtf16().

---

<table>
<thead>
<tr>
<th>Unicode range</th>
<th>Byte sequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>U+000000000 - U+0000007F</td>
<td>0xxxxxxx</td>
</tr>
<tr>
<td>U+00000080 - U+000007FF</td>
<td>110xxxxx 10xxxxxx</td>
</tr>
<tr>
<td>U+00000800 - U+0000FFFF</td>
<td>1110xxxx 10xxxxxx 10xxxxxx</td>
</tr>
<tr>
<td>U+00010000 - U+001FFFFF</td>
<td>11110xxx 10xxxxxx 10xxxxxx 10xxxxxx</td>
</tr>
<tr>
<td>U+00200000 - U+03FFFFFF</td>
<td>111100xx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx</td>
</tr>
<tr>
<td>U+04000000 - U+7FFFFFFF</td>
<td>1111110x 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx</td>
</tr>
</tbody>
</table>

**Note**

This table contains theoretical values outside the valid Unicode range (U+000000 - U+10FFFF). Such values can only be returned by conversion functions for illegal input values (see Illegal Unicode and UTF-8 Sequences).
17.3 Illegal Unicode and UTF-8 Sequences

Three pre-processor variables are defined in the source code [1] that determine how fl_utf8decode() handles illegal UTF-8 sequences:

- if ERRORS_TO_CP1252 is set to 1 (the default), fl_utf8decode() will assume that a byte sequence starting with a byte in the range 0x80 to 0x9f represents a Microsoft CP1252 character, and will return the value of an equivalent UCS character. Otherwise, it will be processed as an illegal byte value as described below.

- if STRICT_RFC3629 is set to 1 (not the default!) then UTF-8 sequences that correspond to illegal UCS values are treated as errors. Illegal UCS values include those above U+10FFFF, or corresponding to UTF-16 surrogate pairs. Illegal byte values are handled as described below.

- if ERRORS_TO_ISO8859_1 is set to 1 (the default), the illegal byte value is returned unchanged, otherwise 0xFFFD, the Unicode REPLACEMENT CHARACTER, is returned instead.

[1] Since FLTK 1.3.4 you may set these three pre-processor variables on your compile command line with -D"variable=value" (value: 0 or 1) to avoid editing the source code.

fl_utf8encode() is less strict, and only generates the UTF-8 sequence for 0xFFFD, the Unicode REPLACEMENT CHARACTER, if it is asked to encode a UCS value above U+10FFFF.

Many of the [fltk2] functions below use fl_utf8decode() and fl_utf8encode() in their own implementation, and are therefore somewhat protected from bad UTF-8 sequences.

The [OksiD] fl_utf8len() function assumes that the byte it is passed is the first byte in a UTF-8 sequence, and returns the length of the sequence. Trailing bytes in a UTF-8 sequence will return -1.

- **WARNING:** fl_utf8len() can not distinguish between single bytes representing Microsoft CP1252 characters 0x80-0x9f and those forming part of a valid UTF-8 sequence. You are strongly advised not to use fl_utf8len() in your own code unless you know that the byte sequence contains only valid UTF-8 sequences.

- **WARNING:** Some of the [OksiD] functions below still use fl_utf8len() in their implementations. These may need further validation.

Please see the individual function description for further details about error handling and return values.

17.4 FLTK Unicode and UTF-8 Functions

This section provides a brief overview of the functions. For more details, consult the main text for each function via its link.

int fl_utf8locale() FLTK2

fl_utf8locale() returns true if the "locale" seems to indicate that UTF-8 encoding is used.
It is highly recommended that you change your system so this does return true!

```c
int fl_utf8test(const char *src, unsigned len) FLTK2
```

`fl_utf8test()` examines the first `len` bytes of `src`. It returns 0 if there are any illegal UTF-8 sequences; 1 if `src` contains plain ASCII or if `len` is zero; or 2, 3 or 4 to indicate the range of Unicode characters found.

```c
int fl_utf_nb_char(const unsigned char *buf, int len) OksiD
```

Returns the number of UTF-8 characters in the first `len` bytes of `buf`.

```c
int fl_unichar_to_utf8_size(Fl_Unichar) FLTK2
int fl_utf8bytes(unsigned ucs) FLTK2
```

Returns the number of bytes needed to encode `ucs` in UTF-8.

```c
int fl_utf8len(char c) OksiD
```

If `c` is a valid first byte of a UTF-8 encoded character sequence, `fl_utf8len()` will return the number of bytes in that sequence. It returns -1 if `c` is not a valid first byte.

```c
unsigned int fl_nonspacing(unsigned int ucs) OksiD
```

Returns true if `ucs` is a non-spacing character.

```c
const char* fl_utf8back(const char *p, const char *start, const char *end) FLTK2
const char* fl_utf8fwd(const char *p, const char *start, const char *end) FLTK2
```

If `p` already points to the start of a UTF-8 character sequence, these functions will return `p`. Otherwise `fl_←utf8back()` searches backwards from `p` and `fl_utf8fwd()` searches forwards from `p`, within the `start` and `end` limits, looking for the start of a UTF-8 character.

```c
unsigned int fl_utf8decode(const char *p, const char *end, int *len) FLTK2
int fl_utf8encode(unsigned ucs, char *buf) FLTK2
```

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**fl_utf8decode()** attempts to decode the UTF-8 character that starts at `p` and may not extend past `end`. It returns the Unicode value, and the length of the UTF-8 character sequence is returned via the `len` argument.

**fl_utf8encode()** writes the UTF-8 encoding of `ucs` into `buf` and returns the number of bytes in the sequence. See the main documentation for the treatment of illegal Unicode and UTF-8 sequences.

```c
unsigned int fl_utf8froma(char *dst, unsigned dstlen, const char *src, unsigned srclen) FLTK2
unsigned int fl_utf8toa(const char *src, unsigned srclen, char *dst, unsigned dstlen) FLTK2
```

**fl_utf8froma()** converts a character string containing single bytes per character (i.e. ASCII or ISO-8859-1) into UTF-8. If the `src` string contains only ASCII characters, the return value will be the same as `srclen`.

**fl_utf8toa()** converts a string containing UTF-8 characters into single byte characters. UTF-8 characters that do not correspond to ASCII or ISO-8859-1 characters below 0xFF are replaced with '?'.

Both functions return the number of bytes that would be written, not counting the null terminator. `dstlen` provides a means of limiting the number of bytes written, so setting `dstlen` to zero is a means of measuring how much storage would be needed before doing the real conversion.

```c
char* fl_utf2mbcs(const char *src) OksiD
```

converts a UTF-8 string to a local multi-byte character string. [More info required here!]

```c
unsigned int fl_utf8fromwc(char *dst, unsigned dstlen, const wchar_t *src, unsigned srclen) FLTK2
unsigned int fl_utf8towc(const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen) FLTK2
unsigned int fl_utf8toUtf16(const char *src, unsigned srclen, unsigned short *dst, unsigned dstlen) FLTK2
```

These routines convert between UTF-8 and `wchar_t` or "wide character" strings. The difficulty lies in the fact that `sizeof(wchar_t)` is 2 on Windows and 4 on Linux and most other systems. Therefore some "wide characters" on Windows may be represented as "surrogate pairs" of more than one `wchar_t`.

**fl_utf8fromwc()** converts from a "wide character" string to UTF-8. Note that `srclen` is the number of `wchar_t` elements in the source string and on Windows this might be larger than the number of characters. `dstlen` specifies the maximum number of bytes to copy, including the null terminator.

**fl_utf8towc()** converts a UTF-8 string into a "wide character" string. Note that on Windows, some "wide characters" might result in "surrogate pairs" and therefore the return value might be more than the number of characters. `dstlen` specifies the maximum number of `wchar_t` elements to copy, including a zero terminating element. [Is this all worded correctly?]
fl_utf8toUtf16() converts a UTF-8 string into a "wide character" string using UTF-16 encoding to handle the "surrogate pairs" on Windows. dstlen specifies the maximum number of wchar_t elements to copy, including a zero terminating element. [Is this all worded correctly?]

These routines all return the number of elements that would be required for a full conversion of the src string, including the zero terminator. Therefore setting dstlen to zero is a way of measuring how much storage would be needed before doing the real conversion.

unsigned int fl_utf8from_mb(char ∗dst, unsigned dstlen, const char ∗src, unsigned srclen) FLTK2
unsigned int fl_utf8to_mb(const char ∗src, unsigned srclen, char ∗dst, unsigned dstlen) FLTK2

These functions convert between UTF-8 and the locale-specific multi-byte encodings used on some systems for filenames, etc. If fl_utf8locale() returns true, these functions don't do anything useful. [Is this all worded correctly?]

int fl_tolower(unsigned int ucs) OksiD
int fl_toupper(unsigned int ucs) OksiD
int fl_utf_tolower(const unsigned char ∗str, int len, char ∗buf) OksiD
int fl_utf_toupper(const unsigned char ∗str, int len, char ∗buf) OksiD

fl_tolower() and fl_toupper() convert a single Unicode character from upper to lower case, and vice versa. fl_utf_tolower() and fl_utf_toupper() convert a string of bytes, some of which may be multi-byte UTF-8 encodings of Unicode characters, from upper to lower case, and vice versa.

Warning: to be safe, buf length must be at least 3*len [for 16-bit Unicode]

int fl_utf_strcasecmp(const char ∗s1, const char ∗s2) OksiD
int fl_utf_strncasecmp(const char ∗s1, const char ∗s2, int n) OksiD

fl_utf_strcasecmp() is a UTF-8 aware string comparison function that converts the strings to lower case Unicode as part of the comparison. flt_utf_strncasecmp() only compares the first n characters [bytes?]
17.5 FLTK Unicode Versions of System Calls

- int fl_access(const char * f, int mode) OksiD
- int fl_chmod(const char * f, int mode) OksiD
- int fl_execvp(const char * file, char ** argv) OksiD
- FILE * fl_fopen(const char * f, const char * mode) OksiD
- char * fl_getcwd(char * buf, int maxlen) OksiD
- char * fl_getenv(const char * name) OksiD
- char * fl_make_path(const char * path) - returns char ? OksiD
- void fl_make_path_for_file(const char * path) OksiD
- int fl_mkdir(const char * f, int mode) OksiD
- int fl_open(const char * f, int o, ...) OksiD
- int fl_rename(const char * f, const char * t) OksiD
- int fl_rmdir(const char * f) OksiD
- int fl_stat(const char * path, struct stat * buffer) OksiD
- int fl_system(const char * f) OksiD
- int fl_unlink(const char * f) OksiD

TODO:

- more doc on unicode, add links
- write something about filename encoding on OS X...
- explain the fl_utf8... commands
- explain issues with Fl_Preferences
Chapter 18

Constants and Enumerations

Note
This file is not actively maintained any more, but is left here as a reference, until the doxygen documentation is completed.

See also
FL/Enumerations.H.

This appendix lists the enumerations provided in the `<FL/Enumerations.H>` header file, organized by section. Constants whose value are zero are marked with "(0)", this is often useful to know when programming.

18.1 Version Numbers

The FLTK version number is stored in a number of compile-time constants:

- FL_MAJOR_VERSION - The major release number, currently 1
- FL_MINOR_VERSION - The minor release number, currently 4
- FL_PATCH_VERSION - The patch release number, currently 0
- FL_VERSION - [Deprecated] A combined floating-point version number for the major, minor, and patch release numbers, currently 1.0400
- FL_API_VERSION - A combined integer version number for the major, minor, and patch release numbers, currently 10400 (use this instead of FL_VERSION, if possible)
- FL_ABI_VERSION - A combined integer version number for the application binary interface (ABI) major, minor, and patch release numbers, currently 10400 (default)

Note
The ABI version (FL_ABI_VERSION) is usually constant throughout one major/minor release version, for instance 10300 if FL_API_VERSION is 10304. Hence the ABI is constant if only the patch version is changed. You can change this with configure or CMake though if you want the latest enhancements (called "ABI features", see CHANGES).
18.2 Events

Events are identified by an Fl_Event enumeration value. The following events are currently defined:

- FL_NO_EVENT - No event (or an event ftik does not understand) occurred (0).
- FL_PUSH - A mouse button was pushed.
- FL_RELEASE - A mouse button was released.
- FL_ENTER - The mouse pointer entered a widget.
- FL_LEAVE - The mouse pointer left a widget.
- FL_DRAG - The mouse pointer was moved with a button pressed.
- FL_FOCUS - A widget should receive keyboard focus.
- FL_UNFOCUS - A widget loses keyboard focus.
- FL_KEYBOARD - A key was pressed.
- FL_CLOSE - A window was closed.
- FL_MOVE - The mouse pointer was moved with no buttons pressed.
- FL_SHORTCUT - The user pressed a shortcut key.
- FL_DEACTIVATE - The widget has been deactivated.
- FL_ACTIVATE - The widget has been activated.
- FL_HIDE - The widget has been hidden.
- FL_SHOW - The widget has been shown.
- FL_PASTE - The widget should paste the contents of the clipboard.
- FL_SELECTIONCLEAR - The widget should clear any selections made for the clipboard.
- FL_MOUSEWHEEL - The horizontal or vertical mousewheel was turned.
- FL_DND_ENTER - The mouse pointer entered a widget dragging data.
- FL_DND_DRAG - The mouse pointer was moved dragging data.
- FL_DND_LEAVE - The mouse pointer left a widget still dragging data.
- FL_DND_RELEASE - Dragged data is about to be dropped.
- FL_SCREEN_CONFIGURATION_CHANGED - The screen configuration (number, positions) was changed.
- FL_FULLSCREEN - The fullscreen state of the window has changed.
18.3 Callback "When" Conditions

The following constants determine when a callback is performed:

- FL_WHEN_NEVER - Never call the callback (0).
- FL_WHEN_CHANGED - Do the callback only when the widget value changes.
- FL_WHEN_NOT_CHANGED - Do the callback whenever the user interacts with the widget.
- FL_WHEN_RELEASE - Do the callback when the button or key is released and the value changes.
- FL_WHEN_ENTER_KEY - Do the callback when the user presses the ENTER key and the value changes.
- FL_WHEN_RELEASE_ALWAYS - Do the callback when the button or key is released, even if the value doesn't change.
- FL_WHEN_ENTER_KEY_ALWAYS - Do the callback when the user presses the ENTER key, even if the value doesn't change.

18.4 Fl::event_button() Values

The following constants define the button numbers for FL_PUSH and FL_RELEASE events:

- FL_LEFT_MOUSE - the left mouse button
- FL_MIDDLE_MOUSE - the middle mouse button
- FL_RIGHT_MOUSE - the right mouse button

18.5 Fl::event_key() Values

The following constants define the non-ASCII keys on the keyboard for FL_KEYBOARD and FL_SHORTCUT events:

- FL_Button - A mouse button; use Fl_Button + n for mouse button n.
- FL_BackSpace - The backspace key.
- FL_Tab - The tab key.
- FL_Enter - The enter key.
- FL_Pause - The pause key.
- FL_Scroll_Lock - The scroll lock key.
- FL_Escape - The escape key.
- FL_Home - The home key.
- FL_Left - The left arrow key.
- FL_Up - The up arrow key.
- FL_Right - The right arrow key.
- FL_Down - The down arrow key.
- FL_Page_Up - The page-up key.
- FL_Page_Down - The page-down key.
- FL_End - The end key.
- FL_Print - The print (or print-screen) key.
- FL_Insert - The insert key.
- FL_Menu - The menu key.
- FL_Num_Lock - The num lock key.
- FL_KP - One of the keypad numbers or keys; use FL_KP + 'n' for number n and, say, FL_KP + '∗'.
- FL_KP_Enter - The enter key on the keypad.
- FL_F - One of the function keys; use FL_F + n for function key n.
- FL_Shift_L - The lefthand shift key.
- FL_Shift_R - The righthand shift key.
- FL_Control_L - The lefthand control key.
- FL_Control_R - The righthand control key.
- FL_Caps_Lock - The caps lock key.
- FL_Meta_L - The left meta/Windows key.
- FL_Meta_R - The right meta/Windows key.
- FL_Alt_L - The left alt key.
- FL_Alt_R - The right alt key.
- FL_Delete - The delete key.

### 18.6 Fl::event_state() Values

The following constants define bits in the Fl::event_state() value:

- FL_SHIFT - One of the shift keys is down.
- FL_CAPS_LOCK - The caps lock is on.
- FL_CTRL - One of the ctrl keys is down.
- FL_ALT - One of the alt keys is down.
- FL_NUM_LOCK - The num lock is on.
- FL_META - One of the meta/Windows keys is down.
- FL_COMMAND - An alias for FL_CTRL on Windows, X11 and Wayland, or FL_META on MacOS X.
- FL_CONTROL - An alias for FL_META on Windows, X11 and Wayland, or FL_CTRL on MacOS X.
- FL_SCROLL_LOCK - The scroll lock is on.
- FL_BUTTON1 - Mouse button 1 is pushed.
- FL_BUTTON2 - Mouse button 2 is pushed.
- FL_BUTTON3 - Mouse button 3 is pushed.
- FL_BUTTONS - Any mouse button is pushed.
- FL_BUTTON(n) - Mouse button n (where n > 0) is pushed.
18.7 Alignment Values

The following constants define bits that can be used with Fl_Widget::align() to control the positioning of the label:

- FL_ALIGN_CENTER - The label is centered (0).
- FL_ALIGN_TOP - The label is top-aligned.
- FL_ALIGN_BOTTOM - The label is bottom-aligned.
- FL_ALIGN_LEFT - The label is left-aligned.
- FL_ALIGN_RIGHT - The label is right-aligned.
- FL_ALIGN_CLIP - The label is clipped to the widget.
- FL_ALIGN_WRAP - The label text is wrapped as needed.
- FL_ALIGN_TOP_LEFT - The label appears at the top of the widget, aligned to the left.
- FL_ALIGN_TOP_RIGHT - The label appears at the top of the widget, aligned to the right.
- FL_ALIGN_BOTTOM_LEFT - The label appears at the bottom of the widget, aligned to the left.
- FL_ALIGN_BOTTOM_RIGHT - The label appears at the bottom of the widget, aligned to the right.
- FL_ALIGN_LEFT_TOP - The label appears to the left of the widget, aligned at the top. Outside labels only.
- FL_ALIGN_RIGHT_TOP - The label appears to the right of the widget, aligned at the top. Outside labels only.
- FL_ALIGN_LEFT_BOTTOM - The label appears to the left of the widget, aligned at the bottom. Outside labels only.
- FL_ALIGN_RIGHT_BOTTOM - The label appears to the right of the widget, aligned at the bottom. Outside labels only.
- FL_ALIGN_INSIDE - 'or' this with other values to put label inside the widget.
- FL_ALIGN_TEXT_OVER_IMAGE - Label text will appear above the image.
- FL_ALIGN_IMAGE_OVER_TEXT - Label text will be below the image.
- FL_ALIGN_IMAGE_NEXT_TO_TEXT - The image will appear to the left of the text.
- FL_ALIGN_TEXT_NEXT_TO_IMAGE - The image will appear to the right of the text.
- FL_ALIGN_IMAGE_BACKDROP - The image will be used as a background for the widget.

18.8 Fonts

The following constants define the standard FLTK fonts:

- FL_HELVETICA - Helvetica (or Arial) normal (0).
- FL_HELVETICA_BOLD - Helvetica (or Arial) bold.
- FL_HELVETICA_ITALIC - Helvetica (or Arial) oblique.
- FL_HELVETICA_BOLD_ITALIC - Helvetica (or Arial) bold-oblique.
- FL_COURIER - Courier normal.
• FL_COURIER_BOLD - Courier bold.
• FL_COURIER_ITALIC - Courier italic.
• FL_COURIER_BOLD_ITALIC - Courier bold-italic.
• FL_TIMES - Times roman.
• FL_TIMES_BOLD - Times bold.
• FL_TIMES_ITALIC - Times italic.
• FL_TIMES_BOLD_ITALIC - Times bold-italic.
• FL_SYMBOL - Standard symbol font.
• FL_SCREEN - Default monospaced screen font.
• FL_SCREEN_BOLD - Default monospaced bold screen font.
• FL_ZAPF_DINGBATS - Zapf-dingbats font.

18.9 Colors

The Fl_Color enumeration type holds a FLTK color value. Colors are either 8-bit indexes into a virtual colormap or 24-bit RGB color values. Color indices occupy the lower 8 bits of the value, while RGB colors occupy the upper 24 bits, for a byte organization of RGBA.

18.9.1 Color Constants

Constants are defined for the user-defined foreground and background colors, as well as specific colors and the start of the grayscale ramp and color cube in the virtual colormap. Inline functions are provided to retrieve specific grayscale, color cube, or RGB color values.

The following color constants can be used to access the user-defined colors:

• FL_BACKGROUND_COLOR - the default background color
• FL_BACKGROUND2_COLOR - the default background color for text, list, and valuator widgets
• FL_FOREGROUND_COLOR - the default foreground color (0) used for labels and text
• FL_INACTIVE_COLOR - the inactive foreground color
• FL_SELECTION_COLOR - the default selection/highlight color

The following color constants can be used to access the colors from the FLTK standard color cube:

• FL_BLACK
• FL_BLUE
• FL_CYAN
• FL_DARK_BLUE
• FL_DARK_CYAN
The following are named values within the standard grayscale:

- FL_GRAY0
- FL_DARK3
- FL_DARK2
- FL_DARK1
- FL_LIGHT1
- FL_LIGHT2
- FL_LIGHT3

The inline methods for getting a grayscale, color cube, or RGB color value are described in the Colors section of the Drawing Things in FLTK chapter.

### 18.10 Cursors

The following constants define the mouse cursors that are available in FLTK. The double-headed arrows are bitmaps provided by FLTK on X, the others are provided by system-defined cursors.

- FL_CURSOR_DEFAULT - the default cursor, usually an arrow (0)
- FL_CURSOR_ARROW - an arrow pointer
- FL_CURSOR_CROSS - crosshair
- FL_CURSOR_WAIT - watch or hourglass
- FL_CURSOR_INSERT - I-beam
- FL_CURSOR_HAND - hand (uparrow on Windows)
- FL_CURSOR_HELP - question mark
- FL_CURSOR_MOVE - 4-pointed arrow
- FL_CURSOR_NS - up/down arrow
- FL_CURSOR_WE - left/right arrow
- FL_CURSOR_NWSE - diagonal arrow
- FL_CURSOR_NESW - diagonal arrow
- FL_CURSOR_NONE - invisible
18.11 FD "When" Conditions

- FL_READ - Call the callback when there is data to be read.
- FL_WRITE - Call the callback when data can be written without blocking.
- FL_EXCEPT - Call the callback if an exception occurs on the file.

18.12 Damage Masks

The following damage mask bits are used by the standard FLTK widgets:

- FL_DAMAGE_CHILD - A child needs to be redrawn.
- FL_DAMAGE_EXPOSE - The window was exposed.
- FL_DAMAGE_SCROLL - The Fl_Scroll widget was scrolled.
- FL_DAMAGE_OVERLAY - The overlay planes need to be redrawn.
- FL_DAMAGE_USER1 - First user-defined damage bit.
- FL_DAMAGE_USER2 - Second user-defined damage bit.
- FL_DAMAGE_ALL - Everything needs to be redrawn.
Chapter 19

GLUT Compatibility

This appendix describes the GLUT compatibility header file supplied with FLTK.

FLTK’s GLUT compatibility is based on the original GLUT 3.7 and the follow-on FreeGLUT 2.4.0 libraries.

19.1 Using the GLUT Compatibility Header File

You should be able to compile existing GLUT source code by including `<FL/glut.H>` instead of `<GL/glut.h>`. This can be done by editing the source, by changing the `-I` switches to the compiler, or by providing a symbolic link from `GL/glut.h` to `FL/glut.H`.

All files calling GLUT procedures must be compiled with C++. You may have to alter them slightly to get them to compile without warnings, and you may have to rename them to get make to use the C++ compiler.

You must link with the FLTK library. Most of `FL/glut.H` is inline functions. You should take a look at it (and maybe at `test/glpuzzle.cxx` in the FLTK source) if you are having trouble porting your GLUT program.

This has been tested with most of the demo programs that come with the GLUT and FreeGLUT distributions.

19.2 Known Problems

The following functions and/or arguments to functions are missing, and you will have to replace them or comment them out for your code to compile:

- `glutGet (GLUT_ELAPSED_TIME)`
- `glutGet (GLUT_SCREEN_HEIGHT_MM)`
- `glutGet (GLUT_SCREEN_WIDTH_MM)`
- `glutGet (GLUT_WINDOW_NUM_CHILDREN)`
- `glutInitDisplayMode (GLUT_LUMINANCE)`
- `glutKeyboardUpFunc (void (*callback)(unsigned char key, int x, int y))`
- `glutLayerGet (GLUT_HAS_OVERLAY)`
• `glutLayerGet(GLUT_LAYER_IN_USE)`
• `glutPushWindow()`
• `glutSetColor(), glutGetColor(), glutCopyColormap()`
• `glutVideoResize() missing.`
• `glutWarpPointer()`
• `glutWindowStatusFunc()`
• Spaceball, buttonbox, dials, and tablet functions

Most of the symbols/enumations have different values than GLUT uses. This will break code that relies on the actual values. The only symbols guaranteed to have the same values are true/false pairs like GLUT_DOWN and GLUT_UP, mouse buttons GLUT_LEFT_BUTTON, GLUT_MIDDLE_BUTTON, GLUT_RIGHT_BUTTON, and GLUT_KEY_F1 thru GLUT_KEY_F12.

The strings passed as menu labels are not copied.

`glutPostRedisplay()` does not work if called from inside a display function. You must use `glutIdle()` if you want your display to update continuously.

`glutSwapBuffers()` does not work from inside a display function. This is on purpose, because FLTK swaps the buffers for you.

`glutUseLayer()` does not work well, and should only be used to initialize transformations inside a resize callback. You should redraw overlays by using `glutOverlayDisplayFunc()`.

Overlays are cleared before the overlay display function is called. `glutLayerGet(GLUT_OVERLAY_DAMAGED)` always returns true for compatibility with some GLUT overlay programs. You must rewrite your code so that `gl_color()` is used to choose colors in an overlay, or you will get random overlay colors.

`glutSetCursor(GLUT_CURSOR_FULL_CROSSHAIR)` just results in a small crosshair.

The fonts used by `glutBitmapCharacter()` and `glutBitmapWidth()` may be different.

`glutInit(argc, argv)` will consume different switches than GLUT does. It accepts the switches recognized by `Fl::args()`, and will accept any abbreviation of these switches (such as `-di` for `--display`).

### 19.3 Mixing GLUT and FLTK Code

You can make your GLUT window a child of a `Fl_Winodw` with the following scheme. The biggest trick is that GLUT insists on a call to `show()` the window at the point it is created, which means the `Fl_Winodw` parent window must already be shown.

• Don’t call `glutInit()`.
• Create your `Fl_Winodw`, and any FLTK widgets. Leave a blank area in the window for your GLUT window.
• `show()` the `Fl_Winodw`. Perhaps call `show(argc, argv)`.
• Call `window->begin()` so that the GLUT window will be automatically added to it.
• Use `glutInitWindowSize()` and `glutInitWindowPosition()` to set the location in the parent window to put the GLUT window.
• Put your GLUT code next. It probably does not need many changes. Call `window->end()` immediately after the `glutCreateWindow()`!
• You can call either `glutMainLoop()`, `Fl::run()`, or loop calling `Fl::wait()` to run the program.
19.4 class Fl_Glut_Window

19.4.1 Class Hierarchy

Fl_Gl_Window
    +----Fl_Glut_Window

19.4.2 Include Files

#include <FL/glut.H>

19.4.3 Description

Each GLUT window is an instance of this class. You may find it useful to manipulate instances directly rather than use GLUT window id's. These may be created without opening the display, and thus can fit better into FLTK's method of creating windows.

The current GLUT window is available in the global variable glut_window.

new Fl_Glut_Window(...) is the same as glutCreateWindow() except it does not show() the window or make the window current.

window->make_current() is the same as glutSetWindow(number). If the window has not had show() called on it yet, some functions that assume an OpenGL context will not work. If you do show() the window, call make_current() again to set the context.

~Fl_Glut_Window() is the same as glutDestroyWindow().

19.4.4 Members

The Fl_Glut_Window class contains several public members that can be altered directly:

<table>
<thead>
<tr>
<th>member</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>display</td>
<td>A pointer to the function to call to draw the normal planes.</td>
</tr>
<tr>
<td>entry</td>
<td>A pointer to the function to call when the mouse moves into or out of the window.</td>
</tr>
<tr>
<td>keyboard</td>
<td>A pointer to the function to call when a regular key is pressed.</td>
</tr>
<tr>
<td>menu[3]</td>
<td>The menu to post when one of the mouse buttons is pressed.</td>
</tr>
<tr>
<td>mouse</td>
<td>A pointer to the function to call when a button is pressed or released.</td>
</tr>
<tr>
<td>motion</td>
<td>A pointer to the function to call when the mouse is moved with a button down.</td>
</tr>
<tr>
<td>overlaydisplay</td>
<td>A pointer to the function to call to draw the overlay planes.</td>
</tr>
<tr>
<td>passivemotion</td>
<td>A pointer to the function to call when the mouse is moved with no buttons down.</td>
</tr>
<tr>
<td>reshape</td>
<td>A pointer to the function to call when the window is resized.</td>
</tr>
<tr>
<td>special</td>
<td>A pointer to the function to call when a special key is pressed.</td>
</tr>
<tr>
<td>visibility</td>
<td>A pointer to the function to call when the window is iconified or restored (made visible.)</td>
</tr>
</tbody>
</table>
19.4.5 Methods

Fl_Glut_Window::Fl_Glut_Window(int x, int y, int w, int h, const char ∗title = 0)

Fl_Glut_Window::Fl_Glut_Window(int w, int h, const char ∗title = 0)

The first constructor takes 4 int arguments to create the window with a preset position and size. The second constructor with 2 arguments will create the window with a preset size, but the window manager will choose the position according to its own whims.

virtual Fl_Glut_Window::~Fl_Glut_Window()  

Destroys the GLUT window.

void Fl_Glut_Window::make_current()

Switches all drawing functions to the GLUT window.
Chapter 20

Forms Compatibility

This appendix describes the Forms compatibility included with FLTK.

**Warning:** The Forms compatibility is deprecated and no longer maintained since FLTK 1.3.0 and is likely to be removed completely in FLTK 1.4 or 1.5

### 20.1 Importing Forms Layout Files

FLUID can read the .fd files put out by all versions of Forms and XForms fdesign. However, it will mangle them a bit, but it prints a warning message about anything it does not understand. FLUID cannot write fdesign files, so you should save to a new name so you don't write over the old one.

You will need to edit your main code considerably to get it to link with the output from FLUID. If you are not interested in this you may have more immediate luck with the forms compatibility header, `<FL/forms.H>`.

### 20.2 Using the Compatibility Header File

You should be able to compile existing Forms or XForms source code by changing the include directory switch to your compiler so that the forms.h file supplied with FLTK is included. The forms.h file simply pulls in `<FL/forms.H>` so you don't need to change your source code. Take a look at `<FL/forms.H>` to see how it works, but the basic trick is lots of inline functions. Most of the XForms demo programs work without changes.

You will also have to compile your Forms or XForms program using a C++ compiler. The FLTK library does not provide C bindings or header files.

Although FLTK was designed to be compatible with the GL Forms library (version 0.3 or so), XForms has bloated severely and its interface is X-specific. Therefore, XForms compatibility is no longer a goal of FLTK. Compatibility was limited to things that were free, or that would add code that would not be linked in if the feature is unused, or that was not X-specific.

To use any new features of FLTK, you should rewrite your code to not use the inline functions and instead use "pure" FLTK. This will make it a lot cleaner and make it easier to figure out how to call the FLTK functions. Unfortunately this conversion is harder than expected and even Digital Domain's inhouse code still uses forms.h a lot.
20.3 Problems You Will Encounter

Many parts of XForms use X-specific structures like XEvent in their interface. I did not emulate these! Unfortunately these features (such as the "canvas" widget) are needed by most large programs. You will need to rewrite these to use FLTK subclasses.

Fl_Free widgets emulate the old Forms "free" widget. It may be useful for porting programs that change the handle() function on widgets, but you will still need to rewrite things.

Fl_Timer widgets are provided to emulate the XForms timer. These work, but are quite inefficient and inaccurate compared to using Fl::add_timeout().

All instance variables are hidden. If you directly refer to the x, y, w, h, label, or other fields of your Forms widgets you will have to add empty parenthesis after each reference. The easiest way to do this is to globally replace "->x" with "->x()", etc. Replace "boxtype" with "box()".

const char * arguments to most FLTK methods are simply stored, while Forms would strdup() the passed string. This is most noticeable with the label of widgets. Your program must always pass static data such as a string constant or malloc'd buffer to label(). If you are using labels to display program output you may want to try the Fl_Output widget.

The default fonts and sizes are matched to the older GL version of Forms, so all labels will draw somewhat larger than an XForms program does.

fdesign outputs a setting of a "fdui" instance variable to the main window. I did not emulate this because I wanted all instance variables to be hidden. You can store the same information in the user_data() field of a window. To do this, search through the fdesign output for all occurrences of "->fdui" and edit to use "->user_data()" instead. This will require casts and is not trivial.

The prototype for the functions passed to fl_add_timeout() and fl_set_idle_callback() callback are different.

All the following XForms calls are missing:

- FL_REVISION, fl_library_version()
- FL_RETURN_DBLCLICK (use Fl::event_clicks())
- fl_add_signal_callback()
- fl_set_form_atactivate() fl_set_form_atdeactivate()
- fl_set_form_property()
- fl_set_app_mainform(), fl_get_app_mainform()
- fl_set_form_minsize(), fl_set_form_maxsize()
- fl_set_form_event_cmask(), fl_get_form_event_cmask()
- fl_set_form_dblbuffer(), fl_set_object_dblbuffer() (use an Fl_Double_Window instead)
- fl_adjust_form_size()
- fl_register_raw_callback()
- fl_set_object_bw(), fl_set_border_width()
- fl_set_object_resize(), fl_set_object_gravity()
- fl_set_objectShortcutkey()
20.4 Additional Notes

These notes were written for porting programs written with the older IRISGL version of Forms. Most of these problems are the same ones encountered when going from old Forms to XForms:

Does Not Run In Background

The IRISGL library always forked when you created the first window, unless "foreground()" was called. FLTK acts like "foreground()" is called all the time. If you really want the fork behavior do "if (fork()) exit(0)" right at the start of your program.
You Cannot Use IRISGL Windows or fl_queue

If a Forms (not XForms) program if you wanted your own window for displaying things you would create a IRISGL window and draw in it, periodically calling Forms to check if the user hit buttons on the panels. If the user did things to the IRISGL window, you would find this out by having the value FL_EVENT returned from the call to Forms.

None of this works with FLTK. Nor will it compile, the necessary calls are not in the interface.

You have to make a subclass of Fl_Gl_Window and write a draw() method and handle() method. This may require anywhere from a trivial to a major rewrite.

If you draw into the overlay planes you will have to also write a draw_overlay() method and call redraw_overlay() on the OpenGL window.

One easy way to hack your program so it works is to make the draw() and handle() methods on your window set some static variables, storing what event happened. Then in the main loop of your program, call Fl::wait() and then check these variables, acting on them as though they are events read from fl_queue.

You Must Use OpenGL to Draw Everything

The file <FL/gl.h> defines replacements for a lot of IRISGL calls, translating them to OpenGL. There are much better translators available that you might want to investigate.

You Cannot Make Forms Subclasses

Programs that call fl_make_object or directly setting the handle routine will not compile. You have to rewrite them to use a subclass of Fl_Widget. It is important to note that the handle() method is not exactly the same as the handle() function of Forms. Where a Forms handle() returned non-zero, your handle() must call do_callback(). And your handle() must return non-zero if it "understood" the event.

An attempt has been made to emulate the "free" widget. This appears to work quite well. It may be quicker to modify your subclass into a "free" widget, since the "handle" functions match.

If your subclass draws into the overlay you are in trouble and will have to rewrite things a lot.

You Cannot Use <device.h>

If you have written your own "free" widgets you will probably get a lot of errors about "getvaluator". You should substitute:

<table>
<thead>
<tr>
<th>Forms</th>
<th>FLTK</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOUSE_X</td>
<td>Fl::event_x_root()</td>
</tr>
<tr>
<td>MOUSE_Y</td>
<td>Fl::event_y_root()</td>
</tr>
<tr>
<td>LEFTSHIFTKEY,RIGHTSHIFTKEY</td>
<td>Fl::event_shift()</td>
</tr>
<tr>
<td>CAPSLOCKKEY</td>
<td>Fl::event_capslock()</td>
</tr>
<tr>
<td>LEFTCTRLKEY,RIGHTCTRLKEY</td>
<td>Fl::event_ctrl()</td>
</tr>
<tr>
<td>LEFTALTKEY,RIGHTALTKEY</td>
<td>Fl::event_alt()</td>
</tr>
<tr>
<td>MOUSE1,RIGHTMOUSE</td>
<td>Fl::event_state()</td>
</tr>
<tr>
<td>MOUSE2,MIDDLEMOUSE</td>
<td>Fl::event_state()</td>
</tr>
<tr>
<td>MOUSE3,LEFTMOUSE</td>
<td>Fl::event_state()</td>
</tr>
</tbody>
</table>
Anything else in getvaluator and you are on your own...

Font Numbers Are Different

The "style" numbers have been changed because I wanted to insert bold-italic versions of the normal fonts. If you use Times, Courier, or Bookman to display any text you will get a different font out of FLTK. If you are really desperate to fix this use the following code:

```c
fl_font_name(3,"*courier-medium-r-no*");
fl_font_name(4,"*courier-bold-r-no*");
fl_font_name(5,"*courier-medium-o-no*");
fl_font_name(6,"*times-medium-r-no*");
fl_font_name(7,"*times-bold-r-no*");
fl_font_name(8,"*times-medium-i-no*");
fl_font_name(9,"*bookman-light-r-no*");
fl_font_name(10,"*bookman-demi-r-no*");
fl_font_name(11,"*bookman-light-i-no*");
```
Chapter 21

Operating System Issues

This appendix describes the operating system specific interfaces in FLTK:

- Accessing the OS Interfaces
- The Wayland/X11 hybrid library
- The UNIX (X11) Interface
- The Windows Interface
- The Apple OS X Interface
- The Wayland Interface

21.1 Accessing the OS Interfaces

All programs that need to access the operating system specific interfaces must include the following header file:
```
#include <FL/platform.H>
```

This header file will define the appropriate interface for your environment. The pages that follow describe the functionality that is provided for each operating system.

Note

These definitions used to be in FL/x.H up to FLTK 1.3.x. Usage of FL/x.H is deprecated since FLTK 1.4.0. You should replace all references of FL/x.H with FL/platform.H if your target is FLTK 1.4 or later. FL/x.H will be retained for backwards compatibility for some releases but will be removed in a later (not yet specified) FLTK release.

**WARNING:**
The interfaces provided by this header file may change radically in new FLTK releases. Use them only when an existing generic FLTK interface is not sufficient.
21.2 The Wayland/X11 hybrid library

By default, the FLTK library is, under Linux and Unix, a Wayland/X11 hybrid which can run FLTK-based apps as Wayland clients or as X11 clients. The choice between running an app as a Wayland or an X11 client is done as follows, when the app runs function *fl_open_display()* (that function can be called explicitly by the app or implicitly by FLTK, for example the first time an Fl_Window is show()'n):

- if the app contains a global boolean variable named *fl_disable_wayland* and this variable is true, X11 is used;
- if environment variable FLTK_BACKEND is not defined, Wayland is used if a Wayland compositor is available, otherwise X11 is used;
- if $FLTK_BACKEND equals "wayland", the library makes the app a Wayland client, and stops with error if no Wayland compositor is available;
- if $FLTK_BACKEND equals "x11", the library makes the app an X11 client even if a Wayland compositor is available.

The first condition listed above is meant to facilitate conversion of code written for FLTK 1.3.x and containing X11-specific code; add this single statement anywhere in the app's source code:

```
FL_EXPORT bool fl_disable_wayland = true;
```

and the app will always run as an X11 client.

After function *fl_open_display()* has been called, exactly one of the functions *fl_wl_display()* and *fl_x11_display()* returns a non-NULL value. When the former function does, the app runs as a Wayland client, and Wayland-specific functions and symbols described below (The Wayland Interface) can be used, whereas X11-specific functions and symbols cannot. Otherwise, the app runs as an X11 client, and only X11-specific functions and symbols below (The UNIX (X11) Interface) can be used.

Because a single app can be expected to run either Wayland or X11, it's necessary to use distinct names for global variables and functions in the X11- and the Wayland-specific source code.

Non-default configurations of the FLTK library under Linux/Unix are described in file README.Wayland.txt.

21.3 The UNIX (X11) Interface

Cross-platform applications should bracket X11-specific source code between `#if defined(FLTK_USE_X11) / #endif` and should ensure function *fl_x11_display()* returns non-NULL before calling X11-specific functions and using X11-specific symbols.

The UNIX interface provides access to the X Window System state information and data structures.

21.3.1 Handling Other X Events

```
void Fl::add_handler(int (∗f)(int))
```

Installs a function to parse unrecognized events. If FLTK cannot figure out what to do with an event, it calls each of these functions (most recent first) until one of them returns non-zero. If none of them returns non-zero then the event is ignored.
FLTK calls this for any X events it does not recognize, or X events with a window ID that FLTK does not recognize. You can look at the X event in the \textit{fl_xevent} variable.

The argument is the FLTK event type that was not handled, or zero for unrecognized X events. These handlers are also called for global shortcuts and some other events that the widget they were passed to did not handle, for example \texttt{FL_SHORTCUT}.

\begin{verbatim}
extern XEvent *fl_xevent

This variable contains the most recent X event.

extern ulong fl_event_time

This variable contains the time stamp from the most recent X event that reported it; not all events do. Many X calls like cut and paste need this value.

Window fl_xid(const Fl_Window *)

Returns the XID for a window, or zero if not \texttt{shown}().

\textbf{Deprecated} Kept for compatibility with FLTK versions before 1.4. Use preferentially \texttt{fl_x11_xid(const Fl_Window *)} with versions 1.4 and above.

\texttt{Fl_Window *fl_find(ulong xid)}

Returns the \texttt{Fl_Window} that corresponds to the given XID, or \texttt{NULL} if not found. This function uses a cache so it is slightly faster than iterating through the windows yourself.

\textbf{Deprecated} Kept for compatibility with FLTK versions before 1.4. Use preferentially \texttt{fl_x11_find(Window)} with versions 1.4 and above.

\begin{verbatim}
int fl_handle(const XEvent &)

This call allows you to supply the X events to FLTK, which may allow FLTK to cooperate with another toolkit or library. The return value is non-zero if FLTK understood the event. If the window does not belong to FLTK and the \texttt{add_handler()} functions all return 0, this function will return false.

Besides feeding events your code should call \texttt{Fl::flush()} periodically so that FLTK redraws its windows.

This function will call the callback functions. It will not return until they complete. In particular, if a callback pops up a modal window by calling \texttt{fl_ask()}, for instance, it will not return until the modal function returns.
\end{verbatim}
21.3.2 Drawing using Xlib

The following global variables are set before `Fl_Widget::draw()` is called, or by `Fl_Window::make_current()`:

```c
extern Display *fl_display; // for compatibility with previous FLTK versions
extern Display *fl_x11_display(); // preferred access starting with FLTK 1.4
extern Window fl_window;
extern GC fl_gc; // for compatibility with previous FLTK versions
extern GC fl_x11_gc(); // preferred access starting with FLTK 1.4
extern int fl_screen;
extern XVisualInfo *fl_visual;
extern Colormap fl_colormap;
```

You must use them to produce Xlib calls. Don't attempt to change them. A typical X drawing call is written like this:

```c
XDrawSomething(fl_display, fl_window, fl_gc, ...);
```

Other information such as the position or size of the X window can be found by looking at `Fl_Window::current()`, which returns a pointer to the `Fl_Window` being drawn.

```c
unsigned long fl_xpixel(Fl_Color i)
unsigned long fl_xpixel(uchar r, uchar g, uchar b)
```

Returns the X pixel number used to draw the given FLTK color index or RGB color. This is the X pixel that `fl_color()` would use.

```c
int fl_parse_color(const char *p, uchar& r, uchar& g, uchar& b)
```

Convert a name into the red, green, and blue values of a color by parsing the X11 color names. On other systems, `fl_parse_color()` can only convert names in hexadecimal encoding, for example `#ff8083`.

```c
extern XFontStruct *fl_xfont
```

Points to the font selected by the most recent `fl_font()`. This is not necessarily the current font of `fl_gc`, which is not set until `fl_draw()` is called. If FLTK was compiled with Xft support, `fl_xfont` will usually be 0 and `fl_xftfont` will contain a pointer to the `XftFont` structure instead.

```c
extern void *fl_xftfont
```

If FLTK was compiled with Xft support enabled, `fl_xftfont` points to the xft font selected by the most recent `fl_font()`. Otherwise it will be 0. `fl_xftfont` should be cast to `XftFont*`.

21.3.3 Changing the Display, Screen, or X Visual

FLTK uses only a single display, screen, X visual, and X colormap. This greatly simplifies its internal structure and makes it much smaller and faster. You can change which it uses by setting global variables before the first `Fl_Window::show()` is called. You may also want to call `Fl::visual()`, which is a portable interface to get a full color and/or double buffered visual.

```c
int Fl::display(const char *)
```
Set which X display to use. This actually does `putenv("DISPLAY=...")` so that child programs will display on the same screen if called with `exec()`. This must be done before the display is opened. This call is provided under MacOS and Windows but it has no effect.

```c
extern Display *fl_display
```

The open X display. This is needed as an argument to most Xlib calls. Don't attempt to change it! This is NULL before the display is opened.

```c
void fl_open_display()
```

Opens the display. Does nothing if it is already open. This will make sure `fl_display` is non-zero. You should call this if you wish to do X calls and there is a chance that your code will be called before the first `show()` of a window.

This may call Fl::abort() if there is an error opening the display.

```c
void fl_close_display()
```

This closes the X connection. You do not need to call this to exit, and in fact it is faster to not do so! It may be useful to call this if you want your program to continue without the X connection. You cannot open the display again, and probably cannot call any FLTK functions.

```c
extern int fl_screen
```

Which screen number to use. This is set by `fl_open_display()` to the default screen. You can change it by setting this to a different value immediately afterwards. It can also be set by changing the last number in the Fl::display() string to "host:0.#".

```c
extern XVisualInfo *fl_visual
extern Colormap fl_colormap
```

The visual and colormap that FLTK will use for all windows. These are set by `fl_open_display()` to the default visual and colormap. You can change them before calling `show()` on the first window. Typical code for changing the default visual is:

```c
Fl::args(argc, argv); // do this first so $DISPLAY is set
fl_open_display();
fl_visual = find_a_good_visual(fl_display, fl_screen);
if (!fl_visual) Fl::abort("No good visual");
fl_colormap = make_a_colormap(fl_display, fl_visual->visual, fl_visual->depth);
// it is now ok to show() windows:
window->show(argc, argv);
```
21.3.4 Using a Subclass of Fl_Window for Special X Stuff

FLTK can manage an X window on a different screen, visual and/or colormap, you just can’t use FLTK’s drawing routines to draw into it. But you can write your own draw() method that uses Xlib (and/or OpenGL) calls only.

FLTK can also manage XID’s provided by other libraries or programs, and call those libraries when the window needs to be redrawn.

To do this, you need to make a subclass of Fl_Window and override some of these virtual functions:

virtual void Fl_Window::show()

If the window is already shown() this must cause it to be raised, this can usually be done by calling Fl_Window::show(). If not shown() your implementation must call either Fl_X::set_xid() or Fl_X::make_xid().

An example:

```cpp
void MyWindow::show() {
  if (shown()) {Fl_Window::show(); return;} // you must do this!
  fl_open_display(); // necessary if this is first window
  // we only calculate the necessary visual colormap once:
  static XVisualInfo *visual;
  static Colormap colormap;
  if (!visual) { // if we are not using Xlib
    visual = figure_out_visual();
    colormap = XCreateColormap(fl_display, RootWindow(fl_display,fl_screen),
                              vis->visual, AllocNone);
  }
  Fl_X::make_xid(this, visual, colormap);
}
```

Fl_X *Fl_X::set_xid(Fl_Window*, Window xid)

Allocate a hidden class called an Fl_X, put the XID into it, and set a pointer to it from the Fl_Window. This causes Fl_Window::shown() to return true.

```cpp
void Fl_X::make_xid(Fl_Window*, XVisualInfo* = fl_visual, Colormap = fl_colormap)
```

This static method does the most onerous parts of creating an X window, including setting the label, resize limitations, etc. It then does Fl_X::set_xid() with this new window and maps the window.

virtual void Fl_Window::flush()

This virtual function is called by Fl::flush() to update the window. For FLTK’s own windows it does this by setting the global variables fl_window and fl_gc and then calling the draw() method. For your own windows you might just want to put all the drawing code in here.
The X region that is a combination of all `damage()` calls done so far is in `Fl_X::flx(this)->region`. If `NULL` then you should redraw the entire window. The undocumented function `fl_clip_region(←XRegion)` will initialize the FLTK clip stack with a region or `NULL` for no clipping. You must set region to `NULL` afterwards as `fl_clip_region()` will own and delete it when done.

If `damage() & FL_DAMAGE_EXPOSE` then only X expose events have happened. This may be useful if you have an undamaged image (such as a backing buffer) around.

Here is a sample where an undamaged image is kept somewhere:

```cpp
void MyWindow::flush() {
    fl_clip_region(Fl_X::flx(this)->region);
    Fl_X::flx(this)->region = 0;
    if (damage() != 2) {... draw things into backing store ...}
    ... copy backing store to window ...
}
```

Note

For compatibility with FLTK versions before 1.4, member function `Fl_X::flx(Fl_Window*)` can also be written `Fl_X::i(Fl_Window*)`.

Virtual void `Fl_Window::hide()`

Destroy the window server copy of the window. Usually you will destroy contexts, pixmaps, or other resources used by the window, and then call `Fl_Window::hide()` to get rid of the main window identified by `xid()`. If you override this, you must also override the destructor as shown:

```cpp
void MyWindow::hide() {
    if (mypixmap) {
        XFreePixmap(fl_display,mypixmap);
        mypixmap = 0;
    }
    Fl_Window::hide(); // you must call this
}
```

Virtual void `Fl_Window::~Fl_Window()`

Because of the way C++ works, if you override `hide()` you must override the destructor as well (otherwise only the base class `hide()` is called):

```cpp
MyWindow::~MyWindow() {
    hide();
}
```

Note

Access to the Fl_X hidden class requires to `#define FL_INTERNALS` before compilation.
21.3.5 Setting the Icon of a Window

FLTK recommends to set window icons using these platform-independent methods: Fl_Window::icon(const Fl_RGB_Image *) and Fl_Window::icons(const Fl_RGB_Image *[], int). See also methods setting default window icons Fl_Window::default_icon(const Fl_RGB_Image *) and Fl_Window::default_icons(const Fl_RGB_Image *[], int).

FLTK on X11 also supports, for backward compatibility, use of the deprecated method Fl_Window::icon(const void *) as follows:
Sets the icon for the window to the passed pointer. You will need to cast the icon Pixmap to a char* when calling this method. To set a monochrome icon using a bitmap compiled with your application use:

```
#include "icon.xbm"
#include <X11/xbm.h>
#include <X11/xpm.h>
#include <X11/xpm.h>

fl_open_display(); // needed if display has not been previously opened
Pixmap p = XCreateBitmapFromData(fl_display, DefaultRootWindow(fl_display),
    icon_bits, icon_width, icon_height);
window->icon((const void*)p);
```

To use a multi-colored icon, the XPM format and library should be used as follows:

```
#include <X11/xpm.h>
Pixmap p, mask;
XpmCreatePixmapFromData(fl_display, DefaultRootWindow(fl_display),
    icon_xpm, &p, &mask, NULL);
window->icon((const void*)p);
```

When using the Xpm library, be sure to include it in the list of libraries that are used to link the application (usually "-lXpm").

**NOTE:**

You must call Fl_Window::show(int argc, char** argv) for the icon to be used. The Fl_Window::show() method does not bind the icon to the window.

Any window icon must be set with the above methods before the window is shown.

21.3.6 X Resources

When the Fl_Window::show(int argc, char** argv) method is called, FLTK looks for the following X resources:

- **background** - The default background color for widgets (color).
- **dndTextOps** - The default setting for drag and drop text operations (boolean).
- **foreground** - The default foreground (label) color for widgets (color).
- **scheme** - The default scheme to use (string).
- **selectBackground** - The default selection color for menus, etc. (color).
- **Text.background** - The default background color for text fields (color).
- **tooltips** - The default setting for tooltips (boolean).
- **visibleFocus** - The default setting for visible keyboard focus on non-text widgets (boolean).

Resources associated with the first window's Fl_Window::xclass() string are queried first, or if no class has been specified then the class "fltk" is used (e.g. fltk.background). If no match is found, a global search is done (e.g. *background).
21.3.7 Display Scaling Factor

FLTK uses the value of the Xft.dpi resource divided by 96. to initialize the display scaling factor. That is also what is done by the gnome and KDE desktops.

21.4 The Windows Interface

Cross-platform applications should bracket Windows-specific source code between #ifdef _WIN32 / #endif.

The Windows interface provides access to the Windows GDI state information and data structures.

21.4.1 Using filenames with non-ASCII characters

In FLTK, all strings, including filenames, are UTF-8 encoded. The utility functions fl_fopen() and fl_open() allow to open files potentially having non-ASCII names in a cross-platform fashion, whereas the standard fopen()/open() functions fail to do so.

21.4.2 Responding to WM_QUIT

FLTK will intercept WM_QUIT messages that are directed towards the thread that runs the main loop. These are converted to SIGTERM signals via raise(). This allows you to deal with outside termination requests with the same code on both Windows and UNIX systems. Other processes can send this message via PostThreadMessage() in order to request, rather than force your application to terminate.

21.4.3 Handling Other Windows API Messages

By default a single WNDCLASSEX called "FLTK" is created. All Fl_Window's are of this class unless you use Fl_Window::xclass(). The window class is created the first time Fl_Window::show() is called.

You can probably combine FLTK with other libraries that make their own window classes. The easiest way is to call Fl::wait(), as it will call DispatchMessage() for all messages to the other windows. If necessary you can let the other library take over as long as it calls DispatchMessage(), but you will have to arrange for the function Fl::flush() to be called regularly so that widgets are updated, timeouts are handled, and the idle functions are called.

extern MSG fl_msg

This variable contains the most recent message read by GetMessage(), which is called by Fl::wait(). This may not be the most recent message sent to an FLTK window, because silly Windows calls the handle procedures directly for some events (sigh).

void Fl::add_handler(int (*f)(int))
Installs a function to parse unrecognized messages sent to FLTK windows. If FLTK cannot figure out what to do with a message, it calls each of these functions (most recent first) until one of them returns non-zero. The argument passed to the functions is the FLTK event that was not handled or zero for unknown messages. If all the handlers return zero then FLTK calls DefWindowProc().

HWND fl_xid(const Fl_Window *)

Returns the window handle for a Fl_Window, or zero if not shown().

Fl_Window *fl_find(HWND xid)

Returns the Fl_Window that corresponds to the given window handle, or NULL if not found. This function uses a cache so it is slightly faster than iterating through the windows yourself.

21.4.4 Drawing Things Using the Windows GDI

When the virtual function Fl_Widget::draw() is called, FLTK stores all the extra arguments you need to make a proper GDI call in some global variables:

extern HINSTANCE fl_display; // for compatibility with previous FLTK versions
extern HINSTANCE fl_win32_display(); // preferred access starting with FLTK 1.4
extern HWND fl_window;
extern HDC fl_gc; // for compatibility with previous FLTK versions
extern HDC fl_win32_gc(); // preferred access starting with FLTK 1.4
COLORREF fl_RGB();
HPEN fl_pen();
HBRUSH fl_brush();

These global variables are set before Fl_Widget::draw() is called, or by Fl_Window::make_current(). You can refer to them when needed to produce GDI calls, but don't attempt to change them. The functions return GDI objects for the current color set by fl_color() and are created as needed and cached. A typical GDI drawing call is written like this:

DrawSomething(fl_gc, ..., fl_brush());

It may also be useful to refer to Fl_Window::current() to get the window's size or position.

21.4.5 HighDPI support

FLTK apps for the Windows platform are by default "Per-monitor DPI-aware V2". This means that any window automatically adjusts its physical size in relation to the scaling factor of the display where it maps. This also means that all drawings (e.g., text, lines, images) take advantage of the full resolution of the display in use. FLTK apps may also use the manifest mechanism to declare their level of DPI awareness. The FLTK library adapts to the DPI awareness level set in the app's manifest, which can be lower than the default level if the manifest sets it so.

21.4.6 Display Scaling Factor

FLTK uses the value given by function GetDpiForMonitor() divided by 96. to initialize the scaling factor of each display in the system. This matches the value of "Change the size of text, apps and other items" found in section "System" subsection "Display" of Windows settings.
21.4.7 Setting the Icon of a Window

FLTK recommends to set window icons using these platform-independent methods: `Fl_Window::icon(const Fl_RGB_Imgae *)` and `Fl_Window::icons(const Fl_RGB_Imgae *[], int)`. See also methods setting default window icons `Fl_Window::default_icon(const Fl_RGB_Imgae *)` and `Fl_Window::default_icons(const Fl_RGB_Imgae *[], int).

FLTK on Windows also supports, for backward compatibility, use of the deprecated method `Fl_Window::icon(const void *)` as follows:

Set the icon for the window to the passed pointer. You will need to cast the HICON handle to a char* when calling this method. To set the icon using an icon resource compiled with your application use:

```cpp
window->icon((const void *)LoadIcon(fl_display, MAKEINTRESOURCE(IDI_ICON));
```

You can also use the `LoadImage()` and related functions to load specific resolutions or create the icon from bitmap data.

**NOTE:**

You must call `Fl_Window::show(int argc, char **argv)` for the icon to be used. The `Fl_Window::show()` method does not bind the icon to the window.

Any window icon must be set with the above methods before the window is shown.

21.4.8 How to Not Get a MSDOS Console Window

Windows has a really stupid mode switch stored in the executables that controls whether or not to make a console window.

To always get a console window you simply create a console application (the "/SUBSYSTEM:CONSOLE" option for the linker). For a GUI-only application create a Windows application (the "/SUBSYSTEM:WINDOWS" option for the linker).

FLTK includes a `WinMain()` function that calls the ANSI standard `main()` entry point for you. **This function creates a console window when you use the debug version of the library.**

Windows applications without a console cannot write to `stdout` or `stderr`, even if they are run from a console window. Any output is silently thrown away. Additionally, Windows applications are run in the background by the console, although you can use "start /wait program" to run them in the foreground.

21.4.9 Known Windows Bugs and Problems

The following is a list of known bugs and problems in the Windows version of FLTK:

- If a program is deactivated, `Fl::wait()` does not return until it is activated again, even though many events are delivered to the program. This can cause idle background processes to stop unexpectedly. This also happens while the user is dragging or resizing windows or otherwise holding the mouse down. We were forced to remove most of the efficiency FLTK uses for redrawing in order to get windows to update while being moved. This is a design error in Windows and probably impossible to get around.

- `Fl_Gl_Window::can_do_overlay()` returns true until the first time it attempts to draw an overlay, and then correctly returns whether or not there is overlay hardware.

- SetCapture (used by `Fl::grab()`) doesn't work, and the main window title bar turns gray while menus are popped up.

- Compilation with `gcc 3.4.4 and -Os` exposes an optimisation bug in gcc. The symptom is that when drawing filled circles only the perimeter is drawn. This can for instance be seen in the symbols demo. Other optimisation options such as `-O2` and `-O3` seem to work OK. More details can be found in STR#1656
21.5 The Apple OS X Interface

Cross-platform applications should bracket macOS-specific source code between 

```c
#if defined(__APPLE__) && !defined(FLTK_USE_X11) / #endif
```

FLTK supports Apple OS X using the Apple Cocoa library. Older versions of MacOS are no longer supported.

Control, Option, and Command Modifier Keys

FLTK maps the Mac 'control' key to FL_CTRL, the 'option' key to FL_ALT and the 'Apple' key to FL_META. Furthermore, FL_COMMAND designates the 'Apple' key on Mac OS X and the 'control' key on other platforms. Keyboard events return the key name in Fl::event_key() and the keystroke translation in Fl::event_text(). For example, typing Option-Y on a Mac US keyboard will set FL_ALT in Fl::event_state(), set Fl::event_key() to 'y' and return the Yen symbol in Fl::event_text().

Right Click simulation with Ctrl Click

The Apple HIG guidelines indicate applications should support 'Ctrl Click' to simulate 'Right Click' for e.g. context menus, so users with one-button mice and one-click trackpads can still access right-click features. However, paraphrasing Manolo's comment on the fltk.coredev newsgroup:

- FLTK does /not/ support Ctrl-Click == Right Click itself because Mac OS X event processing doesn't support this at the system level: the system reports left-clicks with the ctrl modifier when the user ctrl-clicks, and OS X system preferences don't allow changing this behavior. Therefore, applications must handle simulation of Right Click with Ctrl Click in the application code.

Ian MacArthur provided the following handle() method code snippet showing an example of how to do this:

```c
case FL_PUSH:
{
    int btn = Fl::event_button();
#ifdef __APPLE__
    int ev_state = Fl::event_state();
#endif
    // Context menu can be called up in one of two ways: -
    // 1 - right click, as normally used on Windows and Linux
    // 2 - Ctrl + left click, as sometimes used on Mac
    //
    #ifdef __APPLE__
    // On apple, check right click, and ctrl+left click
    if ((btn == FL_RIGHT_MOUSE) || (ev_state == (FL_CTRL | FL_BUTTON1)))
    #else
    // On other platforms, only check right click as ctrl+left is used for selections
    if (btn == FL_RIGHT_MOUSE)
    #endif
    { // Did we right click on the object?..

    }
```

There is a thread about this subject on fltk.coredev (Aug 1-14, 2014) entitled "[RFC] Right click emulation for one button mouse on Mac".

Apple "Quit" Event
When the user presses Cmd-Q or requests a termination of the application, FLTK sends an `FL_CLOSE` event to all open windows. If any window remains open, the termination request aborts. If all windows close, the application's event loop terminates, that is, `Fl::run()` returns. The application can then follow FLTK's normal termination path executing cleanup code that may be programmed after termination of the event loop, and returning from `main()`. Function `Fl::program_should_quit()` allows to detect whether the event loop terminated because of a program termination request.

Apple "Open" Event

Whenever the user drops a file onto an application icon, OS X generates an Apple Event of the type "Open". You can have FLTK notify you of an Open event by calling the `fl_open_callback()` function.

```c
void fl_open_display()
```

Opens the display. Does nothing if it is already open. You should call this if you wish to do Cocoa or Quartz calls and there is a chance that your code will be called before the first `show()` of a window.

```c
Window fl_xid(const Fl_Window *)
```

Returns the window reference for an `Fl_Window`, or `NULL` if the window has not been shown. This reference is a pointer to an instance of the subclass FLWindow of Cocoa's NSWindow class.

```c
Fl_Window *fl_find(Window xid)
```

Returns the `Fl_Window` that corresponds to the given window reference, or `NULL` if not found.

```c
void fl_mac_set_about( Fl_Callback *cb, void *user_data, int shortcut)
```

Attaches the callback `cb` to the "About myprog" item of the system application menu. `cb` will be called with `NULL` first argument and `user_data` second argument. This MacOS-specific function is deprecated in FLTK 1.4 and replaced by `Fl_Sys_Menu_Bar::about(Fl_Callback *cb, void *data)` which is cross-platform.

`Fl_Sys_Menu_Bar` class

The `Fl_Sys_Menu_Bar` class allows to build menu bars that, on Mac OS X, are placed in the system menu bar (at top-left of display), and, on other platforms, at a user-chosen location of a user-chosen window.

### 21.5.1 Setting the icon of an application

- First, create a `.icns` file containing several copies of your icon of decreasing sizes. This can be done using the Preview application or the Icon Composer application available in "Graphics Tools for Xcode". To create a high resolution icon file, it is necessary to use the iconutil command-line utility.
- Put your `.icns` file in the Resources subdirectory of your application bundle.
- Add these two lines to the Info.plist file of your application bundle

```xml
<key>CFBundleIconFile</key>
<string>foo.icns</string>
```

Replacing `foo` by your application name. If you use Xcode, just add your `.icns` file to your application target.
21.5.2 Drawing Things Using Quartz

All code inside `Fl_Widget::draw()` is expected to call Quartz drawing functions. The Quartz coordinate system is flipped to match FLTK's coordinate system. The origin for all drawing is in the top left corner of the enclosing `Fl_Window`. The function `fl_mac_gc()` returns the appropriate Quartz 2D drawing environment (of type `CGContextRef`). For compatibility with previous FLTK versions, deprecated global variable `fl_gc` gives the same value.

Include `FL/platform.H` to declare the `fl_mac_gc()` function (or the `fl_gc` variable).

21.5.3 Internationalization

All FLTK programs contain an application menu with, e.g., the About xxx, Hide xxx, and Quit xxx items. This menu can be internationalized/localized by any of two means.

- using the `Fl_Mac_App_Menu` class.
- using the standard Mac OS X localization procedure. Create a language-specific .lproj directory (e.g., German.lproj) in the Resources subdirectory of the application bundle. Create therein a `Localizable.strings` file that translates all menu items to this language. The German `Localizable.strings` file, for example, contains:

  "About %@" = "Über %@";
  "Print Front Window"="Frontfenster drucken";
  "Services" = "Dienste";
  "Hide %@"="%@ ausblenden";
  "Hide Others"="Andere ausblenden";
  "Show All"="Alle einblenden";
  "Quit %@"="%@ beenden";

  Set "Print Front Window" = ""; therein so the application menu doesn't show a "Print Front Window" item. To localize the application name itself, create a file `InfoPlist.strings` in each .lproj directory and put `CFBundleName = "localized name";` in each such file.

21.5.4 OpenGL and 'retina' displays

It is possible to have OpenGL produce graphics at the high pixel resolution allowed by the so-called 'retina' displays present on recent Apple hardware. For this, call

```cpp
Fl::use_high_res_GL(1);
```

before any `Fl_Gl_Window` is shown. Also, adapt your `Fl_Gl_Window::draw()` and `Fl_Gl_Window::draw_overlay()` methods replacing

```cpp
glViewport(0, 0, w(), h());
```

by

```cpp
glViewport(0, 0, pixel_w(), pixel_h());
```

making use of the `Fl_Gl_Window::pixel_w()` and `Fl_Gl_Window::pixel_h()` methods that return the width and height of the GL scene in pixels: if the `Fl_Gl_Window` is mapped on a retina display, these methods return twice as much as reported by `Fl_Widget::w()` and `Fl_Widget::h()`. If it's mapped on a regular display, they return the same values as `w()` and `h()`. These methods dynamically change their values if the window is moved into/out from a retina display. If `Fl::use_high_res_GL(1)` is not called, all `Fl_Gl_Window`s are drawn at low resolution. These methods are useful on all platforms because `Fl_Gl_Window::w()` and `Fl_Gl_Window::h()` don't return, on HighDPI displays, the quantities in pixels necessary to OpenGL functions.

The `Fl_Gl_Window::pixels_per_unit()` method is useful when the OpenGL code depends on the pixel dimension of the GL scene. This occurs, e.g., if a window's handle() method uses `Fl::event_x()` and `Fl::event_y()` whose returned values should be multiplied by `Fl_Gl_Window::pixels_per_unit()` to obtain the adequate pixel units. This method may also be useful, for example, to adjust the width of a line in a high resolution GL scene.
21.5.5 Fl_Double_Window

OS X double-buffers all windows automatically. On OS X, Fl_Window and Fl_Double_Window are handled internally in the same way.

21.5.6 Mac File System Specifics

Resource Forks

FLTK does not access the resource fork of an application. However, a minimal resource fork must be created for OS X applications. Starting with OS X 10.6, resource forks are no longer needed.

Caution (OS X 10.2 and older):
When using UNIX commands to copy or move executables, OS X will NOT copy any resource forks! For copying and moving use CpMac and MvMac respectively. For creating a tar archive, all executables need to be stripped from their Resource Fork before packing, e.g. "DeRez fluid > fluid.r". After unpacking the Resource Fork needs to be reattached, e.g. "Rez fluid.r -o fluid".

It is advisable to use the Finder for moving and copying and Mac archiving tools like Sit for distribution as they will handle the Resource Fork correctly.

Mac File Paths

FLTK uses UTF-8-encoded UNIX-style filenames and paths.

See also

Mac OS X-specific symbols

21.6 The Wayland Interface

Cross-platform applications should bracket Wayland-specific source code between #ifdef FLTK_USE_WAYLAND / #endif and should ensure function fl_wl_display() returns non-NULL before calling Wayland-specific functions and using Wayland-specific symbols.

extern struct wl_display *fl_wl_display();

After fl_open_display() has run, function fl_wl_display() returns a pointer to the struct wl_display representing the connection between the application and Wayland. For example, wl_display_get_fd(fl_wl_display()) gives the file descriptor one can use to communicate with the Wayland compositor according to the Wayland protocol.

struct wid_window *fl_wl_xid(const Fl_Window *)
Returns a pointer to an \texttt{FLTK-defined} structure holding Wayland-related data created when a window gets \texttt{show()}'n, or NULL if not \texttt{show()}'n.

\texttt{Fl_{Window} \ast fl\_wl\_find(struct wld\_window \ast wld\_win)}

Returns the \texttt{Fl_{Window}} that corresponds to the given Window, or NULL if not found.

\texttt{struct wl\_surface \ast fl\_wl\_surface(struct wld\_window \ast wld\_win)}

Returns a pointer to the struct \texttt{wl\_surface} corresponding to a \texttt{show()}'n top-level window or subwindow.

\texttt{cairo\_t \ast fl\_wl\_gc()}  

\texttt{void fl\_close\_display()}  

This closes the Wayland connection. You do not need to call this to exit. It may be useful to call this if you want your program to continue without the Wayland connection. You cannot open the display again, and cannot call any \texttt{FLTK} functions.

See also  
\texttt{wayland.H} for all functions specific of the Wayland platform.

### 21.6.1 HiDPI display support

\texttt{FLTK} Wayland apps automatically scale according to the Wayland-defined, integer-valued scale factor. On a HiDPI display, it's enough to set this factor to 2 for any \texttt{FLTK} app to be drawn using twice as many pixels and thus to be as readable as it is on a regular display. With the gnome and KDE-plasma desktops, that is achieved in the "Displays" section of the "Settings" application, selecting 200 \% for the "Scale" parameter. In addition to this, \texttt{FLTK} apps can also be scaled up or down typing ctrl/+/-/0/ and with the \texttt{FLTK\_SCALING\_FACTOR} environment variable.
21.6.2 Window icons

Standard FLTK functions `Fl_Window::icon(const Fl_RGB_Image*)`, `Fl_Window::icons(const Fl_RGB_Image*, int)`, `Fl_Window::default_icon(const Fl_RGB_Image*)` and `Fl_Window::default_icons(const Fl_RGB_Image*, int)` have no effect on the Wayland platform. The equivalent of a call to `Fl_Window::default_icon(const Fl_RGB_Image*)` to set the application-specific window icon can be obtained as follows, using FLTK's editor app as an example:

- create a text file named `editor.desktop` containing:

  ```
  [Desktop Entry]
  Version=1.0
  Type=Application
  Name=Editor
  Name[fr]=Editeur
  Comment=FLTK editor
  Exec=editor %F
  Icon=/path/to/icon/file/editor.svg
  MimeType=text/plain
  ```

- The `Name=` line therein determines the string displayed when the app runs.
- Optionally, one or more `Name[locale]=` lines can be used to set locale-specific app names.
- The `Icon=` line accepts also .png files.
- Put this file in `/usr/local/share/applications/` so it's available to all system users or in `$HOME/.local/share/applications/` so it's available to a single user.

21.6.3 Window titlebars

Wayland supports both client-side window decoration (CSD), where client applications are responsible for drawing window titlebars, and server-side window decoration (SSD), where the Wayland compositor itself draws window titlebars. Among 4 tested Wayland compositors, Mutter (gnome's compositor) and Weston use CSD mode whereas the KWin and Sway compositors use SSD mode. When running in CSD mode, FLTK uses a library called `libdecor` to draw titlebars. The libdecor library has been conceived to use various plug-in's to draw titlebars in various fashions intended to match any desktop's preferred titlebar style. FLTK supports drawing titlebars with any libdecor plug-in via an environment variable called `LIBDECOR_PLUGIN_DIR` which can be given the name of a directory containing the desired plug-in. When `LIBDECOR_PLUGIN_DIR` is not defined, or points to a directory that doesn't contain a libdecor plug-in, FLTK uses its built-in plug-in to draw titlebars. That is the most common situation, until libdecor plug-in's become available for popular UNIX desktops.
Chapter 22

Migrating Code from FLTK 1.3 to 1.4

This appendix describes the differences between FLTK 1.3.x and FLTK 1.4.x functions and classes and potential requirements to change source code.

We also explain how code can be made compatible so it can be compiled by both FLTK 1.3.x and 1.4.x.

If you need to migrate your code from prior FLTK versions to FLTK 1.4, then you should first consult the relevant appendices in the FLTK 1.3 online documentation or by downloading the FLTK 1.3 documentation. See https://www.fltk.org/doc-1.3/index.html and/or https://www.fltk.org/software.php, respectively.

22.1 Changes in Header Files

We strive to include only necessary header files in the public headers of the FLTK library to reduce dependencies and hence compile times.

We try to avoid including system header files as far as possible. Known exceptions are `<stdio.h>` where file system structures and functions are visible in the public API, for instance `FILE*`, and sometimes essential header files like `<stdlib.h>` and/or `<stddef.h>`. Some required system headers may be included in platform specific header files like `<FL/platform.H>` or `<FL/platform_types.h>`.

In earlier versions (1.3.x) some of the public FLTK headers included some not strictly required system headers by accident.

The consequence for building user programs with FLTK 1.4 is that if you require a system or FLTK header in your user program that you don't `#include` explicitly but which has been included by FLTK 1.3.x your FLTK 1.3 program may issue compiler errors or warnings about missing header files or missing declarations when compiled with FLTK 1.4.

This is not a fault of FLTK 1.4 but a fault of the source code that did not include all required headers.

In FLTK 1.4 inclusion of `<FL/Fl.H>` is no longer a strict requirement as it was required and documented in FLTK 1.3.x. In FLTK 1.4 you may still need to `#include <FL/Fl.H>` if you are using enumerations or methods of class `Fl` like `Fl::run()` but there are exceptions where this header is included by other FLTK headers, like `Fl_Window.H` and other subclasses.

Suggested solution: include all FLTK and system header files your source code requires explicitly and don’t rely on FLTK headers to include a particular header file. If you want your code to be as much as possible compatible with FLTK 1.3.x, then you should `#include <FL/Fl.H>` as required by 1.3.x.

You don’t need to include headers of base classes - this is done by all FLTK headers as required. Besides that you need to include some support headers if you use FLTK functions like `fl_choice()` and others. This is described in the function’s documentation (if a required header is missing in the docs this is a bug).

If you follow these rules your program will be compatible with both FLTK 1.3.x and FLTK 1.4.x as long as you use only functions and classes defined in FLTK 1.3.
22.2 Fl_Preferences

Starting with FLTK 1.3, preference databases are expected to be in UTF-8 encoding. Previous databases were stored in the current character set or code page which renders them incompatible for text entries using international characters.

Starting with FLTK 1.4, searching a valid path to store the preference files has changed slightly. Please see Fl_Preferences::Fl_Preferences(Root, const char*, const char*) for details.

On Unix/Linux platforms new FLTK preference files are stored using the XDG Base Directory Specification which means in essence that user preference files are stored in the user's home directory under the subdirectory .config, i.e. in $HOME/.config/fltk.org/ rather than $HOME/.fltk/fltk.org/. Existing preference files are still found and used, hence this new location is optional.

You may want to move the preference files from their old locations to their new locations as documented in Fl_Preferences::Fl_Preferences(Root, const char*, const char*) .

New Fl_Preferences types Fl_Preferences::USER_L, Fl_PREFERENCES::SYSTEM_L and some more combinations with "_L" suffix have been defined to make preference files independent of the current locale. This is particularly important for floating point data which is stored in text form with varying decimal separator depending on the locale (either '.' or ','). You may want to change your program to use these new constants instead of those without the "_L" suffix. For more information see the documentation of Fl_Preferences.

22.3 Fl::add_timeout and friends

Since FLTK 1.4.0 internal timeout handling has been unified across platforms. This ensures equal timeout handling, improved accuracy of Fl::repeat_timeout(), and easier maintenance (less potential for errors).

This will very likely not affect user code, however there is one subtle exception on macOS and Windows: in FLTK 1.3.x these platforms used system timers to schedule timeouts. Since FLTK 1.4.0 all platforms use the same internal timer management that was previously only used on Unix/Linux/X11. The consequence of this change is that the FLTK event loop needs to be executed to trigger timeout events, i.e. you must either call Fl::wait() repeatedly or start the event loop with Fl::run().

Code that did not execute the event loop and relied on the system timers has never been cross platform compatible, i.e. it wouldn't work on Unix/Linux. An example would be code that opened a splash window, scheduled a timeout with Fl::add_timeout(), and waited for the timer event w/o running the FLTK event loop. Such code must be modified to execute Fl::run() and/or use Fl::wait().

22.4 New FL_OVERRIDE Macro

FLTK 1.4 defines a new macro FL_OVERRIDE as "override" if a recent C++ standard (C++11 or higher) is used to compile your code.

This macro is currently defined in FL/fl_attr.h but this may change in a future release. It is enough to '#include <FL/Fl.H>' to enable this macro.

Unfortunately Visual Studio does not define a meaningful value of __cplusplus to detect the C++ standard. Hence we use the Visual Studio version (2015 or higher) to decide whether we can define FL_OVERRIDE or not.

The FL_OVERRIDE macro is used to decorate declarations of overridden virtual methods in subclasses. Example code from FL/FL_Window.H:

```
int handle(int) FL_OVERRIDE;
```
The `FL_OVERRIDE` macro translates to 'override' on newer compilers and to an empty string for older compilers.

We recommend to add this to your overridden virtual methods in subclasses derived from FLTK base classes (widgets) and to compile with C++ standard C++11 or higher to enable the compiler to detect some errors if methods are not overridden correctly.

You don't need to declare the overridden methods 'virtual' if you use `FL_OVERRIDE` or the keyword `override`.

Hint: For the GCC and clang compilers you can enable the warning `-Wsuggest-override` to detect where you may (want to) add the `FL_OVERRIDE` macro.

### 22.5 `Fl_Image::copy()` 'const'

Since FLTK 1.4.0 the virtual method `Fl_Image::copy()` has been declared 'const' so read-only ('const') images can be copied w/o casts.

This will very likely not affect user code. However, if you derived your own class from any of the `Fl_*_Image` variants and you overrode Your_Image::copy() then you must declare this 'const' as well, i.e. you must add the keyword 'const' to the declaration of copy() in your header file and in the implementation.

We suggest to add the new `FL_OVERRIDE` macro or the keyword 'override' (see above) to your own overridden method declarations to enable the compiler to detect such incompatibilities.

Code example in header file:
```cpp
class Your_Image {
    // ...
    Fl_Image *copy() const FL_OVERRIDE;
    Fl_Image *copy(int w, int h) const FL_OVERRIDE;
};
```

Note the 'const' attribute and the `FL_OVERRIDE` macro.
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   The authors do request that such modifications be contributed to the FLTK project - send all contributions through the "Software Trouble Report" on the following page:  
   https://www.fltk.org/bugs.php

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   However, programs must still identify their use of FLTK. The following example statement can be included in user documentation to satisfy this requirement:

   [program/widget] is based in part on the work of the FLTK project ( https://www.fltk.org).
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Chapter 24

Example Source Code

The FLTK distribution contains over 60 sample applications written in, or ported to, FLTK. If the FLTK archive you received does not contain either an 'examples' or 'test' directory, you can download the complete FLTK distribution from https://www.fltk.org/software.php. Most of the example programs were created while testing a group of widgets. They are not meant to be great achievements in clean C++ programming, but merely a test platform to verify the functionality of the FLTK library. Note that extra example programs are also available in an additional 'examples' directory, but these are **NOT** built automatically when you build FLTK, unlike those in the 'test' directory shown below.

24.1 Example Applications: Overview

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</tr>
</tbody>
</table>

24.1.1 adjuster

**adjuster** shows a nifty little widget for quickly setting values in a great range.

24.1.2 animated

**animated** shows a window with an animated square that shows drawing with transparency (alpha channel).

24.1.3 arc
The `arc` demo explains how to derive your own widget to generate some custom drawings. The sample drawings use the matrix based arc drawing for some fun effects.

### 24.1.4 ask

`ask` shows some of FLTK's standard dialog boxes. Click the correct answers or you may end up in a loop, or you may end up in a loop, or you...

### 24.1.5 bitmap

This simple test shows the use of a single color bitmap as a label for a box widget. Bitmaps are stored in the X11 `.bmp` file format and can be part of the source code.

### 24.1.6 blocks

A wonderful and addictive game that shows the usage of FLTK timers, graphics, and how to implement sound on all platforms. `blocks` is also a good example for the Mac OS X specific bundle format.

### 24.1.7 boxtype

`boxtype` gives an overview of readily available boxes and frames in FLTK. More types can be added by the application programmer. When using themes, FLTK shuffles boxtypes around to give your program a new look.

### 24.1.8 browser

`browser` shows the capabilities of the `Fl_Browser` widget. Important features tested are loading of files, line formatting, and correct positioning of the browser data window.

### 24.1.9 button

The `button` test is a simple demo of push-buttons and callbacks.

### 24.1.10 buttons

`buttons` shows a sample of FLTK button types.

### 24.1.11 cairo_test

`cairo_test` shows a sample of drawing with Cairo in an `Fl_Cairo_Window`. This program can only be built if FLTK was configured with Cairo support.

### 24.1.12 checkers

Written by Steve Poulsen in early 1979, `checkers` shows how to convert a VT100 text-terminal based program into a neat application with a graphical UI. Check out the code that drags the pieces, and how the pieces are drawn by layering. Then tell me how to beat the computer at Checkers.
24.1.13 clock

The clock demo shows two analog clocks. The innards of the Fl_Clock widget are pretty interesting, explaining the use of timeouts and matrix based drawing.

24.1.14 colbrowser

colbrowser runs only on X11 systems. It reads /usr/lib/X11/rgb.txt to show the color representation of every text entry in the file. This is beautiful, but only moderately useful unless your UI is written in Motif.

24.1.15 color_chooser

The color_chooser gives a short demo of FLTK's palette based color chooser and of the RGB based color wheel.

24.1.16 cube

The cube demo shows the speed of OpenGL. It also tests the ability to render two OpenGL buffers into a single window, and shows OpenGL text.

24.1.17 CubeView

CubeView shows how to create a UI containing OpenGL with Fluid.

24.1.18 cursor

The cursor demo shows all mouse cursor shapes that come standard with FLTK. The fgcolor and bgcolor sliders work only on few systems (some version of Irix for example).

24.1.19 curve

curve draws a nice Bézier curve into a custom widget. The points option for splines is not supported on all platforms.

24.1.20 demo

This tool allows quick access to all programs in the test directory. demo is based on the visuals of the IrixGL demo program. The menu tree can be changed by editing test/demo.menu.

24.1.21 device

Exercises the Fl_Image_Surface, Fl_Copy_Surface, and Fl_Printer classes to draw to an Fl_Image object, copy graphical data to the clipboard, and for print support.

Note

The clipboard.cxx program of the 'examples' directory is a clipboard watching application that continuously displays the textual or graphical content of the system clipboard (a.k.a pasteboard on Mac OS X) exercising Fl::paste().
24.1.22 doublebuffer

The `doublebuffer` demo shows the difference between a single buffered window, which may flicker during a slow redraw, and a double buffered window, which never flickers, but uses twice the amount of RAM. Some modern OS's double buffer all windows automatically to allow transparency and shadows on the desktop. FLTK is smart enough to not triple buffer a window in that case.

24.1.23 editor

FLTK has two very different text input widgets. `Fl_Input` and derived classes are rather light weight, however `Fl_Text_Editor` is a complete port of `nedit` (with permission). The `editor` test is almost a full application, showing custom syntax highlighting and dialog creation.

24.1.24 fast_slow

`fast_slow` shows how an application can use the `Fl_Widget::when()` setting to receive different kinds of callbacks.

24.1.25 file_chooser

The standard FLTK `file_chooser` is the result of many iterations, trying to find a middle ground between a complex browser and a fast light implementation.

24.1.26 fonts

`fonts` shows all available text fonts on the host system. If your machine still has some pixmap based fonts, the supported sizes will be shown in bold face. Only the first 256 fonts will be listed.

24.1.27 forms

`forms` is an XForms program with very few changes. Search for "fltk" to find all changes necessary to port to fltk. This demo shows the different boxtypes. Note that some boxtypes are not appropriate for some objects.

24.1.28 fractals

`fractals` shows how to mix OpenGL, Glut and FLTK code. FLTK supports a rather large subset of Glut, so that many Glut applications compile just fine.

24.1.29 fullscreen

This demo shows how to do many of the window manipulations that are popular for games. You can toggle the border on/off, switch between single- and double-buffered rendering, and take over the entire screen. More information in the source code.

24.1.30 gl_overlay

`gl_overlay` shows OpenGL overlay plane rendering. If no hardware overlay plane is available, FLTK will simulate it for you.

24.1.31 glpuzzle
The glpuzzle test shows how most Glut source code compiles easily under FLTK.

24.1.32 hello

hello: Hello, World. Need I say more? Well, maybe. This tiny demo shows how little is needed to get a functioning application running with FLTK. Quite impressive, I'd say.

24.1.33 help_dialog

help_dialog displays the built-in FLTK help browser. The Fl_Help_Dialog understands a subset of html and renders various image formats. This widget makes it easy to provide help pages to the user without depending on the operating system's html browser.

24.1.34 icon

icon demonstrates how an application icon can be set from an image. This icon should be displayed in the window bar (label), in the task bar, and in the task switcher (Windows: Alt-Tab). This feature is platform specific, hence it is possible that you can't see the icon. On Unix/Linux (X11) this can even depend on the Window Manager (WM).

24.1.35 iconize

iconize demonstrates the effect of the window functions hide(), iconize(), and show().

24.1.36 image

The image demo shows how an image can be created on the fly. This generated image contains an alpha (transparency) channel which lets previous renderings 'shine through', either via true transparency or by using screen door transparency (pixelation).

24.1.37 inactive

inactive tests the correct rendering of inactive widgets. To see the inactive version of images, you can check out the pixmap or image test.

24.1.38 input

This tool shows and tests different types of text input fields based on Fl_Input_. The input program also tests various settings of Fl_Input::when().

24.1.39 input_choice

input_choice tests the latest addition to FLTK1, a text input field with an attached pulldown menu. Windows users will recognize similarities to the 'ComboBox'. input_choice starts up in 'plastic' scheme, but the traditional scheme is also supported.

24.1.40 keyboard

FLTK unifies keyboard events for all platforms. The keyboard test can be used to check the return values of Fl::event_key() and Fl::event_text(). It is also great to see the modifier buttons and the scroll wheel at work. Quit this application by closing the window. The ESC key will not work.
24.1.41 label

Every FLTK widget can have a label attached to it. The label demo shows alignment, clipping, and wrapping of text labels. Labels can contain symbols at the start and end of the text, like @FLTK or @circle uh-huh @square.

24.1.42 line_style

Advanced line drawing can be tested with line_style. Not all platforms support all line styles.

24.1.43 list_visuals

This little app finds all available pixel formats for the current X11 screen. But since you are now an FLTK user, you don't have to worry about any of this.

24.1.44 mandelbrot

mandelbrot shows two advanced topics in one test. It creates grayscale images on the fly, updating them via the idle callback system. This is one of the few occasions where the idle callback is very useful by giving all available processor time to the application without blocking the UI or other apps.

24.1.45 menubar

The menubar tests many aspects of FLTK's popup menu system. Among the features are radio buttons, menus taller than the screen, arbitrary sub menu depth, and global shortcuts.

24.1.46 message

message pops up a few of FLTK's standard message boxes.

24.1.47 minimum

The minimum test program verifies that the update regions are set correctly. In a real life application, the trail would be avoided by choosing a smaller label or by setting label clipping differently.

24.1.48 native-filechooser

The native-filechooser program invokes the platform specific file chooser, if available (see Fl_Native_File_Chooser widget).

24.1.49 navigation

navigation demonstrates how the text cursor moves from text field to text field when using the arrow keys, tab, and shift-tab.

24.1.50 offscreen

offscreen shows how to draw into an offscreen image and display the offscreen image in the program window.
24.1.51 output

output shows the difference between the single line and multi line mode of the Fl_Output widget. Fonts can be selected from the FLTK standard list of fonts.

24.1.52 overlay

The overlay test app shows how easy an FLTK window can be layered to display cursor and manipulator style elements. This example derives a new class from Fl_Overlay_Window and provides a new function to draw custom overlays.

24.1.53 pack

The pack test program demonstrates the resizing and repositioning of children of the Fl_Pack group. Putting an Fl_Pack into an Fl_Scroll is a useful way to create a browser for large sets of data.

24.1.54 pixmap

This simple test shows the use of a LUT based pixmap as a label for a box widget. Pixmaps are stored in the X11 '.xpm' file format and can be part of the source code. Pixmaps support one transparent color.

24.1.55 pixmap_browser

pixmap_browser tests the shared-image interface. When using the same image multiple times, Fl_Shared_Image will keep it only once in memory.

24.1.56 preferences

I do have my preferences in the morning, but sometimes I just can't remember a thing. This is where the Fl_Preferences come in handy. They remember any kind of data between program launches.

24.1.57 radio

The radio tool was created entirely with fluid. It shows some of the available button types and tests radio button behavior.

24.1.58 resizebox

resizebox shows some possible ways of FLTK's automatic resize behavior.

24.1.59 rotated_text

rotated_text shows how text can be rotated, i.e. drawn in any given angle. This demo is device specific, for instance it works under X11 only if configured with Xft.

24.1.60 resize

The resize demo tests size and position functions with the given window manager.
24.1.61 scroll

scroll shows how to scroll an area of widgets, one of them being a slow custom drawing. Fl_Scroll uses clipping and smart window area copying to improve redraw speed. The buttons at the bottom of the window control decoration rendering and updates.

24.1.62 shape

shape is a very minimal demo that shows how to create your own OpenGL rendering widget. Now that you know that, go ahead and write that flight simulator you always dreamt of.

24.1.63 subwindow

The subwindow demo tests messaging and drawing between the main window and 'true' sub windows. A sub window is different to a group by resetting the FLTK coordinate system to 0, 0 in the top left corner. On Win32 and X11, subwindows have their own operating system specific handle.

24.1.64 sudoku

Another highly addictive game - don't play it, I warned you. The implementation shows how to create application icons, how to deal with OS specifics, and how to generate sound.

24.1.65 symbols

symbols are a speciality of FLTK. These little vector drawings can be integrated into labels. They scale and rotate, and with a little patience, you can define your own. The rotation number refers to 45 degree rotations if you were looking at a numeric keypad (2 is down, 6 is right, etc.).

24.1.66 table

The table demo shows the features of the Fl_Table widget.

24.1.67 tabs

The tabs tool was created with fluid. It tests correct hiding and redisplaying of tabs, navigation across tabs, resize behavior, and no unneeded redrawing of invisible widgets.

The tabs application shows the Fl_Tabs widget on the left and the Fl_Wizard widget on the right side for direct comparison of these two panel management widgets.

24.1.68 threads

FLTK can be used in a multithreading environment. There are some limitations, mostly due to the underlying operating system. threads shows how to use Fl::lock(), Fl::unlock(), and Fl::awake() in secondary threads to keep FLTK happy. Although locking works on all platforms, this demo is not available on every machine.

24.1.69 tile

The tile tool shows a nice way of using Fl_Tile. To test correct resizing of subwindows, the widget for region 1 is created from an Fl_Window class.
24.1.70 tiled_image

The tiled_image demo uses a small image as the background for a window by repeating it over the full size of the widget. The window is resizable and shows how the image gets repeated.

24.1.71 tree

The tree demo shows the features of the Fl_Tree widget.

24.1.72 twowin

The twowin program tests focus transfer from one window to another window.

24.1.73 unittests

unittests exercises all of FLTK's drawing features (e.g., text, lines, circles, images), as well as scrollbars and schemes.

24.1.74 utf8

utf8 shows all fonts available to the platform that runs it, and how each font draws each of the Unicode code points ranging between U+0020 and U+FFFF.

24.1.75 valuators

valuators shows all of FLTK's nifty widgets to change numeric values.

24.1.76 windowfocus

windowfocus shows a very special case when a new window is shown while the focus stays in the original window.

24.1.77 fluid

fluid is not only a big test program, but also a very useful visual UI designer. Many parts of fluid were created using fluid. See the Fluid Tutorial for more details.

24.2 Example Applications: Images

This chapter contains a few selected images of the test and example applications listed above. It is not meant to be complete or a full reference. The reason some images are included here is to show how the display should look when running the example programs.

24.2.1 cairo_test
The `cairo_test` demo program shows three shiny buttons drawn with Cairo in an `Fl_Cairo_Window`.

![Buttons drawn with Cairo](image1)

**Figure 24.1 Buttons drawn with Cairo**

### 24.2.2 icon

The `icon` program lets you set the program icon from an image (here an `Fl_RGB_Image`).

![Green icon (Windows 10)](image2)

**Figure 24.2 Green icon (Windows 10)**

### 24.2.3 unitests
Select "drawing images" in the browser at the left side to see the image drawing example:

![Image Drawing](image.png)

Figure 24.3 Image Drawing
Chapter 25

FAQ (Frequently Asked Questions)

A list of frequently asked questions about FLTK.
This appendix describes various frequently asked questions regarding FLTK.

- Where do I start learning FLTK?
- How do I make a box with text?
- Can I use FLTK to make closed-source commercial applications?
- Hitting the 'Escape' key closes windows - how do I prevent this?

25.1 Where do I start learning FLTK?

It is assumed you know C++, which is the language all FLTK programs are written in, including FLTK itself.
If you like reading manuals to work your way into things, a good start is the FLTK documentation's Introduction to FLTK. Under the FLTK Basics section there's an example 'hello world' program that includes a line-by-line description.
If you like looking at simple code first to pique your interest, and then read up from there, start with the example programs in the test/ and examples/ directory that is included with the source code. A good place to start is the 'hello world' program in test/hello.cxx. Also do a google search for "FLTK example programs". "Erco's Cheat Page" is one that shows many simple examples of how to do specific things.
If you like to run example programs and look for ones that are like yours and then read them, download and build FLTK from the source, then run the test/demo program. Also, go into the 'examples/' directory and run 'make', then run some of those programs.
If you prefer watching TV to reading books and code, google search for "FLTK video tutorials" which has some introductory examples of how to write FLTK programs in C++ and build them.

25.2 How do I make a box with text?

The 'hello world' program shows how to make a box with text. All widgets have labels, so picking a simple widget like Fl_Box and setting its label() and using align() to align the label and labelfont() to set the font, and labelsize() to set the size, you can get text just how you want.
Labels are not selectable though; if you want selectable text, you can use Fl_Output or Fl_Multiline_Output for simple text that doesn't include scrollbars. For more complex text that might want scrollbars and multiple colors/fonts, use either Fl_Text_Display which handles plain text, or Fl_Help_View which handles simple HTML formatted text.

25.3 Can I use FLTK to make closed-source commercial applications?

Yes. The FLTK Software License is standard LGPL, but also includes a special clause ("exception") to allow for static linking. Specifically:

[from the top of the FLTK LGPL License section on exceptions]

3. Static linking of applications and widgets to the FLTK library does
not constitute a derivative work and does not require the author to provide source code for the application or widget, use the shared FLTK libraries, or link their applications or widgets against a user-supplied version of FLTK.

If you link the application or widget to a modified version of FLTK, then the changes to FLTK must be provided under the terms of the LGPL in sections 1, 2, and 4.

4. You do not have to provide a copy of the FLTK license with programs that are linked to the FLTK library; nor do you have to identify the FLTK license in your program or documentation as required by section 6 of the LGPL.

However, programs must still identify their use of FLTK. The following example statement can be included in user documentation to satisfy this requirement:

[program/widget] is based in part on the work of the FLTK project (https://www.fltk.org).

25.4 Hitting the 'Escape' key closes windows - how do I prevent this?

[From FLTK article #378]

1. FLTK has a "global event handler" that makes Escape try to close the window, the same as clicking the close box. To disable this everywhere you can install your own that pretends it wants the escape key and thus stops the default one from seeing it (this may not be what you want, see below about the callbacks):

```c
static int my_handler(int event) {
  if (event == FL_SHORTCUT) return 1; // eat all shortcut keys
  return 0;
}
...in main():
Fl::add_handler(my_handler);
...}
```

1. Attempts to close a window (both clicking the close box or typing Escape) call that window's callback. The default version of the callback does hide(). To make the window not close or otherwise do something different you replace the callback. To make the main window exit the program:

```c
void my_callback(Fl_Widget*, void*) {
  exit(0);
}
... main_window->callback(my_callback);
...}
```

If you don't want Escape to close the main window and exit you can check for and ignore it. This is better than replacing the global handler because Escape will still close pop-up windows:

```c
void my_callback(Fl_Widget*, void*) {
  if (Fl::event() == FL_SHORTCUT && Fl::event_key() == FL_Escape)
    return; // ignore Escape
  exit(0);
}
```

The reason for calling a window callback can also be found using the `Fl::callback_reason()` method:

```c
void my_callback(Fl_Widget*, void*) {
  if (Fl::callback_reason() == FL_REASON_CANCELLED)
    return; // ignore that the user pressed the Escape key
  if (Fl::callback_reason() == FL_REASON_CLOSED)
    save_and_exit(); // user clicked the Close button in the window decoration
  exit(0); // fallback for other callback reasons
}
```

It is very common to ask for confirmation before exiting, this can be done with:

```c
void my_callback(Fl_Widget*, void*) {
  if (fl_choice("Are you sure you want to quit?",
              "continue", "quit", NULL))
    exit(0);
}
```
Chapter 26

Development of the FLTK library

- The Wayland backend for its developer
- Developer info for bundled libs
- Developer Information

26.1 The Wayland backend for its developer

This chapter describes how the Wayland backend of FLTK works from a developer's viewpoint.

26.1.1 Introduction to Wayland

Wayland usage involves communication via a Unix domain socket between a client application and another process called the Wayland compositor which creates, moves, resizes and draws windows on the display. Diverse Wayland compositors exist. They can follow rather diverse logics. For example, FreeBSD offers Sway which is a tiling compositor where the display is always entirely filled with whatever resizable windows are mapped at any given time. Compositors follow either the client-side decoration (CSD) rule where client apps draw window titlebars, or the server-side decoration (SSD) rule where the compositor draws titlebars. FLTK supports both CSD and SSD compositors. It uses a library called libdecor charged of determining whether a CSD or a SSD compositor is active, and of drawing titlebars in the first case.

Wayland is divided in various protocols that a given compositor may or may not support, although they all support the core protocol. Each protocol adds functionality not available in the core protocol. Wayland Explorer lists all protocols. The core protocol allows a client app to discover what protocols the connected compositor supports. Protocols can be stable, which means they have a defined API that will not change but can be expanded, or unstable. For example, mapping a window on a display is not done by the core protocol but by the xdg shell protocol which is stable. The names of symbols used by unstable protocols always begin with letter 'z'. For example, FLTK uses unstable protocol Text input to support CJK input methods; its symbol names begin with zwp_text_input_v3.

Wayland makes intensive use of the listener mechanism. A listener is a small array of pointers to FLTK-defined callback functions associated to a Wayland-defined object; Wayland calls these functions when defined events occur (more at Listeners below).

Wayland differs noticeably from X11 in that rendering is left to clients: Wayland provides no drawing API. Instead, Wayland provides objects of type struct wl_buffer which encapsulate a memory array of pixel values shared between the client and the compositor. The client app is expected to draw to that memory buffer with whatever means it chooses, and to instruct the compositor to map those pixels to the display when the drawing is complete. The Wayland platform of FLTK draws with the Cairo library to Fl_Window's and Fl_Image_Surface's, and with OpenGL to Fl_Gl_Winodw's.

Wayland differs also from X11 in that the position of a window in the display is completely hidden to the client app. This prevents function Fl_Window::position() from having any effect on a top-level window. Wayland also prevents a client app from knowing whether a window is minimized: Fl_Window::show() has no effect on a minimized window. Subwindows can be positioned as usual relatively to their parent window. Wayland allows to create popup windows positioned relatively to a previously mapped other window. This allows FLTK to position adequately menu and tooltip windows (see Menu windows and other popups). FLTK uses also popups for the small,
yellow windows that display the new scale factor value when it's changed: these are created as short-lived popups centered above Fl::first_window().

Wayland uses a trick of its own to handle lists of linked records. It defines type struct wl_list and a few macros (wl_list_init(), wl_list_for_each(), wl_list_insert(), wl_list_for_each_safe(), wl_list_remove()) to manage linked lists. Records put in these lists must contain a member variable of type struct wl_list used to link records together and often named 'link'. Access to such a list is possible memorizing a value of type struct wl_list computed by macro wl_list_init(). Macro wl_list_for_each(arg1, arg2, arg3) allows to run through all list elements with:

- arg1 is a pointer variable of the type of elements of the linked list;
- arg2 is the address of a variable of type struct wl_list identifying the targeted list;
- arg3 is the name of the member variable of these elements used to link them together.

For example, wl_list_for_each() can be used as follows to scan the linked list of all displays of the system (see Fl_Wayland_Screen_Driver::output):

```cpp
Fl_Wayland_Screen_Driver *output = Fl::screen_driver();
wl_list_for_each(output, &output->outputs, link) {
  // ... work with output, an item of the linked list of all displays in the system ...
}
```

Overall, and ignoring for now OpenGL usage, FLTK interacts with Wayland as follows:

- When opening the display: FLTK calls Fl::add_fd() in FL_READ mode to associate a callback function to the socket connecting the client and the compositor.
- Client to compositor: FLTK calls C functions of the libwayland-client.so, libwayland-cursor.so, libxkbcommon.so and libdecor library. These send suitable messages to the compositor writing to the socket. The names of these functions begin with wl_, xkb_ or libdecor_.
- Compositor to client: the callback function runs when there are data to read in the socket; it calls wl_display_dispatch() which interprets the read data and calls corresponding listeners.

The core protocol defines also a number of mostly opaque structures whose names begin with wl_. The names of symbols and types defined by the other protocols FLTK uses begin with xdg_, zwp_text_input_v3, zxdg_toplevel_decoration_, gtk_shell1_ and gtk_surface1_. FLTK defines a few structures holding Wayland-related data. The names of FLTK-defined structures don't begin with wl_. For example, struct wld_window (see wld_window) is used to store all Wayland-specific data associated to a mapped Fl_Window.

### 26.1.2 Building libfltk as a Wayland client

Classes Fl_Wayland_Window_Driver, Fl_Wayland_Screen_Driver, Fl_Wayland_Graphics_Driver, Fl_Wayland_Copy_Surface_Driver, Fl_Wayland_Image_Surface_Driver and Fl_Wayland_GL_Window_Driver and file fl_wayland_platform_init.cxx contain all the Wayland-specific code of the FLTK library. This code is located at src/drivers/Wayland/ in the FLTK source tree. A single C++ source file generally contains all the code of a given class. The code related to copy, paste and drag-and-drop operations, however, is gathered in file fl_wayland_clipboard_dnd.cxx and contains a few member functions of class Fl_Wayland_Screen_Driver. Furthermore, class Fl_UNIX_System_Driver is used by both the Wayland and the X11 FLTK platforms. File FL/fl_config.h defines preprocessor variables FLTK_USE_WAYLAND and FLTK_USE_CAIRO.

The public C API to Wayland, xkb, EGL and libdecor libraries are obtained with

```cpp
#include <wayland-client.h>
#include <wayland-cursor.h>
#include <xkbcommon/xkbcommon.h>
#include <xkbcommon/xkbcommon-compose.h>
#include <linux/input.h> // for BTN_LEFT, BTN_RIGHT, BTN_MIDDLE
#include ".../libdecor/src/libdecor.h"
#include ".../libdecor/src/libdecor-plugin.h"
#if HAVE_GL
#include <wayland-egl.h>

// necessary.
```

File README.Wayland.txt details what software packages are needed on Debian-based, Fedora and FreeBSD systems for FLTK to use Wayland. Wayland protocols are packaged as XML files accompanied by a utility program, wayland-scanner, able to generate a header file and a necessary glue C source file from a given XML file. For
example, for FLTK to use the XDG_shell protocol, these commands are run at build time to generate a .c file that will be compiled into libfltk and a header file that FLTK code will include:

```
PROTOCOLS='pkg-config --variable=pkgdatadir wayland-protocols'
wayland-scanner private-code $PROTOCOLS/stable/xdg-shell/xdg-shell.xml xdg-shell-protocol.c
wayland-scanner client-header $PROTOCOLS/stable/xdg-shell/xdg-shell.xml xdg-shell-client-protocol.h
```

Similar operations are performed for FLTK to use protocols XDG decoration, Text input and GTK Shell.

### 26.1.3 The hybrid Wayland/X11 platform

The Wayland platform of FLTK is normally a two-legged hybrid able to use either Wayland or X11 and to choose between these possibilities at run-time, without any change to the client application. The Wayland/X11 hybrid is essentially a version of the FLTK library containing both all Wayland-specific and all X11-specific code. That's reflected in file FL/fl_config.h which defines both FLTK_USE_WAYLAND and FLTK_USE_X11. This creates the constraint that Wayland and X11 cannot use the same type name for different purposes or the same symbol name. That is why function fl_xid(const Fl_Window*) is deprecated in FLTK 1.4 and replaced by fl_wl_xid() for Wayland and fl_x11_xid() for X11. Also, global variable Window fl_window is not used by the Wayland platform which instead uses static struct wld_window *Fl_Wayland_Window_Driver:: wld_window.

The FLTK library contains also a short source file, fl_wayland_platform_init.cxx, that determines, at startup time, whether the app will run as a Wayland or an X11 client. Function attempt_wayland() therein performs this choice as follows:

- if the app defines a global bool variable called fl_disable_wayland and this variable is true, the X11 leg is chosen;
- if environment variable FLTK_BACKEND is defined to string "wayland", the Wayland leg is chosen;
- if environment variable FLTK_BACKEND is defined to string "x11", the X11 leg is chosen;
- otherwise, a connection to a Wayland compositor is attempted; if it's successful, the Wayland leg is chosen; if it's not, the X11 leg is chosen.

The first condition listed above is meant to facilitate transition to FLTK 1.4 of source code written for FLTK 1.3 and containing X11-specific code: it's enough to put

```
FL_EXPORT bool fl_disable_wayland = true;
```

anywhere in the source code, for the app to run with 1.4, using the x11 leg of the hybrid platform, without any other change in the source code nor to the application's environment.

In special situations, such as with embedded systems equipped with the Wayland software but lacking the X11 library, it's possible to build the FLTK library such as it contains only the Wayland backend. This is achieved building FLTK with cmake -D OPTION_WAYLAND_ONLY=on or with configure -disable-x11. In that case, FL/fl_config.h does not define FLTK_USE_X11.

The rest of this chapter describes what happens when the Wayland leg has been chosen.

### 26.1.4 Listeners

A Wayland 'listener' is a small array of pointers to FLTK-defined callback functions associated to a Wayland-defined object; Wayland calls these functions when defined events occur, and transmits relevant information to the client app as parameters of these calls. Each listener is associated to its corresponding Wayland object, usually right after the object's creation, by a call to a specific Wayland function named following the form `wl_XXX_add_listener()`. For example, this code:

```
static void surface_enter(......) { ...... } // called when a surface enters a display
static void surface_leave(......) { ...... } // called when a surface leaves a display
static struct wl_surface_listener surface_listener = {
    surface_enter,
    surface_leave,
};
some_pointer_type pter_to_data;
struct wl_surface *my_wl_surface;
my_wl_surface = wl_compositor_create_surface(scr_driver->wl_compositor);
wlsurface_add_listener(my_wl_surface, &surface_listener, pter_to_data);
```

creates a Wayland object of type struct wl_surface, and associates it with a 2-member listener called surface_listener. After this, Wayland is expected to call the 2 listener members, surface_enter or surface_leave, each time my_wl_surface will enter or leave, respectively, a display. The arguments of these calls, not detailed here, allow the listener functions to identify which surface enters or leaves which display. The `wl_surface_add_listener()` call above also associates pter_to_data to my_wl_surface as
user data. The \texttt{wl_surface} object's "user data" can be obtained later calling function \texttt{wl_surface_get_user_data()}.  
Wayland function \texttt{wl_proxy_get_listener()} returns a pointer to a Wayland object's listener provided that object is transmitted cast to type \texttt{struct wl_proxy ∗}. This gives a handy way to distinguish FLTK-created Wayland objects from objects of other origin: the listener of an FLTK-created object is a known FLTK listener. For example, function \texttt{Fl_Wayland_Window_Driver::surface_to_window()} uses this possibility calling \texttt{wl_proxy_get_listener( (struct wl_proxy ∗)wl_surface )} for any object of type \texttt{struct wl_surface}: if that object was created as in the example above, this call returns a pointer to FLTK's \texttt{surface_listener} static variable.

26.1.5 Opening a Wayland connection

Establishing a Wayland connection requires environment variable \texttt{XDG_RUNTIME_DIR} to be defined and to point to a directory containing a socket connected to a Wayland compositor. This variable is usually set by the login procedure of Wayland-friendly desktops. The name of the Wayland socket is determined as follows:

- the client may call \texttt{Fl::display(const char ∗display_name) before \texttt{f1_open_display()}} runs or use the \texttt{-display} command line argument and transmit there the socket name;
- environment variable \texttt{WAYLAND_DISPLAY} can be defined to the socket name;
- otherwise, "wayland-0" is used.

What socket is selected determines what compositor will be used by the client application.

Function \texttt{Fl_Wayland_Screen_Driver::open_display_platform()} establishes the connection to the Wayland socket identified above calling \texttt{wl_display_connect(NULL)} which returns a \texttt{struct wl_display} pointer or \texttt{NULL} in case of failure. Such \texttt{NULL} return is the hint that allows the FLTK display opening procedure of the Wayland/X11 hybrid to recognize when Wayland access is not possible and to fallback to X11.

Then, function \texttt{wl_registry_add_listener()} associates a 2-member listener, whose 1st member, \texttt{registry_handle_global()}, will be called by Wayland a number of times to indicate each time a protocol supported by the compositor or a system feature such as displays and keyboards. This code allows to run the client until all calls to \texttt{registry_handle_global()} have occurred:

\begin{verbatim}
    static void registry_handle_global(void ∗user_data, struct wl_registry ∗wl_registry,
                                       uint32_t id, const char ∗interface, uint32_t version) {
        // ... code to handle global registration events ...
    }

    wl_registry ∗registry = wl_display_get_registry(wl_display);
    registry_cb = wl_registry_add_listener(registry, registry_handle_global);
\end{verbatim}

A pointer to an object of type \texttt{struct wl_callback} created by function \texttt{wl_display_sync()} is assigned to variable \texttt{registry_cb}. Then a 1-member listener is attached to this object. Wayland will run this listener's member function, \texttt{sync_done()}, after all calls to \texttt{registry_handle_global()} have occurred. Function \texttt{sync_done()} sets to null variable \texttt{registry_cb} and destroys the \texttt{wl_callback}. Finally, function \texttt{wl_display_dispatch()} is called as long as variable \texttt{registry_cb} is not null. This makes Wayland process all its pending requests until \texttt{sync_done()} runs.

The prototype of function \texttt{registry_handle_global()} is:

\begin{verbatim}
    static void registry_handle_global(void ∗user_data, struct wl_registry ∗wl_registry,
                                       void ∗user_data, struct wl_registry ∗wl_registry,
                                       uint32_t id, const char ∗interface, uint32_t version)
\end{verbatim}

Each time Wayland calls \texttt{registry_handle_global()}, \texttt{interface} and \texttt{version} give the name and version of a component or feature of the Wayland system. It's necessary to call each time function \texttt{wl_registry_bind()} which returns a pointer to a Wayland structure that will be the client's access point to the corresponding Wayland protocol or system feature. This pointer is stored in a dedicated member variable of the unique \texttt{Fl_Wayland_Screen_Driver} object of an FLTK app, or of another object accessible from this object. For example, when \texttt{interface} equals "wl_compositor", the value returned by \texttt{wl_registry_bind()} is stored as member \texttt{wl_compositor} of the \texttt{Fl_Wayland_Screen_Driver} object. \texttt{registry_handle_global()} also identifies whether the Mutter, Weston, or KWin compositor is connected and stores this information in static member variable \texttt{Fl_Wayland_Screen_Driver::compositor}.

Wayland calls \texttt{registry_handle_global()} with its parameter \texttt{interface} equals to "wl_output" once for each screen connected to the system. Each time, an object of type \texttt{struct wl_output} is created, to which a 4-member listener is associated by function \texttt{wl_output_add_listener()}. The 3rd member of this 4-function listener, \texttt{output_done()}, runs after all initialization steps of the screen have completed and turns to true...
26.1 The Wayland backend for its developer

Wayland defines objects called surfaces of type `struct wl_surface`. A Wayland surface "has a rectangular area which may be displayed on zero or more displays, present buffers, receive user input, and define a local coordinate system". In other words, surface is the name Wayland uses for a window. Buffers allow the client app to draw to surfaces (see Wayland buffers). FLTK creates a surface each time an `Fl_Window` is show()ed, and has initialized all screens of the system. For DECOURED windows, this object is created inside libdecor and transmitted to FLTK by function `libdecor_frame_get_xdg_surface()`. For UNFRAMED and POPUP windows, it's created by function `xdg_wm_base_get_xdg_surface()`. Finally, each surface is also associated to one more Wayland object whose type varies with the window's kind. These explain this part of the `wl_window` record:

```c
struct {
    struct libdecor_frame *frame; // created for DECOURED by libdecor_decorate()
    struct wl_subsurface *subsurface; // created for SUBWINDOW by wl_subcompositor_get_subsurface()
    struct xdg_popup *xdg_popup; // created for POPUP by xdg_surface_get_popup()
    struct xdg_toplevel *xdg_toplevel; // created for UNFRAMED by xdg_surface_get_toplevel()
};
```

Except for SUBWINDOW's, each surface is associated to a 'configure' function that Wayland calls once or more times when the window is going to be mapped on the display. The 'configure' function of DECOURED surfaces is `libdecor_frame_configure()` which is the 1st member of a 4-member listener named `libdecor_frame_listener` associated to a decorated window when it's created calling `libdecor_decorate()`. Finally, a call to `libdecor_frame_map()` triggers the process of mapping the newly created DECOURED surface on a display. Wayland calls `handle_configure()` twice during this process. The first `handle_configure()` run allows to set the window's `xdg_surface` object which is returned by function `libdecor_frame_get_xdg_surface()`. Finally, each surface is also associated to one more Wayland object whose type varies with the window's kind. These explain this part of the `wl_window` record:

```c
union {
    struct libdecor_frame *frame; // created for DECOURED by libdecor_decorate()
    struct wl_subsurface *subsurface; // created for SUBWINDOW by wl_subcompositor_get_subsurface()
    struct xdg_popup *xdg_popup; // created for POPUP by xdg_surface_get_popup()
    struct xdg_toplevel *xdg_toplevel; // created for UNFRAMED by xdg_surface_get_toplevel()
};
```

Finally, function `wl_display_get_fd()` is called to obtain the file descriptor of the Wayland socket and a call to `Fl::add_fd()` makes FLTK listen to this descriptor in FL_READ mode and associates function `wl_displaysocket_callback()` with the file descriptor. This function calls `wl_display_dispatch()` which reads and interprets data available from the file descriptor, and calls corresponding listeners. The event loop is run by function `Fl::System_Driver::wait()` which is used by both the Wayland and X11 FLTK backends. Among various tasks, this function waits for data arriving on the file descriptors FLTK is listening. Overall, the event loop of the Wayland backend is nearly exactly the same as that used by the X11 backend. The Wayland backend differs only in the callback function handling data read from the Wayland connection socket, and in overridden functions `Fl_Wayland_Screen_Driver::poll_or_select_with_delay()` and `Fl_Wayland_Screen_Driver::poll_or_select()`.
configure().

When a decorated window changes size, whatever the cause of it, Wayland calls handle_configure() which sets member variable Fl_Wayland_Window_Driver::in_handle_configure to true and calls the window's virtual resize() function which ultimately runs Fl_Wayland_Window_Driver::resize() which calls Fl_Group::resize() to perform FLTK's resize operations and Fl_Wayland_Graphics_Driver::buffer_release() to delete the existing window buffer that's not adequate for the new window size. At the end of the run of handle_configure(), in_handle_configure is set back to false. When the window size change is caused by the app itself calling the window's resize() function, Fl_Wayland_Window_Driver::in_handle_configure is false. This allows Fl_Wayland_Window_Driver::resize() to detect that Wayland needs be informed of the desired size change, which gets done by a call to libdecor_frame_commit(). Wayland later calls handle_configure() and events described above unfold.

Wayland generally does not provide a way to control where the compositor should map a window in the system displays. Nevertheless, for multi-display systems, Wayland allows to control on what display should the compositor map a fullscreen window. That is done inside function handle_configure() which calls libdecor_frame_commit() for DECORATED windows and inside function xdg_toplevel_configure() which calls xdg_toplevel_set_fullscreen() for UNFRAMED. The struct wl_output pointer for the targeted display is transmitted as 2nd argument of these calls.

### 26.1.7 Menu windows and other popups

Menu windows, tiny menu title windows, and tooltip windows are implemented using Wayland's popup mechanism which allows to position a popup window relatively to a previously mapped window, itself a popup or another kind of window, with the restriction that any popup must overlap or at least touch that other window. Member function Fl_Wayland_Window_Driver::makeWindow calls member function Fl_Wayland_Window_Driver::process_menu_or_tooltip to create all popups. This function gets called after FLTK has computed using a given algorithm the desired (x,y) position of the popup window's top-left corner, using coordinates centered on the top-left corner of the toplevel window from which the popup originates. This algorithm is able to prevent popups from being positioned beyond the screen borders under the assumption that the position of a toplevel window inside a screen is known. While this assumption holds for other platforms, it does not for the Wayland platform. The FLTK code for the Wayland platform therefore modifies the algorithm that FLTK uses to compute the position of menu windows. The key information used by this algorithm is obtained by member function Fl_Wayland_Window_Driver::menu_window_area which computes the coordinates of the rectangle where menu windows are allowed to be positioned. Under other platforms, this function just returns the origin and size of the work area of the screen in use. In contrast, the Wayland platform handles two situations differently:

- For menu windows that are not taller than the display in use, the Wayland-overridden member function Fl_Wayland_Window_Driver::menu_window_area returns large negative origin and large width and height values. This lets the standard FLTK algorithm position the menu relatively to its window of origin without concern about screen limits, and relies on Wayland's constraint mechanism described below to prevent the menu from going beyond these limits, without FLTK having to know where they are.

- Menu windows taller than the screen where they are mapped need special handling described in detail in a comment above the source code of function Fl_Wayland_Window_Driver::process_menu_or_tooltip.

Function Fl_Wayland_Window_Driver::process_menu_or_tooltip first computes origin_win, pointer to the F1_Window relatively to which the popup is to be positioned. Window origin_win is the parent menu window when the popup is a sub-menu; it's the tiny windowtitle when the popup is a menu with a title; otherwise, it's the window containing the point of origin of the popup. An object of type struct xdg_positioner created by function xdg_wm_base_create_positioner() is used to express the rules that will determine the popup position relatively to origin_win as follows:

- Function xdg_positioner_set_anchor_rect() determines a rectangle in origin_win relatively to which the popup is to be positioned. When the popup to be created is a menu window spawned by an Fl_Menu_Bar, that rectangle is the full area of the menu title window. Otherwise, that rectangle is an adequately located point.

- Function xdg_positioner_set_size() sets the popup size.
• The \texttt{xdg_positioner_set_anchor} \texttt{(positioner, XDG\_POSITIONER\_ANCHOR\_BOTTOM\_LEFT)}; and \texttt{xdg_positioner_set_gravity} \texttt{(positioner, XDG\_POSITIONER\_GRAVITY\_BOTTOM\_RIGHT)}; calls position the popup so that its top-left corner is initially below and at right of the bottom-left corner of the \texttt{origin\_win}'s anchor rectangle.

• The call to \texttt{xdg_positioner_set_offset()} further changes the popup vertical position.

• The call to \texttt{xdg_positioner_set_constraint_adjustment()} uses constraint flags \texttt{XDG\_POSITIONER\_CONSTRAINT\_ADJUSTMENT\_SLIDE\_X} and \texttt{XDG\_POSITIONER\_CONSTRAINT\_ADJUSTMENT\_SLIDE\_Y} which mean that the compositor will move the popup horizontally and vertically if its initial position would make it expand beyond the edges of the screen. Furthermore, flag \texttt{XDG\_POSITIONER\_CONSTRAINT\_ADJUSTMENT\_FLIP\_Y} is added when the popup is a menu window spawned by an \texttt{Fl\_Menu\_Bar}; this has the popup flipped above the \texttt{Fl\_Menu\_Bar} if there's not enough screen room below it for the popup.

• Finally, a call to function \texttt{xdg_surface_get_popup()} creates the popup accounting for position rules listed above. The positioner is then deleted by \texttt{xdg_positioner_destroy()}, a listener is associated to the popup surface with \texttt{xdg_popup_add_listener()}, and a call to \texttt{wl_surface_commit()} triggers the mapping of the popup on the display.

Overall, the expected coordinates of the top-left corner of the popup relatively to \texttt{origin\_win} are \texttt{popup\_x}, \texttt{popup\_y}. They are memorized in a record of FLTK-defined type \texttt{struct win\_positioner} that's associated to the popup listener. When the compositor maps the popup, function \texttt{popup\_configure}, the first element of the popup listener, runs and receives as arguments the coordinates of the popup top left and its size. These values account for the positioning constraints of the popup which may have moved it to avoid screen borders. This function can therefore detect whether constraints applied have modified the effective popup location in comparison to the expected coordinates which are available as member variables of the \texttt{struct win\_positioner} record mentioned above. That's key to the handling by FLTK of tall menu windows.

Groups of popups containing a menutitle, the associated menuwindow, and optionally a submenu window and that don't belong to an \texttt{Fl\_Menu\_Bar} are mapped in a different order: the menuwindow is mapped first, and the menutitle is mapped second above it as a child popup. Function \texttt{Fl\_Window\_Driver::is\_floating\_menutitle()} detects when such a menutitle is created, static member variable \texttt{previous\_floating\_menutitle} is assigned the value of this menutitle, and the menutitle is mapped only after the menuwindow has been mapped, as a child of it. This positions better the popup group in the display relatively to where the popup was created.

\subsection{Fl\_Wayland\_Graphics\_Driver and Fl\_Cairo\_Graphics\_Driver}

The Wayland platform of FLTK uses an \texttt{Fl\_Wayland\_Graphics\_Driver} object for all its on-screen drawing operations. This object is created by function \texttt{Fl\_Graphics\_Driver::new\_main\_graphics\_driver()} called by \texttt{Fl\_Display\_Device::display\_device()} when the library opens the display. New \texttt{Fl\_Wayland\_Graphics\_Driver} objects are also created for each \texttt{Fl\_Image\_Surface} and each \texttt{Fl\_Copy\_Surface} used, and deleted when these objects are deleted.

Class \texttt{Fl\_Wayland\_Graphics\_Driver} derives from class \texttt{Fl\_Cairo\_Graphics\_Driver} which implements all the FLTK drawing API for a Cairo surface. Function \texttt{Fl\_Wayland\_Graphics\_Driver::cairo\_init()} creates the Cairo surface used by each \texttt{Fl\_Wayland\_Graphics\_Driver} object by calling \texttt{cairo\_image\_surface\_create\_for\_data()} for the window's or offscreen's draw buffer (see below).

Class \texttt{Fl\_Cairo\_Graphics\_Driver} is also used by the X11 leg of the hybrid Wayland-X11 platform because this leg draws to the display with a \texttt{Fl\_X11\_Cairo\_Graphics\_Driver} object which derives from class \texttt{Fl\_Cairo\_Graphics\_Driver}. Finally, \texttt{Fl\_Cairo\_Graphics\_Driver} is also used, in the form of an object from its derived class \texttt{Fl\_PostScript\_Graphics\_Driver}, when the hybrid Wayland-X11 platform draws PostScript, or when the classic X11 platform uses Pango and draws PostScript. This happens when classes \texttt{Fl\_PostScript\_File\_Device} and \texttt{Fl\_Printer} are used.

\subsection{Wayland buffers}

Wayland uses buffers, objects of type \texttt{struct wl\_buffer}, to draw to surfaces. In principle, one or more buffers can be associated to a surface, and functions \texttt{wl\_surface\_attach()} and \texttt{wl\_surface\_commit()} are called to first attach one such buffer to the surface and then inform the compositor to map this buffer’s graphics content on the display. Wayland buffers can use various memory layouts. FLTK uses \texttt{WL\_SHM\_FORMAT\_ARGB8888}, which is the same layout as what Cairo calls \texttt{CAIRO\_FORMAT\_ARGB32}. 

Generated by Doxygen
FLTK calls function `Fl_Wayland_Window_Driver::make_current()` before drawing to any `Fl_Window`. Member buffer of this `Fl_Window`'s struct `wld_window` (see `wld_window`) is NULL when the window has just been created or resized. In that case, FLTK calls `Fl_Wayland_Graphics_Driver::create_wld_buffer()` which returns a pointer to a struct `wld_buffer` containing

- a Wayland buffer, member `wl_buffer`;
- a Cairo image surface, created by a call to `Fl_Wayland_Graphics_Driver::cairo_init()`.

Each of these two objects encapsulates a byte array of the same size and the same memory layout destined to contain the `Fl_Window`'s graphics. The Cairo image surface object is where FLTK draws. The Wayland buffer is what Wayland maps on the display. FLTK copies the Cairo surface's byte array to the Wayland buffer's byte array before beginning the mapping operation. If `width` and `height` are a window's dimensions in pixels,

```c
int stride = cairo_format_stride_for_width(CAIRO_FORMAT_ARGB32, width);
int size = stride * height;
```

give size, the common size of both byte arrays.

The effective creation of the `wl_buffer` object is delayed until function `Fl_Wayland_Graphics_Driver::buffer_commit()` gets called. Section Buffer factories below details how FLTK creates `wl_buffer` objects.

The struct `Fl_Wayland_Graphics_Driver::wld_buffer` (see `wld_buffer`) contains a pointer to the byte array of the Cairo image surface (member `draw_buffer.buffer`), information about the Wayland buffer (members `wl_buffer` and `data`), the common size of the Cairo surface's and Wayland buffer's byte arrays (member `draw_buffer.data_size`, and other information. A pointer to this struct `Fl_Wayland_Graphics_Driver::wld_buffer` is memorized as member `buffer` of the `Fl_Window`'s `wld_window`. All drawing operations to the `Fl_Window` then modify the content of the Cairo image surface.

Function `Fl_Wayland_Window_Driver::flush()` is in charge of sending FLTK graphics data to the display. That is done by calling function `Fl_Wayland_Graphics_Driver::buffer_commit()` which creates the struct `wl_buffer` object calling `create_shm_buffer()` if that was not done before, copies the byte array of the Cairo surface to the Wayland buffer's starting memory address, and calls functions `wl_surface_attach()` and `wl_surface_commit()`. Before calling `Fl_Window::flush()`, FLTK has computed a damaged region. If that region is not null, `Fl_Wayland_Graphics_Driver::buffer_commit()` copies only the damaged parts of the Cairo surface to the Wayland buffer and calls function `wl_surface_damage_buffer()` for these parts to inform the compositor of what parts of the surface need its attention.

Throttling redraw operations

An important detail here is that FLTK uses Wayland's synchronization mechanism to make sure the surface's `wl_buffer` is not changed while the compositor is using it and to refrain from calling `wl_surface_commit()` more frequently than the system can process it. This 2-step mechanism works as follows:

- `Fl_Wayland_Graphics_Driver::buffer_commit()` first calls function `wl_surface_frame()` to obtain a pointer to a struct `wl_callback` object and stores it as member `cb` of the surface's `wl_buffer`. Then it calls `wl_callback_add_listener()` to associate this object to the FLTK-defined, callback function `surface_frame_done()`. It next calls `wl_surface_commit()`. Together, these 3 calls instruct Wayland to start mapping the buffer content to the display and to call `surface_frame_done()` later, when it will have become ready for another mapping operation.

- Later, `surface_frame_done()` runs and destroys the `wl_callback` object by function `wl_callback_destroy()` and sets member `cb` to NULL.

Member variable `draw_buffer.needs_commit` of the `wl_buffer` is also important in this mechanism: it informs FLTK that the graphics buffer has changed and needs being committed. This variable is turned `true` every time a graphics operation changes the buffer content and turned `false` when the buffer gets committed.

This procedure ensures that FLTK never changes the surface’s Wayland buffer while it’s being used by the compositor and never calls `wl_surface_commit()` before Wayland gets ready for a new commit because `Fl_Wayland_Window_Driver::flush()` calls `Fl_Wayland_Graphics_Driver::buffer_commit()` only if `cb` is NULL. If it’s not NULL, the exact content of function `surface_frame_done()`:

```c
static void surface_frame_done(void *data, struct wl_callback *cb, uint32_t time) {
  struct wl_window *window = (struct wl_window *)data;
  wl_callback_destroy(cb);
  if (window->buffer) {
    window->buffer->cb = NULL;
  }
```

Generated by Doxygen
has the effect that when the mapping operation eventually completes, Wayland runs `surface_frame_done()`, which calls anew `Fl_Wayland_Graphics_Driver::buffer_commit()` if the buffer's `draw_buffer_needs_commit` member is true. The net result is that the screen shows the most recent surface content.

This synchronization mechanism is also used when performing an interactive window resize operation. During such operation, the compositor informs the client an interactive resize is being performed and sends window resize commands at high rate (~60 Hz) to the client via the socket. Libdecor turns on flag `LIBDECOR_WINDOW_STATE_RESIZING` to inform the client, and runs function `handle_configure()` for each received resize command. Before calling `Fl_Group::resize()` and later `Fl_Window::draw()`, `handle_configure()` tests whether `window->buffer->cb` is NULL. When it's not because a previous resize operation is being performed, the current resize command is skipped. At the end of the interactive resize, flag `LIBDECOR_WINDOW_STATE_RESIZING` is off and Wayland sends a final resize command which is not skipped. Overall, this ensures the client program resizes its window as frequently as it can without falling behind resize commands sent by the compositor.

**Progressive window drawing**

FLTK supports progressive drawing when an app calls function `Fl_Window::make_current()` at any time and then calls the FLTK drawing API. This is made possible in function `Fl_Wayland_Window_Driver::make_current()` with

```cpp
if ( (!Fl_Wayland_Window_Driver::in_flush_) && window->buffer && (!window->buffer->cb) ) {
    Fl_Wayland_Window_Driver::make_current(window);
}
```

Thus, `buffer_commit()` runs only when `cb` is NULL. If an app rapidly performs calls to `Fl_Window::make_current()` and to drawing functions, FLTK will copy `draw_buffer` to the Wayland buffer and instruct Wayland to map it to the display when `cb` is NULL which means that the compositor is ready to start performing a mapping operation. This occurs when the progressive drawing operation begins. Later, `cb` is generally found non NULL when `Fl_Wayland_Window_Driver::make_current()` runs because the compositor is busy processing the previous Wayland buffer. When the compositor has completed this processing, the client app runs `surface_frame_done()` which, provided member variable `draw_buffer_needs_commit` is true, calls `Fl_Wayland_Graphics_Driver::buffer_commit()`. This makes the compositor map the Wayland buffer in its new, more advanced, state.

An example of progressive drawing is given by FLTK's mandelbrot test app. When set to fullscreen, this app can be seen to progressively fill its window from top to bottom by blocks of lines, each block appearing when the compositor is ready to map a new buffer. When the compositor is not ready, the app does not block but continues computing and drawing in memory but not on display more lines of the desired Mandelbrot graph.

**Wayland buffer deletion**

Each `wld_buffer` record contains boolean member `in_use` which is set to `true` just before the buffer gets committed, and boolean member `released` which is set to `true` when FLTK no longer needs the buffer and calls `Fl_Wayland_Graphics_Driver::buffer_release()`. FLTK's buffer-creating function `Fl_Wayland_Graphics_Driver::create_shm_buffer()` attaches a 1-member listener to each buffer which Wayland calls after a commit operation to indicate the client is allowed to re-use the buffer. This listener's member function, `buffer_release_listener()`, turns to false member `in_use` of the buffer's `wld_buffer` record. Since the two events 'FLTK no longer needs the buffer' and 'the client is allowed to re-use the buffer' can arrive in any order, FLTK deletes the `struct wl_buffer` object by running `do_buffer_release()` only after both events happened, that is, when `in_use` is false and `released` is true. That's why function `do_buffer_release()` is called by both functions `Fl_Wayland_Graphics_Driver::buffer_release()` and `buffer_release_listener()`.

### 26.1.10 Buffer factories

Wayland names *buffer factory* a software procedure that constructs objects of type `struct wl_buffer` for use by a client application. FLTK creates a `wl_buffer` object each time an `Fl_Window` is mapped on a display or resized. That's done by member function `Fl_Wayland_Graphics_Driver::create_shm_buffer()` which follows this 3-step procedure to create a "buffer factory" for FLTK and to construct Wayland buffers from it:
- Libdecor function `os_createAnonymous_file(off_t size)` creates an adequate file and `mmap`'s it. This file lives in RAM because it is created by function `memfd_create()`. FLTK sets this file size to 10 MB unless the size of the buffer to be created is larger; in that case the anonymous file is sized to twice the buffer size.

- Wayland function `wl_shm_create_pool()` shares this `mmap`'d memory with the Wayland compositor and returns an object of type `struct Fl_Wayland_Graphics_Driver::wl_shm_pool` which encapsulates this memory. A record of type `struct Fl_Wayland_Graphics_Driver::wl_shm_pool_data` is created and associated to the newly created `wl_shm_pool` by `wl_shm_pool_set_user_data()`. This record stores the starting address (pool_memory) and size (pool_size) of the pool’s encapsulated memory. The record also contains member buffers of type `struct Fl_Wayland_Graphics_Driver::wl_list` which stores the access point to the linked list of `wl_buffer` objects that will be created from the `wl_shm_pool`.

- A variable named chunk_offset represents the offset within the pool’s shared memory available for the buffer being constructed. It equals 0 when the pool has just been created and is updated as detailed below when one or more buffers have been previously created from the pool. A record of type `struct Fl_Wayland_Graphics_Driver::wl_buffer` is created. This record will contain (member `wl_buffer`) the address of a `wl_buffer` object that’s created by function `wl_shm_pool_create_buffer()`. This `wl_buffer` object encapsulates a section of a given size of the pool’s shared memory beginning at offset chunk_offset in it. Quantity pool_memory + chunk_offset is therefore the address of the beginning of the `mmap`’ed memory section encapsulated by this `wl_buffer`. Member `wl_shm_pool` of the newly constructed `Fl_Wayland_Graphics_Driver::wl_buffer` object is set to the address of the current `wl_shm_pool` object. This record is added to the head of the linked list of current pool’s buffers by a call to `wl_list_insert()`. At that point, a struct `Fl_Wayland_Graphics_Driver::wl_buffer` record is part of the linked list of all such records corresponding to `wl_buffer` objects created from the same `wl_shm_pool` object, and member `wl_shm_pool` of this record gives the address of this `wl_shm_pool`. When a new `struct Fl_Wayland_Graphics_Driver::wl_buffer` record is to be created,

```c
struct Fl_Wayland_Graphics_Driver::wl_buffer *record = wl_container_of(pool_data->buffers.next,
                record, link);
int chunk_offset = ((char*)record->data - pool_data->pool_memory) + record->data_size;
```

gives the offset within the current pool’s `mmap`’ed memory available for a new `wl_buffer`. Macro `wl_container_of()` gives the address of a record belonging to a linked list of records of the same type.

A window’s `wl_buffer` is re-filled by graphics data and committed each time the window gets redrawn, and is set to be destroyed by function `Fl_Wayland_Graphics_Driver::buffer_release()` when `Fl_Window::hide()` runs or the window is resized. When the `wl_buffer` is no longer in use, function `do_buffer_release()` gets called as explained above. It destroys the `wl_buffer` with `wl_buffer_destroy()`, and removes the corresponding `Fl_Wayland_Graphics_Driver::wl_buffer` record from the linked list of buffers from the same `wl_shm_pool`. Since new `Fl_Wayland_Graphics_Driver::wl_buffer` records are added at the head of the linked list, and since the record at the head of this list is used to compute the offset within the pool’s `mmap`’ed memory available for a new `wl_buffer`, destruction of the last created `wl_buffer` allows to re-use the destroyed buffer’s pool’s memory for a new `wl_buffer`. When function `do_buffer_release()` finds the list of buffers from a given pool empty, two situations can occur.

1) This pool is the current pool. Its `mmap`’ed memory will be re-used from offset 0 to create future `wl_buffer` objects.

2) This pool is not current. It gets destroyed with `wl_shm_pool_destroy()`, the pool’s `mmap`’ed memory is unmmap’ed, and the pool’s associated `struct Fl_Wayland_Graphics_Driver::wl_shm_pool_data` is freed. In situation 1) above, the next `wl_buffer` to be created can need more memory than the current pool’s memory size. If so, the current pool gets destroyed and replaced by a new, larger pool.

If the sum of chunk_offset plus the buffer size is larger than the current pool’s size when function `create_shm_buffer()` is called, chunk_offset is reset to 0, and a new `wl_shm_pool` object is created and used by FLTK’s “buffer factory”. This mechanism allows to access new `mmap`’ed memory when chunk_offset reaches the end of the previous `mmap`’ed section.

Wayland uses also `wl_buffer` objects to support cursors. FLTK uses the “buffer factory” described here when creating custom cursors (see `custom-cursor`) with function `Fl_Wayland_Window_Driver::set_cursor(const Fl_RGB_Image *...)` which calls `create_shm_buffer()` via `set_cursor`-`4args()`, `custom_offscreen()` and `create_wl_buffer()`. In contrast, standard shaped-cursors (e.g., FL_CURSOR_INSERT) use their own “buffer factory” inside Wayland functions such as `wl_cursor_theme_get_cursor()`. Therefore, the fact that the `wl_buffer` objects behind standard cursors are never generated by Doxygen
destroyed doesn't prevent disused \texttt{struct wl_shm_pool} objects from being freed because those buffers come from a distinct "buffer factory". The "buffer factory" described here is also used by function \texttt{offsreen_from_text()} when displaying dragged text in a DnD operation.

### 26.1.11 Displays and HighDPI support

Wayland uses the concept of \textit{seat} of type \texttt{struct wl_seat} which encompasses displays, a keyboard, a mouse, and a trackpad. Although Wayland may be in principle able to deal with several seats, FLTK’s Wayland platform is conceived for one seat only. That seat may contain one or more displays, which Wayland calls \textit{outputs}, of type \texttt{struct wl_output}.

As written above, function \texttt{registry_handle_global()} discovers the available seat at start-up time. This function also associates a listener to each display connected to the system by calling function \texttt{wl_output_add_listener()}. This listener’s member functions run at program startup when Wayland discovers its displays (see \textit{Opening a Wayland connection}). Member \texttt{output_mode} runs also when the display is resized and member \texttt{output_scale} also when the Wayland scale factor (see below) is changed. FLTK defines type \texttt{struct Fl_Wayland_Screen_Driver::output} to store display size and scaling information. One such record is created for each display. These records are put in a \texttt{struct wl_list} accessible from member \texttt{Fl_Wayland_Screen_Driver::output} of the single \texttt{Fl_Wayland_Screen_Driver} object.

FLTK uses 2 distinct scaling parameters for each display:

- \texttt{int wld_scale;}: This member variable of the \texttt{struct Fl_Wayland_Screen_Driver::output} record typically equals 1 for standard, and 2 for HighDPI displays. The effect of value \texttt{n} of variable \texttt{wld_scale} is that 1 Wayland graphics unit represents a block of \texttt{n}\texttt{xn} pixels. Another effect is that a drawing buffer for a surface of size \texttt{WxH} units contains \texttt{W \ast n \ast H \ast n \ast 4} bytes. Member function \texttt{output_scale()} mentioned above sets this value for each system's display at startup time. Member function \texttt{Fl_Wayland__Graphics_Driver::buffer_commit()} informs the Wayland compositor of the value of \texttt{wld_scale} calling \texttt{wl_surface_set_buffer_scale()} which is enough to make FLTK apps HighDPI-aware. Under the gnome and KDE desktops, this parameter is visible in the "Settings" app, "Displays" section, "Scale" parameter which is 200% on HighDPI displays.

- \texttt{float gui_scale;}: This other member variable is where FLTK’s own GUI scaling mechanism with \texttt{ctrl+/0/} keystrokes and with environment variable \texttt{FLTK_SCALING_FACTOR} operates: when FLTK is scaled at 150%, \texttt{gui_scale} is assigned value 1.5. Function \texttt{Fl_Wayland_Screen_Driver::scale(int n, float f)} assigns value \texttt{f} to the \texttt{gui_scale} member variable of display \# \texttt{n}. This variable is used by function \texttt{Fl_Wayland_Window_Driver::make_current()} when it calls \texttt{Fl_Wayland__Graphics_Driver::set_buffer()} that scales the graphics driver by this factor with \texttt{cairo_scale()}. Overall, an FLTK object, say an \texttt{Fl_Window}, of size \texttt{WxH} FLTK units occupies \texttt{int(W \ast gui_scale) \ast wld_scale \ast x \ast int(H \ast gui_scale) \ast wld_scale} pixels on the display.

When an \texttt{Fl_Window} is to be show(), \texttt{Fl_Wayland_Window_Driver::makeWindow()} creates a \texttt{struct wl_surface} with \texttt{wl_compositor_create_surface()} and associates it calling \texttt{wl_surface_add_listener()} with a 2-member listener called \texttt{surface_listener} encharged of managing as follows the list of displays where this \texttt{wl_surface} will map. The \texttt{Fl_Window} possesses an initially empty linked list of displays accessible at member \texttt{outputs} of the window’s \texttt{wl_window} record. When the \texttt{Fl_Window}, or more exactly its associated \texttt{struct wl_surface} is mapped on a display, member \texttt{surface_listener()} of \texttt{surface_listener} runs. This function adds the display where the surface belongs to the end of the linked list of displays for this surface. When a surface is dragged or enlarged across the edge of a display in a multi-display system and expands on a second display, \texttt{surface_enter()} runs again, and this surface’s list of displays contains 2 items. When a surface leaves a display, member \texttt{surface_leave()} of \texttt{surface_listener} runs. It removes that display from the surface’s list of displays. Each time the first item of a surface’s list of displays changes, function \texttt{change_scale()} is called and applies that display’s \texttt{gui_scale} value to that surface calling \texttt{Fl_Wayland_Window_Driver::screen_num(int)}. When a window is unmapped by function \texttt{Fl_Wayland_Window_Driver::hide()}, the surface’s list of displays is emptied.

### Fractional scaling

The KWin compositor, and gnome too if specially set, allow to use \textit{fractional scaling} that can take intermediate values between 100% and 200%. Wayland implements this rendering all \texttt{wl_surface’s} as if the scaling was...
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at 200%, and downsizing them to the desired fractional scale value at the compositing stage. Seen from FLTK, everything runs as when wld_scale = 2.

These commands make gnome accept fractional scaling, and turn that off:

```sh
gsettings set org.gnome.mutter experimental-features "[‘scale-monitor-framebuffer’]"
gsettings reset org.gnome.mutter experimental-features
```

## 26.1.12 Mouse and trackpad handling

FLTK receives information about mouse and pointer events via a ‘listener’ made up of 5 pointers to functions which Wayland calls when events listed in table below occur. These functions receive from Wayland enough information in their parameters to generate corresponding FLTK events, that is, calls to `Fl::handle(int event_type, Fl_Window *)`.

<table>
<thead>
<tr>
<th>listener function</th>
<th>called by Wayland when</th>
<th>resulting FLTK events</th>
</tr>
</thead>
<tbody>
<tr>
<td>pointer_enter</td>
<td>pointer enters a window</td>
<td>FL_ENTER</td>
</tr>
<tr>
<td>pointer_leave</td>
<td>pointer leaves a window</td>
<td>FL_LEAVE</td>
</tr>
<tr>
<td>pointer_motion</td>
<td>pointer moves inside a window</td>
<td>FL_MOVE</td>
</tr>
<tr>
<td>pointer_button</td>
<td>state of mouse buttons changes</td>
<td>FL_PUSH, FL_RELEASE</td>
</tr>
<tr>
<td>pointer_axis</td>
<td>trackpad is moved vertically or horizontally</td>
<td>FL_MOUSEWHEEL</td>
</tr>
</tbody>
</table>

`pointer_listener` is installed by a call to function `wl_pointer_add_listener()` made by function `seat_capabilities()` which is itself another ‘listener’ made up of 2 function pointers

```c
static struct wl_seat_listener seat_listener = {
  seat_capabilities,
  seat_name
};
```

installed by a call to function `wl_seat_add_listener()` made by function `registry_handle_global()` when it receives a "wl_seat" interface.

### Handling middle mouse button clicks on window titlebars

The gnome desktop, via its `gnome-tweaks` application, allows to determine what happens when a middle mouse button click occurs on a window titlebar. To obey this setting, FLTK implements part of the GTK Shell protocol as follows. Mutter, gnome’s Wayland compositor, declares its support of the GTK Shell protocol calling `registry_handle_global()` with its interface argument equal to "gtk_shell1". FLTK initializes then a static global variable `gtk_shell` of type `struct gtk_shell1 *`.

Member functions of `pointer_listener` mentioned above run for all mouse events on all `wl_surface` objects. The table above describes what these functions do for mouse events on FLTK-created `wl_surface` objects. But they also run for the libdecor-created `wl_surface` objects corresponding to window titlebars. Thus, member function `pointer_enter()` runs when the mouse enters a titlebar. It calls `Fl_Wayland_Screen_Driver::event_coords_from_surface()` which calls `Fl_Wayland_Window_Driver::surface_to_window()` which, as mentioned above, can distinguish FLTK-created from non FLTK-created `wl_surface` objects. This allows `pointer_enter()` to identify the entered surface as a titlebar and to assign static global variable `gtk_shell_surface` with the titlebar’s `wl_surface` when the mouse enters a titlebar. Similarly, member function `pointer_leave()` sets `gtk_shell_surface` to NULL when the mouse leaves this titlebar. When there’s a click on a titlebar, member function `pointer_button()` runs this code

```c
if (gtk_shell_surface && state == WL_POINTER_BUTTON_STATE_PRESSED && button == BTN_MIDDLE) {
  struct gtk_surface1 *gtk_surface = gtk_shell1_get_gtk_surface(gtk_shell, gtk_shell_surface);
  gtk_surface1_titlebar_gesture(gtk_surface, serial, seat->wl_seat, GTK_SURFACE1_GESTURE_MIDDLE_CLICK);
  gtk_surface1_release(gtk_surface);
  return;
}
```

which ensures that what `gnome-tweaks` has assigned to middle-click events is executed. At this point, FLTK obeys what `libdecor` decides for right-click (display the window menu) and double-click (maximize the window) events on titlebars which may diverge from `gnome-tweaks` settings.

## 26.1.13 Wayland cursors

Wayland defines types `struct wl_cursor` and `struct wl_cursor_theme` to hold cursor-related data. FLTK uses function `init_cursors()` from file `Fl_Wayland_Screen_Driver.cxx` to obtain the ‘cursor theme’ name using function `libdecor_get_cursor_settings()` of library `libdecor`. Function `wl←`
cursor_theme_load() then returns a pointer to an object of type struct wl_cursor_theme stored in member variable cursor_theme of the Fl_Wayland_Screen_Driver::seat record. Function init_cursors() is itself called by a 'listener' called seat_capabilities() installed when function registry_handle_global() receives a "wl_seat" interface, at program startup. It is also called when the value of the Wayland scaling factor changes: output_done() calls try_update_cursor() calls init_cursors(). Function output_done() belongs to a 'listener' installed when function registry_handle_global() receives a "wl_output" interface.

Each time Fl_Window::cursor(Fl_Cursor) runs, FLTK calls Fl_Wayland_Window_Driver::set_cursor(Fl_Cursor) which calls wl_cursor_theme_get_cursor() to set the current cursor shape to one of the standard shapes from the Fl_Cursor enumeration. This Wayland function selects a cursor shape based on the current wl_cursor_theme object and a cursor name and returns a pointer to a struct wl_cursor. Under the gnome desktop, cursor names are the files of directory /usr/share/icons/XXXX/cursors/ where XXXX is the 'gnome cursor theme' (default= Adwaita). For example, what FLTK calls FL_CURSOR_INSERT corresponds to file xterm therein. The full correspondence between Fl_Cursor values and names of files therein is found in function Fl_Wayland_Window_Driver::set_cursor(). FLTK stores in member variable default_cursor of the Fl_Wayland_Screen_Driver::seat record a pointer to the currently used wl_cursor object, and the current Fl_Cursor value in member standard_cursor of the Fl_Wayland_Window_Driver object.

Finally, function do_set_cursor() of file Fl_Wayland_Screen_Driver.cxx makes the system pointer use the current wl_cursor object to draw its shape on screen. That's done with a call to wl_pointer_set_cursor() and a few other functions.

Custom cursor shapes

To support custom cursors, FLTK presently uses a non-public type, struct cursor_image, defined in file Fl_Wayland_Window_Driver.cxx as follows:

```c
struct cursor_image {
  struct wl_cursor_image image;
  struct wl_cursor_theme *theme;
  struct wl_buffer *buffer;
  int offset;
};
```

This definition has been copied to the FLTK source code from file wayland-cursor.c of the Wayland project source code because it's not accessible via Wayland header files. It shows that a pointer to a cursor_image object can also be viewed as a pointer to the embedded struct wl_cursor_image object, this one being part of the public Wayland API. It also shows that a struct cursor_image object has an associated struct wl_buffer object used to contain the cursor's graphics.

Function Fl_Wayland_Window_Driver::set_cursor(const Fl_RGB_Image *rgb, int hotx, int hoty) gives FLTK support of custom cursor shapes. It calls Fl_Wayland_Window_Driver::set_cursor_4args() that creates a cursor_image object, allocates the corresponding wl_buffer by a call to Fl_Wayland_Graphics_Driver::create_shm_buffer() via custom_offscreen() and create_wld_buffer() and draws the cursor shape into that buffer using the offscreen-drawing method of FLTK.

The public type struct wl_cursor is essentially an array of wl_cursor_image objects and a name:

```c
struct wl_cursor {
  unsigned int image_count;
  struct wl_cursor_image **images;
  char *name;
};
```

Function Fl_Wayland_Window_Driver::set_cursor_4args() also creates a struct wl_cursor object containing a single wl_cursor_image, which is in fact the cursor_image. Finally, a struct custom_cursor (see wld_window) is allocated and used to memorize the struct wl_cursor and the cursor's image and hotspot. A pointer to this struct custom_cursor object is stored in member custom_cursor of the window's wld_window.

Function Fl_Wayland_Window_Driver::set_cursor_4args() is also called when a window with a custom cursor is moved between distinct displays or when a display is rescaled to adapt the cursor size to the new display's scale factor.

Member function Fl_Wayland_Window_Driver::delete_cursor() is used to delete any custom cursor shape. This occurs when a window associated to a custom cursor is un-mapped and when such a window gets associated to a standard cursor or to a new custom cursor.
26.1.14 Keyboard support

The "Mouse handling" section above mentioned function `seat_capabilities()` that Wayland calls when the app discovers its "seat". Presence of flag `WL_SEAT_CAPABILITY_KEYBOARD` in argument `capabilities` of this function indicates that a keyboard is available. In that case, a call to `wl_seat_get_keyboard()` returns a pointer stored in member `wl_keyboard` of the `Fl_Wayland_Screen_Driver::seat` object, and a call to `wl_keyboard_add_listener()` installs a 6-member listener of type `struct wl_keyboard_listener`. These 6 FLTK-defined, callback functions are used as follows.

Function `wl_keyboard_keymap()` runs when the app starts and also if the keyboard layout is changed during run-time. It allows initialization of access to this keyboard. Noticeably, member `xkb_state` of type `struct xkb_state` of the current `Fl_Wayland_Screen_Driver::seat` record is adequately initialized.

Functions `wl_keyboard_enter()` and `wl_keyboard_leave()`, called when focus enters and leaves a surface, send `FL_FOCUS` and `FL_UNFOCUS` events to the `Fl_Window` object corresponding to this surface.

Function `wl_keyboard_key()` runs each time a keyboard key is pressed or released. Its argument key, to which 8 must be added, provides the keycode via function `xkb_state_key_get_one_sym()` and then the corresponding text via function `xkb_state_key_get_utf8()` which is put in `Fl::e_text`. Then, a few calls to functions whose name begin with `xkb_` are necessary to support dead and compose keys.

Finally a call to `Fl::handle()` sends an `FL_KEYDOWN` or `FL_KEYUP` event to the appropriate `Fl_Window`. Also, function `wl_keyboard_key()` uses global variable `Fl::Int_Vector key_vector` to record all currently pressed keys. This is the base of the implementation of `Fl_Wayland_Screen_Driver::event_segment()`.

Function `wl_keyboard_modifiers()` runs when a modifier key (e.g., shift, control) is pressed or released. Calls to functions `xkb_state_update_mask()` and `xkb_state_mod_name_is_active()` allow FLTK to set `Fl::e_state` adequately.

Function `wl_keyboard_repeat_info()` does not run, for now, because this would require version 4 of the `wl_keyboard` object which is at version 2 in all tested Wayland compositors.

26.1.15 Support of text input methods

When the connected Wayland compositor supports text input methods, function `registry_handle_global()` gets called with its `interface` argument equal to `zwp_text_input_manager_v3::interface.name`. The following call to `wl_registry_bind()` returns a pointer to type `struct zwp_text_input_manager_v3` that is stored as member `text_input_base` of the `Fl_Wayland_Screen_Driver` object.

Later, when function `seat_capabilities()` runs, `text_input_base` is found not NULL, which triggers a call to function `zwp_text_input_manager_v3::get_text_input()` returning a value of type `struct zwp_text_input_v3` * and stored as member `text_input` of the `Fl_Wayland_Screen_Driver::seat` object.

Next, a call to `zwp_text_input_v3::add_listener()` associates this `text_input` with a 6-member listener of type `struct zwp_text_input_v3_listener`. These 6 FLTK-defined, callback functions are used as follows.

Functions `text_input_enter()` and `text_input_leave()` are called when text input enters or leaves a surface (which corresponds to an `Fl_Window`).

Functions `text_input_preedit_string()` and `text_input_commit_string()` are called when the text input method asks the client app to insert 'marked' text or regular text, respectively. Complex text input often begins by inserting temporary text which is said to be 'marked' before replacing it with the text that will stay in the document. FLTK underlines marked text to distinguish it from regular text.

Functions `text_input_delete_surrounding_text()` and `text_input_done()` have no effect at present, without this preventing input methods that have been tested with FLTK from working satisfactorily.

It's necessary to inform text input methods of the current location of the insertion point in the active surface. This information allows them to map their auxiliary windows next to the insertion point, where they are expected to appear. The flow of information on this topic is as follows:

- The two FLTK widgets supporting text input, `Fl_Input` and `Fl_Text_Display`, transmit to FLTK the window coordinates of the bottom of the current insertion point and the line height each time they change calling function `fl_set_spot()`.

- `fl_set_spot()` calls the platform override of virtual member function `Fl_Screen_Driver::set_segment()`. Under Wayland, this just calls `Fl_Wayland_Screen_Driver::insertion_point_segmented()` which calls `zwp_text_input_v3::set_cursor_position()`.
Although this type is public in header file `libdecor-plugin.h` and its own string in member _libdecor-plugins.c`, FLTK performs operation 1) above using its function that is specific of that plugin and that returns the pixels of the drawn titlebar.

FLTK needs to perform two operations: 1) identify what plugin is operating, and 2) call a function that supports function `Fl_Widget_Surface::draw_decorated_window()` to support function the desired plugin becomes part of `libfltk`. This trick is also used to modify function `libdecor_new()` becomes part of `libfltk` except that function `USE_SYSTEM_LIBDECOR` is defined to value 1, and both `libdecor` and its plugin are loaded at run-time from shared libraries. When these packages are not available or are at an earlier version, FLTK uses the bundled copy of `libdecor`. When `CMake OPTION_USE_SYSTEM_LIBDECOR` is OFF, FLTK uses the bundled `libdecor` copy even if shared libraries `libdecor.so` and `libdecor-gtk.so` are installed. This option is ON by default.

`Libdecor` uses the Wayland protocol `XDG decoration` to request being decorated by a supporting compositor. If the running compositor supports SSD, `libdecor` doesn’t draw window titlebars because the compositor does it. That is what happens with the `KWin` and `Sway` compositors. However, if environment variable `LIBDECOR_FORCE_CSD` is defined to value 1 when an FLTK app runs, `libdecor` instructs an SSD-able compositor to refrain from decorating its windows and decorates windows itself.

Whatever the value of `OPTION_USE_SYSTEM_LIBDECOR`, FLTK and `libdecor` use environment variable `LIBDECOR_PLUGIN_DIR` as follows: if this variable is defined and points to the name of a directory, this directory is searched for a potential `libdecor` plugin in the form of a shared library; if one is found, FLTK and `libdecor` load it and use it.

The `libdecor` source code bundled in FLTK is identical to that of the `libdecor` repository. Nevertheless, FLTK uses this code with some minor changes. For example, except if `USE_SYSTEM_LIBDECOR` is 1, FLTK needs to modify function `libdecor_new()` charged of loading the plugin, to make it use the plugin code that is included in `libfltk` if none is found as a dynamic library. This is done as follows in file `libdecor/build/fl_libdecor.c`:

```c
#define libdecor_new libdecor_new_orig
#include "../src/libdecor.c"

void libdecor_new() { // FLTK rewrite of this function...
...}
```

FLTK compiles file `fl_libdecor.c` which includes `libdecor.c` to the effect that all of the `libdecor` code becomes part of `libfltk` except that function `libdecor_new()` is substituted by its FLTK rewrite, without file `libdecor.c` being modified at all. This trick is also used to modify function `libdecor_frame_set_minimized()` to bypass a bug in the Weston compositor before version 10. Similarly, FLTK compiles file `fl_libdecor-plugins.c` which includes either `libdecor-gtk.c` or `libdecor-cairo.c` to the effect that the desired plugin becomes part of `libfltk`.

To support function `Fl_Widget_Surface::draw_decorated_window()` that draws a mapped window and its titlebar, FLTK needs to perform two operations: 1) identify what plugin is operating, and 2) call a function that is specific of that plugin and that returns the pixels of the drawn titlebar.

FLTK performs operation 1) above using its function `get_libdecor_plugin_description()` of file `fl Libdecor-plugins.c` that returns a human readable string describing the running plugin. Each plugin puts its own string in member `description` of a record of type `struct libdecor_plugin_description`. Although this type is public in header file `libdecor-plugin.h`, accessing the symbol defined by the plugin to

The `text_input_enter()` function is called when the insertion point is moved in the Wayland screen driver `Fl_Wayland_Screen_Driver::insertion_point_location(int *, int *, int *)` which gives it the stored position information, and then calls `zwp_text_input_v3_set_cursor_rectangle()` to inform the text input method about the position of the insertion point.

### 26.1 The Wayland backend for its developer

### 26.1.16 Interface with `libdecor`

FLTK uses a library called `libdecor` to determine whether the Wayland compositor uses CSD or SSD mode, and also to draw window titlebars when in CSD mode (see `libdecor`). `Libdecor` is conceived to be present in a shared library linked to the Wayland client application which itself, and if the running Wayland compositor uses CSD mode, loads another shared library intended to draw titlebars in a way that best matches the Desktop. As of late 2023, `libdecor` is at version 0.2.0 and contains two titlebar-drawing plugins:

- `libdecor-gtk` intended for the Gnome desktop;
- `libdecor-cairo` for other situations.

Because `libdecor` is not yet in major Linux packages, or only at version 0.1.x, FLTK bundles the most recent source code of `libdecor` and its plugins. This code is included in `libfltk`. FLTK uses `libdecor-gtk` when software package `libgtk-3-dev` is present in the build system, and `libdecor-cairo` otherwise.

As of late 2023, `libdecor` version 0.2.0 is available in very recent Linux distributions in packages `libdecor-0-dev` and `libdecor-0-plugin-1-gtk`. If they are installed on the build system, preprocessor variable `USE_SYSTEM_LIBDECOR` is defined as follows: if this variable is defined and points to the name of a directory, this directory is searched for a potential `libdecor` plugin in the form of a shared library; if one is found, FLTK and `libdecor` load it and use it.

The `libdecor` source code bundled in FLTK is identical to that of the `libdecor` repository. Nevertheless, FLTK uses this code with some minor changes. For example, except if `USE_SYSTEM_LIBDECOR` is 1, FLTK needs to modify function `libdecor_new()` charged of loading the plugin, to make it use the plugin code that is included in `libfltk` if none is found as a dynamic library. This is done as follows in file `libdecor/build/fl_libdecor.c`:

```c
#define libdecor_new libdecor_new_orig
#include "../src/libdecor.c"

void libdecor_new() { // FLTK rewrite of this function...
...}
```

FLTK compiles file `fl_libdecor.c` which includes `libdecor.c` to the effect that all of the `libdecor` code becomes part of `libfltk` except that function `libdecor_new()` is substituted by its FLTK rewrite, without file `libdecor.c` being modified at all. This trick is also used to modify function `libdecor_frame_set_minimized()` to bypass a bug in the Weston compositor before version 10. Similarly, FLTK compiles file `fl_libdecor-plugins.c` which includes either `libdecor-gtk.c` or `libdecor-cairo.c` to the effect that the desired plugin becomes part of `libfltk`.

To support function `Fl_Widget_Surface::draw_decorated_window()` that draws a mapped window and its titlebar, FLTK needs to perform two operations: 1) identify what plugin is operating, and 2) call a function that is specific of that plugin and that returns the pixels of the drawn titlebar.

FLTK performs operation 1) above using its function `get_libdecor_plugin_description()` of file `fl_libdecor-plugins.c` that returns a human readable string describing the running plugin. Each plugin puts its own string in member `description` of a record of type `struct libdecor_plugin_description`. Although this type is public in header file `libdecor-plugin.h`, accessing the symbol defined by the plugin to

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store a pointer to a value of this type is complicated for a reason and solved by a method detailed in a comment
before function get_libdecor_plugin_description().
Operation 2) above is done by FLTK-defined function fl_libdecor_titlebar_buffer() from file fl-

EGL™ to interface OpenGL with the underlying native platform window system. OpenGL-using FLTK
apps are therefore linked to libwayland-egl.so and libEGL.so in addition to libGL.so and libGLU.so.
EGL is initialized calling member function Fl_Wayland_GL_Window_Driver::init() once, the first time
the Fl_Wayland_GL_Window_Driver c’tor runs. That is done with calls to eglGetDisplay(), egl-Initialize(), and eglBindAPI().
Member function Fl_Wayland_GL_Window_Driver::find() calls eglChooseConfig() to filter the
set of GL configurations that match the Fl_Gl_Window’s mode(), and puts in the returned Fl_Gl_CHOICE
object the first matching configuration. The filtering gets done with bits EGL_WINDOW_BIT, to support the creation
of window surfaces, and EGL_OPENGL_BIT, to support the creation of OpenGL contexts.
EGL needs 2 more objects created for each Fl_Gl_Window. They have types struct wl_eegl_window
and EGLSurface, and are created by member function Fl_Wayland_GL_Window_Driver::make←
current_before() which runs at the beginning of Fl_Gl_Window::make←current(). The first ar-
gument of the call to wl_eegl_window_create() therein has type struct wl_surface * and is what
connects EGL with the targeted Wayland window.
EGL creates with eglCreateContext() an object of type EGLContext via member function Fl←
Wayland_GL_Window_Driver::create_gl_context() called by Fl_Gl_Window::make←current().
Types EGLContext and GLContext are 2 names for the same object. The call to eglCreateContext() is
made asking for a GL context of version at least 2. This does not prevent from obtaining contexts of higher versions,
namely above 3.2, which are compatible with version 2 (the so-called compatibility profile) under all tested Linux
systems.
FLTK function Fl_Gl_Window::make←current() calls overridden function Fl_Wayland_GL_Window←
_Driver::set_gl_context() which calls EGL function eglMakeCurrent() when the cached context
changes.
FLTK calls function Fl_Wayland_GL_Window_Driver::swap_buffers() each time it wants a GL con-
text to be sent to the display. This function contains some pure GL code to emulate an overlay buffer to support
Fl_Gl_Window objects overriding their draw_overlay() member function. Then, it calls function eglSwap-
Buffers().
The overridden Fl_Wayland_GL_Window_Driver::resize() function is implemented with calls to wl←
_eegl_window_get_attached_size() and wl_eegl_window_resize().
Class Fl_Wayland_GL_Plugin exists to allow libfltk to call functions from libfltk_gl,
libwayland-egl.so or libEGL.so and without having libfltk force linking any FLTK app with these

26.1.17 Copy/Paste/Drag-n-Drop

FLTK follows the procedure that is very well described in item "Wayland clipboard and drag & drop" of the
Documentation resources. All corresponding source code is in file src/drivers/Wayland/fl_wayland←
_clipboard_dnd.cxx.
This part of the Fl_Wayland_Screen_Driver::seat record stores pointers to Wayland objects used for clipboard and
D-n-D operations:
struct wl_data_device_manager *data_device_manager;
struct wl_data_device *data_device;
struct wl_data_source *data_source;
FLTK can copy or paste plain UTF-8 text or image data to/from the clipboard. Images are copied to the clipboard as
image/bmp mime type. Images in image/bmp or image/png mime types from the clipboard can be pasted to FLTK apps.
Files dropped are received one pathname per line, with no ' \n' after the last pathname.

26.1.18 EGL as support for OpenGL

Wayland uses EGL™ to interface OpenGL with the underlying native platform window system. OpenGL-using FLTK
apps are therefore linked to libwayland-egl.so and libEGL.so in addition to libGL.so and libGLU.so.
EGL is initialized calling member function Fl_Wayland_GL_Window_Driver::init() once, the first time
the Fl_Wayland_GL_Window_Driver c’tor runs. That is done with calls to eglGetDisplay(), egl-Initialize(), and eglBindAPI().
Member function Fl_Wayland_GL_Window_Driver::find() calls eglChooseConfig() to filter the
set of GL configurations that match the Fl_Gl_Window’s mode(), and puts in the returned Fl_Gl_CHOICE
object the first matching configuration. The filtering gets done with bits EGL_WINDOW_BIT, to support the creation
of window surfaces, and EGL_OPENGL_BIT, to support the creation of OpenGL contexts.
EGL needs 2 more objects created for each Fl_Gl_Window. They have types struct wl_eegl_window
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EGL creates with eglCreateContext() an object of type EGLContext via member function Fl←
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Types EGLContext and GLContext are 2 names for the same object. The call to eglCreateContext() is
made asking for a GL context of version at least 2. This does not prevent from obtaining contexts of higher versions,
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systems.
FLTK function Fl_Gl_Window::make←current() calls overridden function Fl_Wayland_GL_Window←
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FLTK calls function Fl_Wayland_GL_Window_Driver::swap_buffers() each time it wants a GL con-
text to be sent to the display. This function contains some pure GL code to emulate an overlay buffer to support
Fl_Gl_Window objects overriding their draw_overlay() member function. Then, it calls function eglSwap-
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The overridden Fl_Wayland_GL_Window_Driver::resize() function is implemented with calls to wl←
_eegl_window_get_attached_size() and wl_eegl_window_resize().
Class Fl_Wayland_GL_Plugin exists to allow libfltk to call functions from libfltk_gl,
libwayland-egl.so or libEGL.so and without having libfltk force linking any FLTK app with these
GL-related libraries. For example, `Fl_Wayland_Window_Driver::flush()` needs to call `Fl_Gl_Window::valid(0)`.

### 26.1.19 FLTK-defined, Wayland-specific types

#### struct wld_window

Defined in `Fl_Wayland_Window_Driver.H`. One such record is created for each shown()’n `Fl_Window` by `Fl_Wayland_Window_Driver::makeWindow()`. Function `fl_wl_xid(Fl_Window*)` returns a pointer to the `struct wld_window` of its argument.

```c
struct wld_window {
    Fl_Window *fl_win;
    struct wld_list outputs; // linked list of displays where part or whole of window maps
    struct wl_surface *wl_surface; // the window’s surface
    struct Fl_Wayland_Graphics_Driver::wld_buffer *buffer; // see wld_buffer
    struct xdg_surface *xdg_surface;
    enum Fl_Wayland_Window_Driver::kind kind; // DECORATED or POPUP or SUBWINDOW or UNFRAMED
    union {
        struct libdecor_frame *frame; // for DECORATED windows
        struct wl_subsurface *subsurface; // for SUBWINDOW windows
        struct xdg_popup *xdg_popup; // for POPUP windows
        struct xdg_toplevel *xdg_toplevel; // for UNFRAMED windows
    };
    struct custom_cursor_ {
        struct wl_cursor *wl_cursor;
        const Fl_RGB_Image *rgb;
        int hotx, hoty;
    } *custom_cursor; // non-null when using custom cursor
    int configured_width; // used when negotiating window size with the compositor
    int configured_height;
    int floating_width; // helps restoring size after un-maximizing
    int floating_height;
    int state; // indicates whether window is fullscreen, maximized. Used otherwise for POPUPs
};
```

#### struct Fl_Wayland_Graphics_Driver::draw_buffer

Defined in file `Fl_Wayland_Graphics_Driver.H`. One such record is created when an `Fl_Image_Surface` object is created. One such record is also embedded inside each `struct Fl_Wayland_Graphics_Driver::wld_buffer` record (see `wld_buffer`).

```c
struct Fl_Wayland_Graphics_Driver::draw_buffer {
    unsigned char *buffer; // address of the beginning of the Cairo image surface’s byte array
    cairo_t *cairo_; // used when drawing to the Cairo image surface
    size_t data_size; // of buffer and wl_buffer, in bytes
    int stride; // bytes per line
    int width; // in pixels
};
```

FLTK gives offscreen buffers the platform-dependent type `Fl_Offscreen` which is in fact member `cairo_` of `struct Fl_Wayland_Graphics_Driver::draw_buffer`. Thus, a variable with type `Fl_Offscreen` needs be cast to type `cairo_t*`. Static member function `struct draw_buffer *offscreen_buffer(Fl_Offscreen)` of class `Fl_Wayland_Graphics_Driver` returns the `draw_buffer` record corresponding to an `Fl_Offscreen` value.

#### struct Fl_Wayland_Graphics_Driver::wld_buffer

Defined in file `Fl_Wayland_Graphics_Driver.H`. One such record is created by `Fl_Wayland_Graphics_Driver::create_wld_buffer()` when an `Fl_Window` is show()’n or resized, when a custom cursor shape is created, or when text is dragged.
struct Fl_Wayland_Graphics_Driver::wld_buffer {
    struct draw_buffer draw_buffer; // see draw_buffer
    struct wl_list link; // links all buffers from the same wl_shm_pool
    struct wl_buffer *wl_buffer; // the Wayland buffer
    void *data; // address of the beginning of the Wayland buffer’s byte array
    struct wl_callback *cb; // non-NULL until Wayland can process new buffer commit
    struct wl_shm_pool *shm_pool; // pter to wl_shm_pool from which this wl_buffer comes
    bool draw_buffer_needs_commit; // true when draw_buffer has been modified but not yet committed
    bool in_use; // true while being committed
    bool released; // true after buffer_release() was called
};

struct Fl_Wayland_Screen_Driver::output

Defined in Fl_Wayland_Screen_Driver.H. One such record is created for each display of the system by function registry_handle_global() when it receives a "wl_output" interface. These records are kept in a linked list of them all, and an identifier of this linked list is stored in member outputs of the unique FLTK Wayland_Screen_Driver object FLTK uses. Thus,

    Fl_Wayland_Screen_Driver *scr_driver = (Fl_Wayland_Screen_Driver*)Fl::screen_driver();
    struct wl_list list_of_all_displays = scr_driver->outputs;

gives access, the Wayland way, to the linked list of displays in the system.

    struct Fl_Wayland_Screen_Driver::output { // one record for each display
        uint32_t id; // an identifier of the display
        int x, y; // logical position of the top-left of display
        int width; // nber of horizontal pixels
        int height; // nber of vertical pixels
        float dpi; // at this point, always 96.
        struct wl_output *wl_output; // the Wayland object for this display
        int wld_scale; // Wayland scale factor
        float gui_scale; // FLTK scale factor
        bool done; // true means record members have been initialized
        struct wl_list link; // links these records together
    };

It’s possible to get the FLTK-defined record associated to a display from the Wayland-associated object for the same display, say struct wl_output *wl_output, by this call: (struct Fl_Wayland_Screen_Driver::output *)wl_output_get_user_data(wl_output).

struct Fl_Wayland_Screen_Driver::seat

Defined in file Fl_Wayland_Screen_Driver.H. One record is created by function registry_handle_global() when it receives a "wl_seat" or wl_data_device_manager_interface.name interface. A pointer to this struct is stored in member seat of the client’s unique Fl_Wayland_Screen_Driver object.

    struct Fl_Wayland_Screen_Driver::seat {
        struct wl_seat *wl_seat;
        struct wl_pointer *wl_pointer;
        struct wl_keyboard *wl_keyboard;
        uint32_t keyboard_enter_serial;
        struct wl_surface *keyboard_surface;
        struct wl_list pointer_outputs;
        struct wl_cursor_theme *cursor_theme;
        struct wl_cursor *default_cursor;
        struct wl_surface *cursor_surface;
        struct wl_surface *pointer_focus;
        int pointer_scale;
        uint32_t serial;
        uint32_t pointer_enter_serial;
        struct wl_data_device_manager *data_device_manager;
        struct wl_data_device *data_device;
        struct wl_data_source *data_source;
        struct xkb_state *xkb_state;
        struct xkb_context *xkb_context;
    };

Generated by Doxygen
struct xkb_keymap *xkb_keymap;
struct xkb_compose_state *xkb_compose_state;
char *name;
struct zwp_text_input_v3 *text_input;
};

26.1.20 Documentation resources

<table>
<thead>
<tr>
<th>The Wayland book</th>
<th>Extensive introduction to Wayland programming written by the author of the sway compositor, unfortunately unachieved.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wayland Explorer</td>
<td>Documentation of all Wayland protocols, both stable and unstable. A language-independent syntax is used which makes function names usable from C or C++ not always obvious. Some useful functions seem undocumented here for an unclear reason.</td>
</tr>
<tr>
<td>Wayland clipboard and drag &amp; drop</td>
<td>Detailed explanation of how clipboard and drag-and-drop work under Wayland.</td>
</tr>
<tr>
<td>Wayland and input methods</td>
<td>Blog article introducing to the issue of text input methods under Wayland.</td>
</tr>
<tr>
<td>Input Method Hub</td>
<td>Entry page for input method support giving newcomers a first understanding of what input methods are and how they are implemented in Wayland.</td>
</tr>
</tbody>
</table>

26.2 Developer info for bundled libs

This chapter details the procedure to update the libraries which are bundled inside FLTK.

26.2.1 Introduction

This file is mainly intended for FLTK developers and contains information about the current versions of all bundled libraries and about how to upgrade these bundled libraries.

Starting with FLTK 1.4.0 the bundled libraries jpeg, png, and zlib use "symbol prefixing" with the prefix 'fltk_' for all external symbols to distinguish the bundled libraries from existing system libraries and to avoid runtime errors.

User code compiled correctly with the header files provided by the bundled image libraries need not be changed. The nanosvg library is not affected.

26.2.2 Current status

Current versions of bundled libraries (as of December 5, 2023):

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<thead>
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<th>Library</th>
<th>Version/git commit</th>
<th>Release date</th>
<th>FLTK Version</th>
</tr>
</thead>
<tbody>
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<td>jpeg</td>
<td>jpeg-9e</td>
<td>2022-01-16</td>
<td>1.4.0</td>
</tr>
<tr>
<td>nanosvg</td>
<td>7aeda550a8 [1]</td>
<td>2023-12-02</td>
<td>1.4.0</td>
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<td>png</td>
<td>libpng-1.6.40</td>
<td>2023-06-21</td>
<td>1.4.0</td>
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<td>zlib</td>
<td>zlib-1.3</td>
<td>2023-08-18</td>
<td>1.4.0</td>
</tr>
<tr>
<td>libdecor</td>
<td>060fe761 [2]</td>
<td>2023-12-01</td>
<td>1.4.0</td>
</tr>
</tbody>
</table>

Previous versions of bundled libraries (FLTK 1.3.x):

<table>
<thead>
<tr>
<th>Library</th>
<th>Version/git commit</th>
<th>Release date</th>
<th>FLTK Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>jpeg</td>
<td>jpeg-9d</td>
<td>2020-01-12</td>
<td>1.3.6 - 1.3.8</td>
</tr>
<tr>
<td>png</td>
<td>libpng-1.6.37</td>
<td>2019-04-14</td>
<td>1.3.6 - 1.3.8</td>
</tr>
<tr>
<td>zlib</td>
<td>zlib-1.2.11</td>
<td>2017-01-15</td>
<td>1.3.6 - 1.3.8</td>
</tr>
</tbody>
</table>

See also git tag 'fltk_yyyy-mm-dd' where yyyy-mm-dd == "Release date" and file nanosvg/README.txt.

Generated by Doxygen
General information:

FLTK does not include the entire library distributions. We only provide the source files necessary to build the FLTK library and some README and/or CHANGEOLOG files. There are no test programs or other contributed files. We use our own build files, hence a few files MUST NOT be upgraded when the library source files are upgraded. We strive to keep changes to the library source files as small as possible. Patching library code to work with FLTK should be a rare exception. Symbol prefixing with prefix 'fltk_' is one such exception to the rule. If patches are necessary all changes in the library files should be marked with "FLTK" in a comment so a developer who upgrades the library later is aware of changes in the source code for FLTK. Look for ‘FLTK’ and/or ‘fltk_’ to find the differences. Additional comments should be added to show the rationale, i.e. why a particular change was necessary. If applicable, add a reference to a Software Trouble Report, GitHub Issue or Pull Request (PR) like “STR 3456”, “Issue #123”, or “PR #234”.

26.2.3 How to update the bundled libraries

It is generally advisable to use a graphical merge program. I’m using ‘meld’ under Linux, but YMMV. Do not add any source files unless they are required to build the library. Some config header files may be pre-generated in the FLTK sources. These header files should be left untouched, but it may be necessary to update these files if new items were added to the new library version. In this case the new header should be pre-generated on a Linux system with default options unless otherwise mentioned below for a specific library. Currently there are no known exceptions.

Merging source files:

Please check if some source and header files contain “FLTK” comments and/or ‘fltk_’ symbol prefixing to be aware of necessary merges. It is also good to download the distribution tar ball or Git source files of the previous version and to run a (graphical) diff or merge tool on the previous version and the bundled version of FLTK to see the "previous" differences. Files that were not patched in previous versions should be copied to the new version w/o changes. Files that had FLTK specific patches must be merged manually. FLTK patches should be verified (if still necessary) and should be kept in the new source files. Source and header files that have been added in the new library version should be added in FLTK as well if they are necessary to build the library. A simple "trial and error" should be sufficient to find files that need to be added. Added files must be added to FLTK’s build files as well, usually to both ‘Makefile’ and ‘CMakeLists.txt’ to be used in configure/make and in CMake based builds, respectively.

Upgrade order:

There is only one dependency between all bundled libraries: libpng depends on zlib. Hence zlib should be upgraded first, then all other libs can be upgraded in arbitrary order.

Tests after merge:

Tests should be done on as many platforms as possible, both with autotools (configure/make) and CMake. Windows (Visual Studio) and macOS (Xcode) builds need CMake to generate the IDE files.

Upgrade notes for specific libraries:

The following chapters contain informations about specific files and how they are upgraded. Since the changes in all bundled libraries are not known in advance this information may change in the future. Please verify that no other changes are necessary.

26.2.4 zlib:

Website: https://zlib.net/
Download: See website and follow links.
Repository: git clone https://github.com/madler/zlib.git
zlib should be upgraded first because libpng depends on zlib.
26.2 Developer info for bundled libs

Download the latest zlib sources, 'cd' to /path-to/zlib and run

$ ./configure --zprefix

This creates the header file 'zconf.h' with definitions to enable the standard 'z_' symbol prefix.
Unfortunately zlib requires patching some source and header files to convert this 'z_' prefix to 'fltk_z_' to be more specific. As of this writing (Nov. 2021) three files need symbol prefix patches:

- gzread.c
- zconf.h
- zlib.h

You may want to compare these files and/or the previous version to find out which changes are required. The general rule is to change all occurrences of 'z_' to 'fltk_z_' but there are exceptions.

The following files need special handling:

- CMakeLists.txt: Keep FLTK version, update manually if necessary.
- Makefile: Same as CMakeLists.txt.
- gzread.c: Merge changes (see above, manual merge recommended).
- zconf.h: Merge changes (see above, manual merge recommended).
- zlib.h: Merge changes (see above, manual merge recommended).
- makedepend: Keep this file.

Run 'make depend' in the zlib folder on a Linux system after the upgrade to update this file.

26.2.5 png:

Website: http://libpng.org/pub/png/libpng.html
Download: See website and follow links.
Repository: git clone https://git.code.sf.net/p/libpng/code libpng
libpng should be upgraded after zlib because it depends on zlib.

Download the latest libpng sources, 'cd' to /path-to/libpng and run

$ ./configure --with-libpng-prefix=fltk-
 $ make

This creates the header files 'pnglibconf.h' and 'pngprefix.h' with the 'fltk_' symbol prefix.
The following files need special handling:

- CMakeLists.txt: Keep FLTK version, update manually if necessary.
- Makefile: Same as CMakeLists.txt.
- pnglibconf.h: Generate on a Linux system and merge (see above).
- pngprefix.h: Generate on a Linux system and merge (see above).
- makedepend: Keep this file.
- png.c: Keep a change labelled with "FLTK"
- pngerror.c: Keep two changes labelled with "FLTK"

Run 'make depend' in the png folder on a Linux system after the upgrade to update this file.
26.2.6 jpeg:

Website:  https://ijg.org/
Download: See website and follow links.
Repository: N/A

Download the latest jpeg-xy sources on a Linux (or Unix) system, `cd` to `/path-to/jpeg-xy` and run

```
$ ./configure
$ make [-jN]
```

This builds the library and should create the static library file '.libs/libjpeg.a'.

Execute the following command to extract the libjpeg symbol names used to build the 'prefixed' libfltk_jpeg library:

```
$ nm --extern-only --defined-only .libs/libjpeg.a | awk '{print $3}' | sort -u | awk '{print "#define $1 fltk_"$1}'
> fltk_jpeg_prefix.h
```

This creates the header file 'fltk_jpeg_prefix.h' with the '# define' statements using the 'fltk_' symbol prefix.

The following files need special handling:

- CMakeLists.txt: Keep FLTK version, update manually if necessary.
- Makefile: Same as CMakeLists.txt.
- fltk_jpeg_prefix.h: Generate on a Linux system and merge (see above).
- jconfig.h: keep changes flagged with

  ```
  /* FLTK */
  ```

  Note: more to come...
- makedepend: Keep this file.

Run `make depend` in the jpeg folder on a Linux system after the upgrade to update this file.

26.2.7 nanosvg:

Website:  https://github.com/memononen/nanosvg
Download: See website and follow links.
Repository: git clone https://github.com/memononen/nanosvg.git
FLTK Fork: git clone https://github.com/fltk/nanosvg.git

FLTK has its own GitHub fork of the original repository (see above).
The intention is to update this fork from time to time so the FLTK specific patches are up-to-date with the original library. Hopefully the FLTK patches will be accepted upstream at some time in the future so we no longer need our own patches. AlbrechtS, 04 Feb 2018.

Update (Feb 22, 2021): The upstream library is officially no longer maintained (see README.md) although updates appear from time to time.

Use this fork (branch 'fltk') to get the nanosvg library with FLTK specific patches:

```
$ git clone https://github.com/fltk/nanosvg.git nanosvg-fltk
$ cd nanosvg-fltk
$ git checkout fltk
$ cd src
$ cp nanosvg.h nanosvgrast.h /path/to/fltk-1.4/nanosvg/
```

This library does not have its own build files since it is a header-only library. The headers are included in FLTK where necessary.

The following files need special handling:

- nanosvg.h: Merge or download from FLTK's fork (see above).
- nanosvgrast.h: Merge or download from FLTK's fork (see above).

Maintaining branch 'fltk' in FLTK's fork of nanosvg (fltk/nanosvg):

Only maintainers with write access on fltk/nanosvg can do this. Others can fork our fltk/nanosvg fork in their own GitHub account and either open a PR on fltk/nanosvg or tell us about their changes in fltk.development.

Use something similar to the following commands to update FLTK's fork of nanosvg to the latest version. Commands are only examples, you may need to change more or less, depending on the outstanding updates.

Step 1: clone the fltk/nanosvg fork, set the remote 'upstream', and update the 'master' branch:

```
$ cd /to/your/dev/dir
$ git clone https://github.com/fltk/nanosvg.git nanosvg-fltk
$ cd nanosvg-fltk
$ git remote add upstream https://github.com/memononen/nanosvg
$ git checkout master
$ git pull upstream master
```
Note: the ‘master’ branch must never be changed, i.e. it must always be the same as ‘upstream/master’. Never
commit your own (FLTK specific) changes to branch ‘master’.

Step 2: rebase branch ‘fltk’ on the new master (upstream/master), fix potential conflicts, and tag the new branch.
It is important to keep the individual FLTK specific patches intact (one commit per patch) because this will preserve
the history and the committer and make it easier to skip single patches when they are accepted upstream.

$ git checkout fltk
$ git rebase upstream/master

At this point you may need to fix conflicts! Do whatever is necessary to update the branch ‘fltk’.

Now ‘git tag’ the ‘fltk’ branch for later reference.

Hint: use ‘git show <any-older-tag-name>’ to see its contents. I like to write a summary of commits in the tag
comment.

$ git tag -a fltk_yyyy-mm-dd fltk

Replace ‘yyyy-mm-dd’ with the current date and add a comment when asked for it (your editor will open an empty
file).

Step 3: at this point it is recommended to copy the changed header files to your working copy of the FLTK library
and test the changes. If anything is wrong, go back, fix the bugs and change the git tag (delete and create a new
one).

Step 4: push the new branch ‘fltk’ and the tag to the fltk/nanosvg repository:

$ git push -f origin fltk
$ git push origin fltk_yyyy-mm-dd

Step 5: copy the changed files to your working copy of the FLTK repository (if not done already), update this file
accordingly, and commit/push the update to the fltk/fltk repository.

26.2.8  libdecor:

Website:  https://gitlab.freedesktop.org/libdecor/libdecor

Download: See website and follow links.

Repository: git clone https://gitlab.freedesktop.org/libdecor/libdecor.git

libdecor is used by the Wayland/X11 hybrid platform to draw window titlebars when FLTK apps run as Wayland
clients and the running Wayland compositor uses client-side decoration. In the future, when libdecor will have made
its way into Linux packages, FLTK will use the system version of libdecor. libdecor will remain as an FLTK bundle to
support Linux configurations where the libdecor package is not available or not installed.

FLTK uses libdecor source files without any modification. This part of the libdecor source tree is copied to directory
libdecor/ of the FLTK source tree:

    LICENSE
    README.md
    src/... and files below except meson.build files

Furthermore, directory libdecor/build/ of the FLTK source tree does not originate from the libdecor source tree but
contains 3 FLTK-created files. File build/Makefile may need changes if a libdecor update adds or renames source
files.

26.3  Developer Information

This chapter describes FLTK development and documentation.

Example

/** 
 * Fl_Clock, Fl_Clock_Output widgets. */
*/

/**
 * \brief This widget can be used to display a program-supplied time.

 The time shown on the clock is not updated. To display the current time,
 use Fl_Clock instead.

 \image html clock.png
 \image latex clock.png " width=10cm
 \image html round_clock.png
 \image latex clock.png " width=10cm

Generated by Doxygen
Returns the displayed time.
Returns the time in seconds since the UNIX epoch (January 1, 1970).

```cpp
ulong value() const {return value_;
```

```cpp
Set the displayed time.
Set the time in seconds since the UNIX epoch (January 1, 1970).

```cpp
void Fl_Clock_Output::value(ulong v) {
...}
```

Create an Fl_Clock widget using the given position, size, and label string.
The default boxtype is FL_NO_BOX.

```cpp
Fl_Clock::Fl_Clock(int X, int Y, int W, int H, const char *L)
: Fl_Clock_Output(X, Y, W, H, L) {}
```

Create an Fl_Clock widget using the given boxtype, position, size, and
label string.

```cpp
Fl_Clock::Fl_Clock(uchar t, int X, int Y, int W, int H, const char *L)
: Fl_Clock_Output(X, Y, W, H, L) {
    type(t);
    box(t==FL_ROUND_CLOCK ? FL_NO_BOX : FL_UP_BOX);
}
```

From Duncan: (will be removed later, just for now as a reminder)
I've just added comments for the fl_color_chooser() functions, and in order to keep them and the general Function
Reference information for them together, I created a new doxygen group, and used \ingroup in the three comment
blocks. This creates a new Modules page (which may not be what we want) with links to it from the File Members
and Fl_Color_Chooser.H pages. It needs a bit more experimentation on my part unless someone already knows
how this should be handled. (Maybe we can add it to a functions.dox file that defines a functions group and do that
for all of the function documentation?)

**Update:** the trick is not to create duplicate entries in a new group, but to move the function information into the
doxxygen comments for the class, and use the navigation links provided. Simply using \relatesalso as the first
doxxygen command in the function's comment puts it in the appropriate place. There is no need to have \defgroup
and \ingroup as well, and indeed they don't work. So, to summarize:

Gizmo.H
```cpp
/** 
   * \class Gizmo
   * A gizmo that does everything
   */
   class Gizmo {
   etc
   }
extern int popup_gizmo(...);
```

Gizmo.cxx:
```cpp
/** \relatesalso Gizmo
 * Pops up a gizmo dialog with a Gizmo in it
 */
int popup_gizmo(...);
```
Comments Within Doxygen Comment Blocks

You can use HTML comment statements to embed comments in doxygen comment blocks. These comments will not be visible in the generated document.

The following text is a developer comment.

```html
<!-- *** This *** is *** invisible *** -->
```

This will be shown as:

```
The following text is a developer comment.
<!-- *** This *** is *** invisible *** -->
```

This will be visible again.

Different Headlines

You can use HTML tags `</H1>` ... `</H4>` for headlines with different sizes. As of doxygen 1.8.x there must not be more than three spaces at the beginning of the line for this to work. Currently (doxygen 1.8.6) there seems to be no difference in the font sizes of `</H3>` and `</H4>` in the pdf output, whereas the html output uses different font sizes.

```
< H 1 > Headline in big text (H1) </H1>
< H 2 > Headline in big text (H2) </H2>
< H 3 > Headline in big text (H3) </H3>
< H 4 > Headline in big text (H4) </H4>
```

**Headline in big text (H1)**

**Headline in big text (H2)**

**Headline in big text (H3)**

**Headline in big text (H4)**

26.3.1 Non-ASCII Characters

Doxygen understands many HTML quoting characters like &quot;, &uuml;, &ccedil;, &Ccedil;, but not all HTML quoting characters. This will appear in the document:

```
Doxygen understands many HTML quoting characters like
&quot;, &uuml;, &ccedil;, &Ccedil;, but not all HTML quoting characters.
```

For further informations about HTML quoting characters see

http://www.doxygen.org/manual/htmlcmds.html

Alternatively you can use UTF-8 encoding within Doxygen comments.

26.3.2 Document Structure

- `\page` creates a named page
- `\section` creates a named section within that page
- `\subsection` creates a named subsection within the current section
- `\subsubsection` creates a named subsubsection within the current subsection

All these statements take a "name" as their first argument, and a title as their second argument. The title can contain spaces. The page, section, and subsection titles are formatted in blue color and a size like "<H1>", "<H2>", and "<H3>", and "<H4>", respectively.

By FLTK documentation convention, a file like this one with a doxygen documentation chapter has the name "\chapter<dox>". The `\page` statement at the top of the page is "\page <chapter> This is the title". Sections within a documentation page must be called "<chapter>_<section>", where "<chapter>" is the name part of the file, and "<section>" is a unique section name within the page that can be referenced in links. The same for subsections and subsubsections.
These doxygen page and section commands work only in special documentation chapters, not within normal source or header documentation blocks. However, links from normal (e.g., class) documentation to documentation sections do work. This page has \page development I - Developer Information at its top. This section is \section development_structure Document Structure The following section is \section development_links Creating Links

### 26.3.3 Creating Links

Links to other documents and external links can be embedded with

- doxygen \ref links to other doxygen \page, \section, \subsection and \anchor locations
- HTML links without markup - doxygen creates "http://..." links automatically
- standard, non-Doxygen, HTML links
  - see chapter \ref unicode creates a link to the named chapter unicode that has been created with a \page statement.
  - For further informations about quoting see http://www.doxygen.org/manual/htmlcmds.html
  - see <a href="https://www.fltk.org/">FLTK Library</a> creates a standard HTML link

appears as:

- see chapter Unicode and UTF-8 Support creates a link to the named chapter unicode that has been created with a \page statement.
- For further informations about quoting see http://www.doxygen.org/manual/htmlcmds.html
- see FLTK Library creates a standard HTML link

### 26.3.4 Paragraph Layout

There is no real need to use HTML `<P>` and `</P>` tags within the text to tell doxygen to start or stop a paragraph. In most cases, when doxygen encounters a blank line or some, but not all, commands in the text it knows that it has reached the start or end of a paragraph. Doxygen also offers the \par command for special paragraph handling. It can be used to provide a paragraph title and also to indent a paragraph. Unfortunately \par won't do what you expect if you want to have doxygen links and sometimes html tags don't work either.

```
\par Normal Paragraph with title

This paragraph will have a title, but because there is a blank line between the \par and the text, it will have the normal layout.

\par Indented Paragraph with title

This paragraph will also have a title, but because there is no blank line between the \par and the text, it will be indented.

\par

It is also possible to have an indented paragraph without title. This is how you indent subsequent paragraphs.

\par No link to Fl_Widget::draw()

Note that the paragraph title is treated as plain text.

Doxygen type links will not work. HTML characters and tags may or may not work.

Fl_Widget::draw() links and "html" tags work<br>

\par

Use a single line ending with <br> for complicated paragraph titles.
```

The above code produces the following paragraphs:
Normal Paragraph with title

This paragraph will have a title, but because there is a blank line between the `par` and the text, it will have the normal layout.

Indented Paragraph with title

This paragraph will also have a title, but because there is no blank line between the `par` and the text, it will be indented.

It is also possible to have an indented paragraph without title. This is how you indent subsequent paragraphs.

No link to Fl_Widget::draw()

Note that the paragraph title is treated as plain text. Doxygen type links will not work. HTML characters and tags may or may not work.

Fl_Widget::draw() links and "html" tags work

Use a single line ending with `<br>` for complicated paragraph titles.

26.3.5 Navigation Elements

Each introduction (tutorial) page ends with navigation elements. These elements must only be included in the html documentation, therefore they must be separated with `htmlonly` and `endhtmlonly`.

The following code gives the navigation bar at the bottom of this page:

```html
\htmlonly
<br>
<table summary="navigation bar" width="100%" border="0">
<tr>
  <td width="45%" align="LEFT">
    <a class="el" href="migration_1_4.html">
      [Prev]
      Migrating Code from FLTK 1.3 to 1.4
    </a>
  </td>
  <td width="10%" align="CENTER">
    <a class="el" href="index.html">
      [Index]
    </a>
  </td>
  <td width="45%" align="RIGHT">
    <a class="el" href="license.html">
      Software License
      [Next]
    </a>
  </td>
</tr>
</table>
\endhtmlonly
```
Chapter 27

Todo List

Page Adding and Extending Widgets

Clarify Fl_Window::damage(uchar) handling - seems confused/wrong? ORing value doesn't match setting behavior in Fl_Widget.H!

Member Fl::now (double offset=0)

Fl::system_driver()->gettime() was implemented for the Forms library and has a limited resolution (on Windows: milliseconds). On POSIX platforms it uses gettimeofday() with microsecond resolution. A new function could use a better resolution on Windows with its multimedia timers which requires a new dependency: winmm.lib (dll). This could be a future improvement, maybe set as a build option or generally (requires Win95 or 98?).

Member Fl_Browser__::scrollbar_width () const

This method should eventually be removed in 1.4+

Member Fl_Browser__::scrollbar_width (int width)

This method should eventually be removed in 1.4+

Class Fl_Chart

Refactor Fl_Chart::type() information.

Member Fl_File_Input::errorcolor (Fl_Color c)

Remove Fl_File_Input::errorcolor(Fl_Color) in FLTK 1.5.0 or higher.

Member Fl_File_Input::errorcolor () const

Remove Fl_File_Input::errorcolor() in FLTK 1.5.0 or higher.

Member fl_filename_list (const char ∗d, struct dirent ∗∗∗l, Fl_File_Sort_F ∗s=fl_numericsort)

should support returning OS error messages

Class Fl_Grid

This (relative group coordinates of nested groups of Fl_Grid) needs explanation and maybe an example.

Member Fl_Grid::clear_layout ()

Fl_Grid::clear() needs to be implemented as documented above!

Member Fl_Grid::debug (int level=127)

Add more information about cells and children.

Control output by using level.

Member Fl_Grid::Fl_Grid (int X, int Y, int W, int H, const char ∗L=0)

More documentation of Fl_Grid constructor?

Member Fl_Grid::layout ()

Document when and why to call layout() w/o args. See Fl_Flex::layout()

Member Fl_Grid::layout (int rows, int cols, int margin=1, int gap=-1)

Document when and why to call layout() w/o args. See Fl_Flex::layout()
Member `Fl_Group::delete_child` (int n)
Reimplementation of `Fl_Group::delete_child(int)` in more FLTK subclasses. This is not yet complete.

Member `fl_height` (int font, int size)
In the future, when the XFT issues are resolved, this function should simply return the 'size' value.

Member `Fl_Help_View::find` (const char *s, int p=0)
complex HTML entities for Unicode code points > 0x80 are currently treated like one byte (not character!) and
do not (yet) match correctly ("<" matches "<" but "€" doesn't match "€", and "ö" doesn't match "ö")

Member `Fl_Input_::handle_mouse` (int, int, int, int, int keepmark=0)
Add comment and parameters

Member `Fl_Input_::handle_text` (int e, int, int, int, int)
Add comment and parameters

Class `Fl_Label`
There is an aspiration that the `Fl_Label` type will become a widget by itself. That way we will be avoiding a lot
of code duplication by handling labels in a similar fashion to widgets containing text. We also provide an easy
interface for very complex labels, containing html or vector graphics. However, this re-factoring is not in place in
this release.

Member `Fl_Menu_::add` (const char *, int shortcut, Fl_Callback *, void * = 0, int = 0)
Raw integer shortcut needs examples. Dependent on responses to https://www.fltk.org/newsgroups.php?g=fltk.coredev+v:10086 and results of STR#2344

Member `Fl_Shortcut`
Discuss and decide whether we can "shift" these special keyboard flags to the upper byte to enable full 21-bit
Unicode characters (U+0000 . U+10FFFF) plus the keyboard indicator bits as this was originally in-
tended. This would be possible if we could rely on all programs being coded with symbolic names and not hard
coded bit values.

Member `Fl_Terminal::scrollbar` Support scrollbar_left/right() - See `Fl_Browser::scrollbar` docs

Member `Fl_Text_Display::extend_range_for_styles` (int *start, int *end)
Unicode?

Member `Fl_Text_Display::handle_vline` (int mode, int lineStart, int lineLen, int leftChar, int rightChar, int
topClip, int bottomClip, int leftClip, int rightClip) const
we need to handle hidden hyphens and tabs here!
we handle all styles and selections
we must provide code to get pixel positions of the middle of a character as well

Member `Fl_Text_Display::overstrike` (const char *text)
Unicode? Find out exactly what we do here and simplify.

Member `Fl_Text_Display::position_to_linecol` (int pos, int *lineNum, int *column) const
a column number makes little sense in the UTF-8/variable font width environment. We will have to further define
what exactly we want to return. Please check the functions that call this particular function.

Member `Fl_Text_Display::scroll` (int topLineNum, int horizOffset)
Column numbers make little sense here.

Member `Fl_Text_Display::scrollbar_width` (int width)
This method should eventually be removed

Member `Fl_Text_Display::scrollbar_height` (int width)
This method should eventually be removed.

Member `Fl_Text_Display::shortcut` (int s)
FIXME : get set methods pointing on shortcut_ have no effects as shortcut_ is unused in this class and derived!
Member Fl_Text_Display::shortcut () const

FIXME: get set methods pointing on shortcut_ have no effects as shortcut_ is unused in this class and derived!

Member Fl_Text_Display::wrapped_column (int row, int column) const

What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function TextDXYToUnconstrainedPosition does not exist (nedit port?)

Unicode?

Member Fl_Text_Display::wrapped_row (int row) const

What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function TextDXYToUnconstrainedPosition does not exist (nedit port?)

Member Fl_Tiled_Image::Fl_Tiled_Image (Fl_Image ∗i, int W=0, int H=0)

Fix Fl_Tiled_Image as background image for widgets and windows and fix the implementation of Fl::scheme(const char ∗).

Member Fl_Tree::handle (int e) FL_OVERRIDE

add Fl_Widget_Tracker (see Fl_Browser_cxx::handle())

Member Fl_Tree::is_scrollbar (Fl_Widget ∗w)

should be const

Member Fl_Tree::show_self ()

should be const

Member Fl_Window::show () FL_OVERRIDE

Check if we can remove resetting the current group in a later FLTK version (after 1.3.x). This may break "already broken" programs though if they rely on this "feature".

Page FLTK Basics

This section needs a major rework. Add a chapter "Building FLTK with CMake".

Page Handling Events

Add details on how to detect repeating keys, since on some X servers a repeating key will generate both FL_KEYUP and FL_KEYDOWN, such that to tell if a key is held, you need Fl::event_key(int) to detect if the key is being held down during FL_KEYUP or not.

Page Unicode and UTF-8 Support

Verify 16/24 bit Unicode limit for different character sets? OksiD's code appears limited to 16-bit whereas the FLTK2 code appears to handle a wider set. What about illegal characters? See comments in fl_utf8fromwc() and fl_utf8toUtf16().

Work through the code and this documentation to harmonize the [OksiD] and [fltk2] functions.

FLTK 1.3 and later supports the full Unicode range (21 bits), but there are a few exceptions, for instance binary shortcut values in menus (Fl_Shortcut) can only be used with characters from the BMP (16 bits). This may be extended in a future FLTK version.
Chapter 28

Deprecated List

Member Fl::release ()
Use Fl::grab(0) instead.

Member Fl::set_idle (Fl_Old_Idle_Handler cb)
This method is obsolete - use the add_idle() method instead.

Member Fl::version ()
Use int Fl::api_version() instead.

Member fl_ask (const char ∗fmt,...)
fl_ask() is deprecated since it uses "Yes" and "No" for the buttons which does not conform to the current FLTK Human Interface Guidelines. Use fl_choice() with the appropriate verbs instead.

Member Fl_Browser:::position () const
"in 1.4.0 - use vposition() instead"

Member Fl_Browser:::position (int pos)
"in 1.4.0 - use vposition(pos) instead"

Member Fl_Browser:::scrollbar_width () const
Use scrollbar_size() instead.

Member Fl_Browser:::scrollbar_width (int width)
Use scrollbar_size() instead.

Member fl_clip (int x, int y, int w, int h)
Please use fl_push_clip(int x, int y, int w, int h) instead. fl_clip(int, int, int, int) will be removed in FLTK 1.5.

Member Fl_File_Input::errorcolor () const
Will be removed in FLTK 1.5.0 or higher.

Member Fl_File_Input::errorcolor (Fl_Color c)
Will be removed in FLTK 1.5.0 or higher.

Member fl_find (Window xid)
Kept in the X11, Windows, and macOS platforms for compatibility with FLTK versions before 1.4. Please use fl_x11_find(Window), fl_wl_find(struct wid_window*), fl_win32_find(HWND) or fl_mac_find(FLWindow*) with FLTK 1.4.0 and above.

Member Fl_GIF_Image::Fl_GIF_Image (const char ∗imagename, const unsigned char ∗data)
Please use Fl_GIF_Image(const char ∗imagename, const unsigned char ∗data, const size_t length) instead.

Member Fl_Group::focus (Fl_Widget ∗W)
This is for backwards compatibility only. You should use W->take_focus() instead.

Member Fl_Group:::sizes ()
Deprecation since 1.4.0. Please use bounds() instead.
Member Fl_Image::draw_scaled (int X, int Y, int W, int H)  
Only for API compatibility with FLTK 1.3.4.

Member Fl_Image::label (Fl_Menu_Item *m)  
Please use Fl_Menu_Item::image() instead.

Member Fl_Image::label (Fl_Widget *w)  
Please use Fl_Widget::image() or Fl_Widget::deimage() instead.

Member Fl_Image_Surface::highres_image ()  
Use image() instead.

Member Fl_Input::position (int p, int m)  
"in 1.4.0 - use insert_position(p, m) or Fl_Widget::position(x, y) instead"

Member Fl_Input::position (int p)  
"in 1.4.0 - use insert_position(p) instead"

Member Fl_Input::position () const  
"in 1.4.0 - use insert_position() instead"

Member Fl_Menu_Item::check ()  
Please use Fl_Menu_Item::set() instead. This method will be removed in FLTK 1.5.0 or later.

Member Fl_Menu_Item::checked () const  
Please use Fl_Menu_Item::value() instead. This method will be removed in FLTK 1.5.0 or later.

Member Fl_Menu_Item::uncheck ()  
Please use Fl_Menu_Item::clear() instead. This method will be removed in FLTK 1.5.0 or later.

Member Fl_Preferences::Fl_Preferences (const char *path, const char *vendor, const char *application)  
"in 1.4.0 - use Fl_Preferences(path, vendor, application, flags) instead"

Member Fl_Text_Display::scrollbar_width () const  
Use scrollbar_size() instead.

Member Fl_Text_Display::scrollbar_width (int width)  
Use scrollbar_size() instead.

Member Fl_Text_Selection::position (int *startpos, int *endpos) const  
"in 1.4.0 - use selected(startpos, endpos) instead"

Member Fl_Tile::position (int oldx, int oldy, int newx, int newy)  
"in 1.4.0 - use move_intersection(p) instead"

Member Fl_Tree::first_visible ()  
in 1.3.3 ABI – use first_visible_item() instead.

Member Fl_Tree::item_clicked (Fl_Tree_Item *val)  
in 1.3.3 ABI – use callback_item() instead.

Member Fl_Tree::item_clicked ()  
in 1.3.3 ABI – use callback_item() instead.

Member Fl_Tree::last_visible ()  
in 1.3.3 – use last_visible_item() instead.

Member Fl_Tree_Item::Fl_Tree_Item (const Fl_Tree_Prefs &prefs)  
in 1.3.3 ABI – you must use Fl_Tree_Item(Fl_Tree*) for proper horizontal scrollbar behavior.
Member `Fl_Tree_Item::next_displayed (Fl_Tree_Prefs &prefs)`
   in 1.3.3 for confusing name, use `next_visible()` instead

Member `Fl_Tree_Item::prev_displayed (Fl_Tree_Prefs &prefs)`
   in 1.3.3 for confusing name, use `prev_visible()`

Member `FL_VERSION`
   This `double` version number is retained for compatibility with existing program code. New code should use `int FL_API_VERSION` instead. `FL_VERSION` is deprecated because comparisons of floating point values may fail due to rounding errors. However, there are currently no plans to remove this deprecated constant.

Member `Fl_Widget::color2 () const`
   Use `selection_color()` instead.

Member `Fl_Widget::color2 (unsigned a)`
   Use `selection_color(unsigned)` instead.

Member `Fl_Window::free_position ()`
   please use `force_position(0)` instead

Member `Fl_Window::icon () const`
   in 1.3.3

Member `Fl_Window::icon (const void *ic)`
   in 1.3.3 in favor of platform-independent methods `Fl_Window::icon(const Fl_RGB_Image *icon)` and `Fl_Window::icons(const Fl_RGB_Image *icons[], int count)`.

Page Operating System Issues
   Kept for compatibility with FLTK versions before 1.4. Use preferentially `fl_x11_xid(const Fl_Window *)` with versions 1.4 and above.
   Kept for compatibility with FLTK versions before 1.4. Use preferentially `fl_x11_find(Windows)` with versions 1.4 and above.
Chapter 29

Module Index

29.1 Modules

Here is a list of all modules:

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- Mac OS X-specific symbols ............................................... 385
- Common Dialog Classes and Functions ................................. 387
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# Chapter 30

## Hierarchical Index

### 30.1 Class Hierarchy

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Chapter 31

Class Index

31.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

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- **Fl_Terminal::CharStyle**: Was stolen from Prisms, and has proven to be very useful for values that need a large dynamic range. 412
- **Fl_GIF_Image::GIF_FRAME::CPAL**: Supports loading, caching, and drawing of animated Compuserve GIF images. 413
- **Fl_Terminal::Cursor**: 414
- **Fl_Preferences::Entry**: 415
- **Fl_Terminal::EscapeSeq**: 416
- **Fl_Adjuster**: The Fl_Adjuster class prototype that allows for additional data in callbacks. 445
- **Fl_Anim_GIF_Image**: Supports loading, caching, and drawing of animated Compuserve GIF images. 447
- **Fl_Bitmap**: Supports caching and drawing of mono-color (bitmap) images. 460
- **Fl_BMP_Image**: Supports loading, caching, and drawing of Windows Bitmap (BMP) image files. 464
- **Fl_Box**: This widget simply draws its box, and possibly its label. 466
- **Fl_Browser**: Displays a scrolling list of text lines, and manages all the storage for the text. 468
- **Fl_Browser::Fl_Browser_**: This is the base class for browsers. 490
- **Fl_Button**: Buttons generate callbacks when they are clicked by the user. 508
- **Fl_Cairo_Context**: Contains all the necessary info on the current cairo context. 514
- **Fl_Cairo_Window**: This defines an FLTK window with Cairo support. 515
- **Fl_Callback_User_Data**: A class prototype that allows for additional data in callbacks. 516
- **Fl_Chart**: Fl_Chart displays simple charts. 517
- **FL_CHART_ENTRY**: For internal use only. 524
- **Fl_Check_Browser**: Displays a scrolling list of text lines that may be selected and/or checked by the user. 524
- **Fl_Check_Button**: A button with a "checkmark" to show its status. 530
**Fl_Choice**
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**Fl_Clock**
This widget provides a round analog clock display .................................. 534

**Fl_Clock_Output**
This widget can be used to display a program-supplied time ...................... 537

**Fl_Color_Chooser**
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**Fl_Copy_Surface**
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**Fl_Counter**
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**Fl_Device_Plugin**
This plugin socket allows the integration of new device drivers for special window or screen types 554

**Fl_Dial**
Circular dial to control a single floating point value ............................... 555

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The computer's display .............................................................................. 557

**Fl_Double_Window**
The Fl_Double_Window provides a double-buffered window .................... 558

**Fl_End**
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**Fl_EPS_File_Surface**
Encapsulated PostScript drawing surface .................................................. 561

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**Fl_File_Chooser**
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**Fl_File_Input**
This widget displays a pathname in a text input field ................................ 579

**Fl_Fill_Dial**
Draws a dial with a filled arc .................................................................... 582

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Widget that draws a filled horizontal slider, useful as a progress or value meter 582

**Fl_Flex**
Fl_Flex is a container (layout) widget for one row or one column of widgets 583

**Fl_Float_Input**
Subclass of Fl_Input that only allows the user to type floating point numbers (sign, digits, decimal point, more digits, 'E' or 'e', sign, digits) ......................................................... 594

**Fl FormsBitmap**
Forms compatibility Bitmap Image Widget ................................................ 594

**Fl FormsPixmap**
Forms pixmap drawing routines ................................................................. 596

**Fl FormsText**
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Emulation of the Forms "free" widget ........................................................ 598

**Fl GIF Image**
Supports loading, caching, and drawing of Compuserve GIF images ........ 600

**Fl Gl Choice**
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**Fl Gl Window**
Sets things up so OpenGL works ............................................................... 604

**Fl Gl_Bitmap_Font**
Fltk glut font/size attributes used in the glutXXX functions .................... 614

**Fl Gl_StrokeChar**
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**Fl Gl_StrokeFont**
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GLUT is emulated using this window class and these static variables (plus several more static variables hidden in glut_compatibility.cxx):

FL_Grid is a container (layout) widget with multiple columns and rows

FL_Group
FLTK container widget

FL_Help_Block
Definition of a link for the html viewer

FL_Help_Dialog
Displays a standard help dialog window using the FL_Help_View widget

FL_Help_Font_Stack
FL_Help_View font stack element definition

FL_Help_Font_Style
FL_Help_Font_Stack element definition

FL_Help_Link
Definition of a link for the html viewer

FL_Help_Target
FL_Help_Target structure

FL_Help_View
Displays HTML text

FL_Hold_Browser
The FL_Hold_Browser is a subclass of FL_Browser which lets the user select a single item, or no items by clicking on the empty space

FL_Hor_Fill_Slider
Single thumb tab slider

FL_Hor_Nice_Slider
Horizontal Slider class

FL_Hor_Value_Slider
Horizontal Slider class

FL_ICO_Image
Supports loading, caching, and drawing of Windows icon (.ico) files

FL_Image
Base class for image caching, scaling and drawing

FL_Image_Reader
Directs all graphics requests to an FL_Image

FL_Input
This is the FLTK text input widget

FL_Input_Choice
A combination of the input widget and a menu button

FL_Int_Input
Subclass of FL_Input that only allows the user to type decimal digits (or hex numbers of the form 0xaef)

FL_JPEG_Image
Supports loading, caching, and drawing of Joint Photographic Experts Group (JPEG) File Interchange Format (JFIF) images

FL_Label
This struct stores all information for a text or mixed graphics label

FL_Light_Button
This subclass displays the "on" state by turning on a light, rather than drawing pushed in

FL_Line_Dial
Base class of all widgets that have a menu in FLTK
Fl_Menu_Bar
This widget provides a standard menubar interface ........................................ 732

Fl_Menu_Button
This is a button that when pushed pops up a menu (or hierarchy of menus) defined by an array
of Fl_Menu_Item objects ................................................................. 734

Fl_Menu_Item
The Fl_Menu_Item structure defines a single menu item that is used by the Fl_Menu_bar class ... 738

Fl_Menu_Window
Window type used for menus ........................................................................ 750

Fl_Multi_Browser
Subclass of Fl_Browser which lets the user select any set of the lines .................. 751

Fl_Multi_Label
Allows a mixed text and/or graphics label to be applied to an Fl_Menu_Item or Fl_Widget ... 752

Fl_Multiline_Input
This input field displays ‘\n’ characters as new lines rather than ‘\n’, and accepts the Return, Tab,
and up and down arrow keys .................................................................... 754

Fl_Multiline_Output
This widget is a subclass of Fl_Output that displays multiple lines of text ............... 755

Fl_Native_File_Chooser
This class lets an FLTK application easily and consistently access the operating system's native
file chooser .............................................................................................. 756

Fl_Nice_Slider
.............................................................................................................. 762

Fl_Output
This widget displays a piece of text .................................................................. 762

Fl_Overlay_Window
This window provides double buffering and also the ability to draw the "overlay" which is another
picture placed on top of the main image ....................................................... 763

Fl_Pack
This class is provided for Forms compatibility ................................................. 783

Fl_Pixmap
Supports caching and drawing of colormap ( pixmap ) images, including transparency ... 774

Fl_Plugin
Fl_Plugin allows link-time and run-time integration of binary modules .................. 778

Fl_Plugin_Manager
Fl_Plugin_Manager manages link-time and run-time plugin binaries .................... 779

Fl_PNG_Image
Supports loading, caching, and drawing of Portable Network Graphics (PNG) image files ... 780

Fl_PNM_Image
Supports loading, caching, and drawing of Portable Anymap (PNM, PBM, PGM, PPM) image files ... 782

Fl_Positioner
This class is provided for Forms compatibility ................................................. 783

Fl_PostScript_File_Device
To send graphical output to a PostScript file .................................................. 785

Fl_Preferences
Fl_Preferences store user settings between application starts .............................. 792

Fl_Printer
OS-independent print support ........................................................................... 813

Fl_Progress
Displays a progress bar for the user ................................................................ 820

Fl_Radio_Button
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Fl_Radio_Light_Button
................................................................. 823

Fl_Radio_Round_Button
................................................................. 823

Fl_Rect
Rectangle with standard FLTK coordinates (X, Y, W, H) ............................... 824

Fl_Scroll::Fl_Region_LRTB
A local struct to manage a region defined by left/right/top/bottom ...................... 827
Fl_Scroll::Fl_Region_XYWH
A local struct to manage a region defined by xywh ........................................ 827

Fl_Repeated_Button
The Fl_Repeated_Button is a subclass of Fl_Button that generates a callback when it is pressed and then repeatedly generates callbacks as long as it is held down ........................................ 827

Fl_Return_Button
The Fl_Return_Button is a subclass of Fl_Button that generates a callback when it is pressed or when the user presses the Enter key ........................................ 829

Fl_RGB_Image
Supports caching and drawing of full-color images with 1 to 4 channels of color information ...... 831

Fl_Roller
"dolly" control commonly used to move 3D objects ........................................ 836

Fl_Round_Button
Buttons generate callbacks when they are clicked by the user ........................................ 838

Fl_Round_Clock
A clock widget of type FL_ROUND_CLOCK ........................................ 840

Fl_Scheme ........................................ 841
Fl_Scheme_Choice ........................................ 843

Fl_Scroll
This container widget lets you maneuver around a set of widgets much larger than your window 844

Fl_Scrollbar
Displays a slider with arrow buttons at the ends of the scrollbar ........................................ 852

Fl_Scroll::Fl_Scrollbar_Data
A local struct to manage a scrollbar’s xywh region and tab values ........................................ 855

Fl_Secret_Input
Subclass of Fl_Input that displays its input as a string of placeholders ........................................ 856

Fl_Select_Browser
The class is a subclass of Fl_Browser which lets the user select a single item, or no items by clicking on the empty space ........................................ 857

Fl_Shared_Image
This class supports caching, loading, and drawing of image files ........................................ 858

Fl_Shortcut_Button
A button that allows the user to type a key combination to create shortcuts ........................................ 866

Fl_Simple_Counter
This widget creates a counter with only 2 arrow buttons ........................................ 868

Fl_Simple_Terminal
This is a continuous text scroll widget for logging and debugging output, much like a terminal ........................................ 869

Fl_Single_Window
This is the same as Fl_Window ........................................ 879

Fl_Slider
Sliding knob inside a box ........................................ 881

Fl_Spinner
This widget is a combination of a numerical input widget and repeat buttons ........................................ 884

Fl_Spinner::Fl_Spinner_Input ........................................ 889

Fl_Surface_Device
A drawing surface that's susceptible to receive graphical output ........................................ 890

Fl_SVG_File_Surface
A drawing surface producing a Scalable Vector Graphics (SVG) file ........................................ 893

Fl_SVG_Image
Supports loading, caching and drawing of scalable vector graphics (SVG) images ........................................ 896

Fl_Sys_Menu_Bar
A class to create and modify menus that appear on macOS in the menu bar at the top of the screen ........................................ 901

Fl_Table
A table of widgets or other content ........................................ 908

Fl_Table_Row
A table with row selection capabilities ........................................ 927
**FL_Tabs**
Container widget that displays a set of tabs, with each tab representing a different child widget

**FL_Terminal**
Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control

**FL_Text_Buffer**
This class manages Unicode text displayed in one or more FL_Text_Display widgets

**FL_Text_Display**
Rich text display widget

**FL_Text_Editor**
This is the FLTK text editor widget

**FL_Text_Selection**
This is an internal class for FL_Text_Buffer to manage text selections

**FL_Tile**
Lets you resize its children by dragging the border between them

**FL_Tiled_Image**
This class supports tiling of images over a specified area

**FL_Timeout**
The internal class FL_Timeout handles all timeout related functions

**FL_Timer**
This is provided only to emulate the Forms Timer widget

**FL_Toggle_Button**
The toggle button is a push button that needs to be clicked once to toggle on, and one more time to toggle off

**FL_Tooltip**
Tooltip support for all FLTK widgets

**FL_Tree**
Tree widget

**FL_Tree_Item**
Tree widget item

**FL_Tree_Item_Array**
Manages an array of FL_Tree_Item pointers

**FL_Tree_Prefs**
Tree widget's preferences

**FL_Valuator**
Controls a single floating-point value and provides a consistent interface to set the value, range, and step, and insures that callbacks are done the same for every object

**FL_Value_Input**
Displays a numeric value

**FL_Value_Output**
Displays a floating point value

**FL_Value_Slider**
FL_Slider widget with a box displaying the current value

**FL_Widget**
FL_Widget is the base class for all widgets in FLTK

**FL_Widget_Surface**
A surface on which any FLTK widget can be drawn

**FL_Widget_Tracker**
This class should be used to control safe widget deletion

**FL_Window**
This widget produces an actual window

**FL_Wizard**
This widget is based off the FL_Tabs widget, but instead of displaying tabs it only changes "tabs" under program control

**FL_XBM_Image**
Supports loading, caching, and drawing of X Bitmap (XBM) bitmap files

**FL_XColor**

**FL_XPM_Image**
Supports loading, caching, and drawing of X Pixmap (XPM) images, including transparency
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<td>Windows ICONDIRENTRY structure</td>
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<td>Simple linked list item associating a key/state to a function</td>
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<td>Fl_Text_Editor::Key_Binding</td>
<td>'Name' provides a simple method to create numerical or more complex procedural names for entries and groups on the fly</td>
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<td>Width, height and name of a page format</td>
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<td>Structure to manage scrollbar and widget interior sizes</td>
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<td>Structure to manage scrollbar and widget interior sizes</td>
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<tr>
<td>Fl_Preferences::RootNode</td>
<td>This structure associates the color, font, and font size of a string to draw with an attribute mask matching attr</td>
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Chapter 32

File Index

32.1  File List

Here is a list of all documented files with brief descriptions:

- **Enumerations.H**
  - This file contains type definitions and general enumerations
  - Page: 1245

- **filename.H**
  - File names and URI utility functions
  - Page: 1278

- **Fl.H**
  - Fl static class
  - Page: 1281

- **Fl_Adjuster.H**
  - Page: 1289

- **Fl_Anim_GIF_Image.H**
  - Page: 1290

- **fl_ask.H**
  - API for common dialogs
  - Page: 1291

- **fl_attr.h**
  - This file defines compiler-specific macros
  - Page: 1295

- **Fl_Bitmap.H**
  - Fl_Box widget
  - Page: 1299

- **Fl_BMP_Image.H**
  - Page: 1298

- **Fl_Box.H**
  - Fl_Box widget
  - Page: 1299

- **Fl_Browser.H**
  - Page: 1301

- **Fl_Browser_.H**
  - Page: 1301

- **Fl_Button.H**
  - Page: 1303

- **Fl_Cairo.H**
  - Cairo is currently supported for the following platforms: Windows, macOS, Unix/Linux (X11 + Wayland)
  - Page: 1304

- **Fl_Cairo_Window.H**
  - Fl_Cairo_Window, an FLTK window incorporating a Cairo draw callback
  - Page: 1305

- **fl_callback_macros.H**
  - This file provides macros for easy function and method callbacks with multiple type safe arguments
  - Page: 1306

- **fl_casts.H**
  - Fl_Chart widget
  - Page: 1315

- **Fl_Chart.H**
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- **Fl_Checked_Browser.H**
  - Page: 1318

- **Fl_Checked_Button.H**
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- **Fl_Checked_History.H**
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- **Fl_Color_chooser.H**
  - Fl_Color_chooser widget
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The `fl_show_colormap()` function hides the implementation classes used to provide the popup window and color selection mechanism.

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<td>FL($('&lt;script type='&quot;text/javascript&quot;&gt;&lt;/script&gt;')).load(FL_UTF8, {&quot;url&quot;:&quot;<a href="http://www.example.com%5C%22,%5C%22callback%5C%22:null%7D).preview">http://www.example.com\&quot;,\&quot;callback\&quot;:null}).preview</a>);</td>
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Public header for FLTK's platform-agnostic string handling.

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Chapter 33

Module Documentation

33.1 Callback Function Typedefs

Typedefs defined in `<FL/Fl.H>` for callback or handler functions passed as function parameters.

**Typedefs**

- typedef void(∗ Fl_Abort_Handler) (const char ∗format,...)
  
  Signature of set_abort functions passed as parameters.

- typedef int(∗ Fl_Args_Handler) (int argc, char ∗∗argv, int &i)
  
  Signature of args functions passed as parameters.

- typedef void(∗ Fl_Atclose_Handler)(Fl_Window ∗window, void ∗data)
  
  Signature of set_atclose functions passed as parameters.

- typedef void(∗ Fl_Awake_Handler)(void ∗data)
  
  Signature of some wakeup callback functions passed as parameters.

- typedef void() Fl_Box_Draw_F(int x, int y, int w, int h, Fl_Color color)
  
  Signature of some box drawing functions passed as parameters.

- typedef void(∗ Fl_Clipboard_Notify_Handler) (int source, void ∗data)
  
  Signature of add_clipboard_notify functions passed as parameters.

- typedef int(∗ Fl_Event_Dispatch)(int event, Fl_Window ∗w)
  
  Signature of event_dispatch functions passed as parameters.

- typedef int(∗ Fl_Event_Handler)(int event)
  
  Signature of add_handler functions passed as parameters.

- typedef void(∗ Fl_FD_Handler)(FL_SOCKET fd, void ∗data)
  
  Signature of add_fd functions passed as parameters.

- typedef void(∗ Fl_Idle_Handler)(void ∗data)
  
  Signature of add_idle callback functions passed as parameters.

- typedef void() Fl_Label_Draw_F(const Fl_Label ∗label, int x, int y, int w, int h, Fl_Align align)
  
  Signature of some label drawing functions passed as parameters.

- typedef void() Fl_Label_Measure_F(const Fl_Label ∗label, int &width, int &height)
  
  Signature of some label measurement functions passed as parameters.

- typedef void(∗ Fl_Old_Idle_Handler) ()
  
  Signature of set_idle callback functions passed as parameters.

- typedef void(∗ Fl_System_Handler)(void ∗event, void ∗data)
  
  Signature of add_system_handler functions passed as parameters.

- typedef void(∗ Fl_Timeout_Handler)(void ∗data)
  
  Signature of timeout callback functions passed as parameters.
33.1.1 Detailed Description

Typedefs defined in `<FL/Fl.H>` for callback or handler functions passed as function parameters. FLTK uses callback functions as parameters for some function calls, e.g. to set up global event handlers (Fl::add_handler()), to add a timeout handler (Fl::add_timeout()), and many more. The typedefs defined in this group describe the function parameters used to set up or clear the callback functions and should also be referenced to define the callback function to handle such events in the user’s code.

See also

Fl::add_handler(), Fl::add_timeout(), Fl::repeat_timeout(), Fl::remove_timeout() and others

33.1.2 Typedef Documentation

33.1.2.1 Fl_Event_Dispatch
typedef int(* Fl_Event_Dispatch) (int event, Fl_Window *w)
Signature of event_dispatch functions passed as parameters.
See also

Fl::event_dispatch(Fl_Event_Dispatch)

33.1.2.2 Fl_Timeout_Handler
typedef void(* Fl_Timeout_Handler) (void *data)
Signature of timeout callback functions passed as parameters. Please see Fl::add_timeout() for details.

33.2 Windows handling functions

Windows and standard dialogs handling declared in `<FL/Fl.H>`

Functions

- static void Fl::default_atclose (Fl_Window *, void *)
  Default callback for window widgets.
- static Fl_Window * Fl::first_window ()
  Returns the first top-level window in the list of shown() windows.
- static void Fl::first_window (Fl_Window *)
  Sets the window that is returned by first_window().
- static Fl_Window * Fl::grab ()
  Returns the window that currently receives all events.
- static void Fl::grab (Fl_Window *)
  Selects the window to grab.
- static Fl_Window * Fl::modal ()
  Returns the top-most modal() window currently shown.
- static Fl_Window * Fl::next_window (const Fl_Window *)
  Returns the next top-level window in the list of shown() windows.
- static void Fl::set_abort (Fl_Abort_Handler f)
  For back compatibility, sets the void Fl::fatal handler callback.
- static void Fl::set_atclose (Fl_Atclose_Handler f)
  For back compatibility, sets the Fl::atclose handler callback.
33.2 Windows handling functions

Variables

• static void(* Fl::atclose)(Fl_Window*, void*)

Back compatibility: default window callback handler.

33.2.1 Detailed Description

Windows and standard dialogs handling declared in <FL/Fl.H>

33.2.2 Function Documentation

33.2.2.1 default_atclose()

void Fl::default_atclose (
    Fl_Window * window,
    void * v ) [static]

Default callback for window widgets.
It hides the window and then calls the default widget callback.

33.2.2.2 first_window() [1/2]

Fl_Window * Fl::first_window ( ) [static]
Returns the first top-level window in the list of shown() windows.
If a modal() window is shown this is the top-most modal window, otherwise it is the most recent window to get an event.

33.2.2.3 first_window() [2/2]

void Fl::first_window ( 
    Fl_Window * window ) [static]
Sets the window that is returned by first_window().
The window is removed from wherever it is in the list and inserted at the top. This is not done if Fl::modal() is on or if the window is not shown(). Because the first window is used to set the "parent" of modal windows, this is often useful.

33.2.2.4 grab() [1/2]

static Fl_Window * Fl::grab ( ) [inline], [static]
Returns the window that currently receives all events.

Returns
The window that currently receives all events, or NULL if event grabbing is currently OFF.

33.2.2.5 grab() [2/2]

void Fl::grab ( 
    Fl_Window * win ) [static]
Selects the window to grab.
This is used when pop-up menu systems are active.
Send all events to the passed window no matter where the pointer or focus is (including in other programs). The window does not have to be shown(), this lets the handle() method of a "dummy" window override all event handling and allows you to map and unmap a complex set of windows (under both X and Windows some window must be mapped because the system interface needs a window id).
If grab() is on it will also affect show() of windows by doing system-specific operations (on X it turns on override-redirect). These are designed to make menus popup reliably and faster on the system.
To turn off grabbing do Fl::grab(0).

*Be careful that your program does not enter an infinite loop while grab() is on. On X this will lock up your screen!* To avoid this potential lockup, all newer operating systems seem to limit mouse pointer grabbing to the time during which a mouse button is held down. Some OS’s may not support grabbing at all.

### 33.2.2.6 modal()

```cpp
static Fl_Window * Fl::modal () [inline], [static]
```

Returns the top-most modal() window currently shown.

This is the most recently shown() window with modal() true, or NULL if there are no modal() windows shown(). The modal() window has its handle() method called for all events, and no other windows will have handle() called (grab() overrides this).

### 33.2.2.7 next_window()

```cpp
Fl_Window * Fl::next_window (const Fl_Window * window ) [static]
```

Returns the next top-level window in the list of shown() windows.

You can use this call to iterate through all the windows that are shown().

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>window</th>
<th>must be shown and not NULL</th>
</tr>
</thead>
</table>

### 33.2.2.8 set_atclose()

```cpp
static void Fl::set_atclose (Fl_Atclose_Handler f ) [inline], [static]
```

For back compatibility, sets the Fl::atclose handler callback.

You can now simply change the callback for the window instead.

See also

**Fl_Window::callback(Fl_Callback*)**

### 33.2.3 Variable Documentation

#### 33.2.3.1 atclose

```cpp
void(* Fl::atclose)(Fl_Window *, void *)=default_atclose [static], [default]
```

Back compatibility: default window callback handler.

See also

**Fl::set_atclose()**

### 33.3 Events handling functions

Fl class events handling API declared in `<FL/Fl.H>`

**Functions**

- static void Fl::add_handler (Fl_Event_Handler h)
  
  *Install a function to parse unrecognized events.*

- static void Fl::add_system_handler (Fl_System_Handler h, void *data)
33.3 Events handling functions

Install a function to intercept system events.

- static Fl_Widget * Fl::belowmouse ()
  Gets the widget that is below the mouse.
- static void Fl::belowmouse (Fl_Widget *)
  Sets the widget that is below the mouse.
- static Fl_Callback_Reason Fl::callback_reason ()
  Give the reason for calling a callback.
- static int Fl::compose (int &del)
  Any text editing widget should call this for each FL_KEYBOARD event.
- static void Fl::compose_reset ()
  If the user moves the cursor, be sure to call Fl::compose_reset().
- static void Fl::disable_im ()
  Disables the system input methods facilities.
- static void Fl::enable_im ()
  Enables the system input methods facilities.
- static int Fl::event ()
  Returns the last event that was processed.
- static int Fl::event_alt ()
  Returns non-zero if the Alt key is pressed.
- static int Fl::event_button ()
  Gets which particular mouse button caused the current event.
- static int Fl::event_button1 ()
  Returns non-zero if mouse button 1 is currently held down.
- static int Fl::event_button2 ()
  Returns non-zero if button 2 is currently held down.
- static int Fl::event_button3 ()
  Returns non-zero if button 3 is currently held down.
- static int Fl::event_buttons ()
  Returns the mouse buttons state bits; if non-zero, then at least one button is pressed now.
- static int Fl::event_clicks ()
  Returns non zero if we had a double click event.
- static void Fl::event_clicks (int i)
  Manually sets the number returned by Fl::event_clicks().
- static void * Fl::event_clipboard ()
  During an FL_PASTE event of non-textual data, returns a pointer to the pasted data.
- static const char * Fl::event_clipboard_type ()
  Returns the type of the pasted data during an FL_PASTE event.
- static int Fl::event_command ()
  Returns non-zero if the FL_COMMAND key is pressed, either FL_CTRL or on OSX FL_META.
- static int Fl::event_ctrl ()
  Returns non-zero if the Control key is pressed.
- static Fl_Event_Dispatch Fl::event_dispatch ()
  Return the current event dispatch function.
- static void Fl::event_dispatch (Fl_Event_Dispatch d)
  Set a new event dispatch function.
- static int Fl::event_dx ()
  Returns the current horizontal mouse scrolling associated with the FL_MOUSEWHEEL event.
- static int Fl::event_dy ()
  Returns the current vertical mouse scrolling associated with the FL_MOUSEWHEEL event.
- static int Fl::event_inside (const Fl_Widget *)
  Returns whether or not the mouse event is inside a given child widget.
• static int Fl::event_inside (int, int, int, int)
  Returns whether or not the mouse event is inside the given rectangle.

• static int Fl::event_is_click ()
  Returns non-zero if the mouse has not moved far enough and not enough time has passed since the last FL_PUSH
  or FL_KEYBOARD event for it to be considered a "drag" rather than a "click".

• static void Fl::event_is_click (int i)
  Clears the value returned by Fl::event_is_click().

• static int Fl::event_key ()
  Gets which key on the keyboard was last pushed.

• static int Fl::event_key (int key)
  Returns true if the given key was held down (or pressed) during the last event.

• static int Fl::event_length ()
  Returns the length of the text in Fl::event_text().

• static int Fl::event_original_key ()
  Returns the keycode of the last key event, regardless of the NumLock state.

• static int Fl::event_shift ()
  Returns non-zero if the Shift key is pressed.

• static int Fl::event_state ()
  Returns the keyboard and mouse button states of the last event.

• static int Fl::event_state (int mask)
  Returns non-zero if any of the passed event state bits are turned on.

• static const char * Fl::event_text ()
  Returns the text associated with the current event, including FL_PASTE or FL_DND_RELEASE events.

• static int Fl::event_x ()
  Returns the mouse position of the event relative to the Fl::Window it was passed to.

• static int Fl::event_x_root ()
  Returns the mouse position on the screen of the event.

• static int Fl::event_y ()
  Returns the mouse position of the event relative to the Fl::Window it was passed to.

• static int Fl::event_y_root ()
  Returns the mouse position on the screen of the event.

• static Fl_Widget * Fl::focus ()
  Gets the current Fl::focus() widget.

• static void Fl::focus (Fl_Widget *)
  Sets the widget that will receive FL_KEYBOARD events.

• static int Fl::get_key (int key)
  Returns true if the given key is held down now.

• static void Fl::get_mouse (int &, int &)
  Return where the mouse is on the screen by doing a round-trip query to the server.

• static int Fl::handle (int, Fl::Window *)
  Handle events from the window system.

• static int Fl::handle_ (int, Fl::Window *)
  Handle events from the window system.

• static Fl_Widget * Fl::pushed ()
  Gets the widget that is being pushed.

• static void Fl::pushed (Fl::Widget *)
  Sets the widget that is being pushed.

• static void Fl::remove_handler (Fl_Event_Handler h)
  Removes a previously added event handler.

• static void Fl::remove_system_handler (Fl::System_Handler h)
  Removes a previously added system event handler.

• static int Fl::testShortcut (Fl::Shortcut)
  Tests the current event, which must be an FL_KEYBOARD or FL_SHORTCUT, against a shortcut value (described in
  Fl::Button).
33.3 Events handling functions

Variables

- `const char * const fl_callback_reason_names []`
  
  This is an array of callback reason names you can use to convert font numbers into names.

- `const char * const fl_eventnames []`
  
  This is an array of event names you can use to convert event numbers into names.

- `const char * const fl_fontnames []`
  
  This is an array of font names you can use to convert font numbers into names.

33.3.1 Detailed Description

FL class events handling API declared in `<FL/Fl.H>`

33.3.2 Function Documentation

33.3.2.1 add_handler()

```cpp
void Fl::add_handler ( Fl_Event_Handler ha ) [static]
```

Install a function to parse unrecognized events.

If FLTK cannot figure out what to do with an event, it calls each of these functions (most recent first) until one of them returns non-zero. If none of them returns non-zero then the event is ignored. Events that cause this to be called are:

- `FL_SHORTCUT` events that are not recognized by any widget. This lets you provide global shortcut keys.

- `FL_SCREEN_CONFIGURATION_CHANGED` events. Under X11, this event requires the libXrandr.so shared library to be loadable at run-time and the X server to implement the RandR extension.

- `FL_ZOOM_EVENT` events.

- System events that FLTK does not recognize. See `fl_xevent`.

- Some other events when the widget FLTK selected returns zero from its `handle()` method. Exactly which ones may change in future versions, however.

See also

- `Fl::remove_handler(Fl_Event_Handler)`
- `Fl::event_dispatch(Fl_Event_Dispatch d)`
- `Fl::handle(int, Fl_Window *)`

33.3.2.2 add_system_handler()

```cpp
void Fl::add_system_handler ( Fl_System_Handler ha, void * data ) [static]
```

Install a function to intercept system events.

FLTK calls each of these functions as soon as a new system event is received. The processing will stop at the first function to return non-zero. If all functions return zero then the event is passed on for normal handling by FLTK.

Each function will be called with a pointer to the system event as the first argument and `data` as the second argument. The system event pointer will always be void *, but will point to different objects depending on the platform:

- X11: XEvent
- Windows: MSG
- OS X: NSEvent
Parameters

<table>
<thead>
<tr>
<th>ha</th>
<th>The event handler function to register</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>User data to include on each call</td>
</tr>
</tbody>
</table>

See also

Fi::remove_system_handler(Fl_System_Handler)

33.3.2.3 belowmouse() [1/2]

static Fl_Widget * Fl::belowmouse ( ) [inline], [static]

Gets the widget that is below the mouse.

See also

belowmouse(Fl_Widget*)

33.3.2.4 belowmouse() [2/2]

void Fl::belowmouse (  
    Fl_Widget * o ) [static]

Sets the widget that is below the mouse.

This is for highlighting buttons. It is not used to send FL_PUSH or FL_MOVE directly, for several obscure reasons, but those events typically go to this widget. This is also the first widget tried for FL_SHORTCUT events.

If you change the belowmouse widget, the previous one and all parents (that don't contain the new widget) are sent FL_LEAVE events. Changing this does not send FL_ENTER to this or any widget, because sending FL_ENTER is supposed to test if the widget wants the mouse (by it returning non-zero from handle()).

33.3.2.5 callback_reason()

Fl_Callback_Reason Fl::callback_reason ( ) [static]

Give the reason for calling a callback.

Returns

the reason for the current callback

See also

Fl_Widget::when(), Fl_Widget::do_callback(), Fl_Widget::callback()

33.3.2.6 compose()

int Fl::compose (  
    int & del ) [static]

Any text editing widget should call this for each FL_KEYBOARD event.

Use of this function is very simple.

If true is returned, then it has modified the Fl::event_text() and Fl::event_length() to a set of bytes to insert (it may be of zero length!). It will also set the "del" parameter to the number of bytes to the left of the cursor to delete, this is used to delete the results of the previous call to Fl::compose().

If false is returned, the keys should be treated as function keys, and del is set to zero. You could insert the text anyways, if you don't know what else to do.

Text editing widgets can preferentially call fl_set_spot() to indicate the window coordinates of the bottom of the current insertion point and the line height. This way, auxiliary windows that help choosing among alternative characters
with some text input methods appear just below or above the insertion point. If widgets don't do that, such auxiliary windows appear at the widget's bottom.

On some platforms, text input can involve marked text, that is, temporary text replaced by other text during the input process. This occurs, e.g., under Wayland or macOS when using dead keys or when entering CJK characters. Text editing widgets should preferentially signal marked text, usually underlining it. Widgets can use int Fl::<compose_state> after having called Fl::compose(int&) to obtain the length in bytes of marked text that always finishes at the current insertion point. Widgets should also call void fl_reset_spot() when processing FL_UNFOCUS events. The Fl_Input and Fl_Text_Editor widgets underline marked text. If none of this is done by a user-defined text editing widget, text input will work, but will not signal to the user what text is marked.

Finally, text editing widgets should call set_flag(MAC_USE_ACCENTS_MENU); in their constructor if they want to use, on the macOS platform, the feature introduced with Mac OS 10.7 "Lion" where pressing and holding certain keys on the keyboard opens a diacritic marks popup window.

Note

For compatibility with FLTK 1.3, text editing widgets can call Fl::insertion_point_location(int x, int y, int height) and Fl::reset_marked_text() only under the macOS platform to indicate/reset the coordinates of the current insertion point. This is deprecated in version 1.4 because redundant with the platform-independent fl_set_spot() and fl_reset_spot() functions.

33.3.2.7 compose_reset()

void Fl::compose_reset ( ) [static]

If the user moves the cursor, be sure to call Fl::compose_reset(). The next call to Fl::compose() will start out in an initial state. In particular it will not set "del" to non-zero. This call is very fast so it is ok to call it many times and in many places.

33.3.2.8 disable_im()

void Fl::disable_im ( ) [static]

Disables the system input methods facilities.

See also

enable_im()

33.3.2.9 enable_im()

void Fl::enable_im ( ) [static]

Enables the system input methods facilities. This is the default.

See also

disable_im()

33.3.2.10 event()

static int Fl::event ( ) [inline], [static]

Returns the last event that was processed. This can be used to determine if a callback is being done in response to a keypress, mouse click, etc.

33.3.2.11 event_button()

static int Fl::event_button ( ) [inline], [static]

Gets which particular mouse button caused the current event. This returns garbage if the most recent event was not a FL_PUSH or FL_RELEASE event.
Return values

```
<table>
<thead>
<tr>
<th>Module Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_LEFT_MOUSE</td>
</tr>
<tr>
<td>FL_MIDDLE_MOUSE</td>
</tr>
<tr>
<td>FL_RIGHT_MOUSE</td>
</tr>
</tbody>
</table>
```

See also

```
Fl::event_buttons()
```

### 33.3.2.12 event_button1()

```
static int Fl::event_button1 ( ) [inline], [static]
```

Returns non-zero if mouse button 1 is currently held down.
For more details, see Fl::event_buttons().

### 33.3.2.13 event_button2()

```
static int Fl::event_button2 ( ) [inline], [static]
```

Returns non-zero if button 2 is currently held down.
For more details, see Fl::event_buttons().

### 33.3.2.14 event_button3()

```
static int Fl::event_button3 ( ) [inline], [static]
```

Returns non-zero if button 3 is currently held down.
For more details, see Fl::event_buttons().

### 33.3.2.15 event_buttons()

```
static int Fl::event_buttons ( ) [inline], [static]
```

Returns the mouse buttons state bits; if non-zero, then at least one button is pressed now.
This function returns the button state at the time of the event. During an FL_RELEASE event, the state of the
released button will be 0. To find out, which button caused an FL_RELEASE event, you can use Fl::event_button()
instead.
Returns

```
a bit mask value like { [FL_BUTTON1] | [FL_BUTTON2] | [FL_BUTTON3] }
```

### 33.3.2.16 event_clicks() [1/2]

```
static int Fl::event_clicks ( ) [inline], [static]
```

Returns non zero if we had a double click event.

### 33.3.2.17 event_clicks() [2/2]

```
static void Fl::event_clicks ( int i ) [inline], [static]
```

### Return values

<table>
<thead>
<tr>
<th>Non-zero</th>
<th>if the most recent FL_PUSH or FL_KEYBOARD was a &quot;double click&quot;.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-1</td>
<td>for N clicks. A double click is counted if the same button is pressed again while event_is_click() is true.</td>
</tr>
</tbody>
</table>


```
33.3 Events handling functions

Manually sets the number returned by Fl::event_clicks(). This can be used to set it to zero so that later code does not think an item was double-clicked.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>corresponds to no double-click if 0, i+1 mouse clicks otherwise</td>
<td></td>
</tr>
</tbody>
</table>

See also

int event_clicks()

33.3.2.18 event_clipboard()

static void * Fl::event_clipboard ( ) [inline], [static]

During an FL_PASTE event of non-textual data, returns a pointer to the pasted data. The returned data is an Fl_RGB_Image * when the result of Fl::event_clipboard_type() is Fl::clipboard_image.

33.3.2.19 event_clipboard_type()

static const char * Fl::event_clipboard_type ( ) [inline], [static]

Returns the type of the pasted data during an FL_PASTE event. This type can be Fl::clipboard_plain_text or Fl::clipboard_image.

33.3.2.20 event_dispatch()

void Fl::event_dispatch ( Fl_Event_Dispatch d ) [static]

Set a new event dispatch function.

The event dispatch function is called after native events are converted to FLTK events, but before they are handled by FLTK. If the dispatch function Fl::event_dispatch d is set, it is up to the dispatch function to call Fl::handle_(int, Fl_Window *) or to ignore the event.

The dispatch function itself must return 0 if it ignored the event, or non-zero if it used the event. If you call Fl::handle_(), then this will return the correct value.

The event dispatch can be used to handle exceptions in FLTK events and callbacks before they reach the native event handler:

```c
int myHandler(int e, Fl_Window *w) {
    try {
        return Fl::handle_(e, w);
    } catch () {
        ...
    }
}

main() {
    Fl::event_dispatch(myHandler);
    ...
    Fl::run();
}
```

Parameters

<table>
<thead>
<tr>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>new dispatch function, or NULL</td>
</tr>
</tbody>
</table>

See also

Fl::add_handler(Fl_Event_Handler)
Fl::handle(int, Fl_Window*)
Fl::handle_(int, Fl_Window*)
33.3.2.21  event_dx()

static int Fl::event_dx ( ) [inline], [static]
Returns the current horizontal mouse scrolling associated with the FL_MOUSEWHEEL event.
Right is positive.

33.3.2.22  event_dy()

static int Fl::event_dy ( ) [inline], [static]
Returns the current vertical mouse scrolling associated with the FL_MOUSEWHEEL event.
Down is positive.

33.3.2.23  event_inside() [1/2]

int Fl::event_inside (const Fl_Widget * o) [static]
Returns whether or not the mouse event is inside a given child widget.
Returns non-zero if the current Fl::event_x() and Fl::event_y() put it inside the given child widget’s bounding box.
This method can only be used to check whether the mouse event is inside a child widget of the window that handles the event, and there must not be an intermediate subwindow (i.e. the widget must not be inside a subwindow of the current window). However, it is valid if the widget is inside a nested Fl_Group. You must not use it with the window itself as the o argument in a window’s handle() method.

Note
The mentioned restrictions are necessary, because this method does not transform coordinates of child widgets, and thus the given widget o must be within the same window that is handling the current event. Otherwise the results are undefined.

You should always call this rather than doing your own comparison so you are consistent about edge effects.

See also
Fl::event_inside(int, int, int, int)

Parameters

| in  | o   | child widget to be tested |

Returns
non-zero, if mouse event is inside the widget

33.3.2.24  event_inside() [2/2]

int Fl::event_inside (int xx, int yy, int ww, int hh) [static]
Returns whether or not the mouse event is inside the given rectangle.
Returns non-zero if the current Fl::event_x() and Fl::event_y() put it inside the given arbitrary bounding box.
You should always call this rather than doing your own comparison so you are consistent about edge effects.
To find out, whether the event is inside a child widget of the current window, you can use Fl::event_inside(const Fl_Widget *).

Parameters

| in  | xx,yy,ww,hh | bounding box |

---

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33.3 Events handling functions

Returns
non-zero, if mouse event is inside

33.3.2.25  event_is_click() [1/2]

static int Fl::event_is_click ( ) [inline], [static]
Returns non-zero if the mouse has not moved far enough and not enough time has passed since the last FL_PUSH
or FL_KEYBOARD event for it to be considered a "drag" rather than a "click".
You can test this on FL_DRAG, FL_RELEASE, and FL_MOVE events.

33.3.2.26  event_is_click() [2/2]

static void Fl::event_is_click ( int i ) [inline], [static]
Clears the value returned by Fl::event_is_click().
Useful to prevent the next click from being counted as a double-click or to make a popup menu pick an item with a
single click. Don't pass non-zero to this.

33.3.2.27  event_key() [1/2]

static int Fl::event_key ( ) [inline], [static]
Gets which key on the keyboard was last pushed.
The returned integer 'key code' is not necessarily a text equivalent for the keystroke. For instance: if someone
presses '5' on the numeric keypad with numlock on, Fl::event_key() may return the 'key code' for this key, and NOT
the character '5'. To always get the '5', use Fl::event_text() instead.

Returns
an integer 'key code', or 0 if the last event was not a key press or release.

See also

int event_key(int), event_text(), compose(int&).

33.3.2.28  event_key() [2/2]

int Fl::event_key ( int key ) [static]
Returns true if the given key was held down (or pressed) during the last event.
This is constant until the next event is read from the server.
Fl::get_key(int) returns true if the given key is held down now. Under X this requires a round-trip to the server and is
much slower than Fl::event_key(int).
Keys are identified by the unshifted values. FLTK defines a set of symbols that should work on most modern
machines for every key on the keyboard:

• All keys on the main keyboard producing a printable ASCII character use the value of that ASCII character
  (as though shift, ctrl, and caps lock were not on). The space bar is 32.

• All keys on the numeric keypad producing a printable ASCII character use the value of that ASCII character
  plus FL_KP (e.g., FL_KP + '4', FL_KP + '/'). The highest possible value is FL_KP_Last so you can range-
  check to see if something is on the keypad.

• All numbered function keys use the number on the function key plus FL_F. The highest possible number is
  FL_F_Last, so you can range-check a value.

• Buttons on the mouse are considered keys, and use the button number (where the left button is 1) plus
  FL_Button.
• All other keys on the keypad have a symbol: FL_Escape, FL_BackSpace, FL_Tab, FL_Enter, FL_Print, FL←_Scroll_Lock, FL_Pause, FL_Insert, FL_Home, FL_Page_Up, FL_Delete, FL_End, FL_Page_Down, FL_Left, FL_Up, FL_Right, FL_Down, FL_Iso_Key, FL_Shift_L, FL_Shift_R, FL_Control_L, FL_Control_R, FL_Caps←_Lock, FL_Alt_L, FL_Alt_R, FL_Meta_L, FL_Meta_R, FL_Menu, FL_Num_Lock, FL_KP_Enter. Be careful not to confuse these with the very similar, but all-caps, symbols used by Fl::event_state().

On X Fl::get_key(FL_Button+n) does not work.
On Windows Fl::get_key(FL_KP_Enter) and Fl::event_key(FL_KP_Enter) do not work.

33.3.2.29 event_length()

static int Fl::event_length () [inline], [static]
Returns the length of the text in Fl::event_text().
There will always be a nul at this position in the text. However there may be a nul before that if the keystroke translates to a nul character or you paste a nul character.

33.3.2.30 event_original_key()

static int Fl::event_original_key () [inline], [static]
Returns the keycode of the last key event, regardless of the NumLock state.
If NumLock is deactivated, FLTK translates events from the numeric keypad into the corresponding arrow key events. event_key() returns the translated key code, whereas event_original_key() returns the keycode before NumLock translation.

33.3.2.31 event_state() [1/2]

static int Fl::event_state ( ) [inline], [static]
Returns the keyboard and mouse button states of the last event.
This is a bitfield of what shift states were on and what mouse buttons were held down during the most recent event.
The legal event state bits are:

• FL_SHIFT
• FL_CAPS_LOCK
• FL_CTRL
• FL_ALT
• FL_NUM_LOCK
• FL_META
• FL_SCROLL_LOCK
• FL_BUTTON1
• FL_BUTTON2
• FL_BUTTON3

X servers do not agree on shift states, and FL_NUM_LOCK, FL_META, and FL_SCROLL_LOCK may not work.
The values were selected to match the XFree86 server on Linux. In addition there is a bug in the way X works so that the shift state is not correctly reported until the first event after the shift key is pressed or released.

33.3.2.32 event_state() [2/2]

static int Fl::event_state ( int mask ) [inline], [static]
Returns non-zero if any of the passed event state bits are turned on.
Use mask to pass the event states you're interested in. The legal event state bits are defined in Fl::event_state().
33.3.2.33  event_text()

static const char * Fl::event_text ( ) [inline], [static]
Returns the text associated with the current event, including FL_PASTE or FL_DND_RELEASE events.
This can be used in response to FL_KEYUP, FL_KEYDOWN, FL_PASTE, and FL_DND_RELEASE.
When responding to FL_KEYUP/FL_KEYDOWN, use this function instead of Fl::event_key() to get the text equivalent
of keystrokes suitable for inserting into strings and text widgets.
The returned string is guaranteed to be NULL terminated. However, see Fl::event_length() for the actual length of
the string, in case the string itself contains NULLs that are part of the text data.
Returns
A NULL terminated text string equivalent of the last keystroke.

33.3.2.34  event_x_root()

static int Fl::event_x_root ( ) [inline], [static]
Returns the mouse position on the screen of the event.
To find the absolute position of an Fl_Window on the screen, use the difference between event_x_root(),event_y_root()
and event_x(),event_y().

33.3.2.35  event_y_root()

static int Fl::event_y_root ( ) [inline], [static]
Returns the mouse position on the screen of the event.
To find the absolute position of an Fl_Window on the screen, use the difference between event_x_root(),event_y_root()
and event_x(),event_y().

33.3.2.36  focus() [1/2]

static Fl_Widget * Fl::focus ( ) [inline], [static]
Gets the current Fl::focus() widget.
See also
Fl::focus(Fl_Widget *)

33.3.2.37  focus() [2/2]

void Fl::focus ( Fl_Widget * o ) [static]
Sets the widget that will receive FL_KEYBOARD events.
Use this function inside the handle(int) member function of a widget of yours to give focus to the widget, for
example when it receives the FL_FOCUS or the FL_PUSH event. Otherwise, use Fl_Widget::take_focus() to give
focus to a widget;
If you change Fl::focus(), the previous widget and all parents (that don't contain the new widget) are sent FL←
UNFOCUS events. Changing the focus does not send FL_FOCUS to this or any widget, because sending FL←
FOCUS is supposed to test if the widget wants the focus (by it returning non-zero from handle()).
Widgets can set the NEEDS_KEYBOARD flag to indicate that a keyboard is essential for the widget to function.
Touchscreen devices will be sent a request to show an on-screen keyboard if no hardware keyboard is connected.
See also
Fl_Widget::take_focus()
Fl_Widget::needs_keyboard() const
Fl_Widget::needs_keyboard(bool)
33.3.2.38  get_key()

int Fl::get_key (  
    int key  ) [static]

Returns true if the given key is held down now.
Under X this requires a round-trip to the server and is much slower than Fl::event_key(int).

See also

    event_key(int)

33.3.2.39  get_mouse()

void Fl::get_mouse (  
    int & x,  
    int & y  ) [static]

Return where the mouse is on the screen by doing a round-trip query to the server.
You should use Fl::event_x_root() and Fl::event_y_root() if possible, but this is necessary if you are not sure if a
mouse event has been processed recently (such as to position your first window). If the display is not open, this will
open it.

33.3.2.40  handle()

int Fl::handle (  
    int e,  
    Fl_Window * window ) [static]

Handle events from the window system.
This is called from the native event dispatch after native events have been converted to FLTK notation. This function
calls Fl::handle_(int, Fl_Window+) unless the user sets a dispatch function. If a user dispatch function is set, the
user must make sure that Fl::handle_() is called, or the event will be ignored.

Parameters

<table>
<thead>
<tr>
<th>e</th>
<th>the event type (Fl::event_number() is not set)</th>
</tr>
</thead>
<tbody>
<tr>
<td>window</td>
<td>the window that caused this event</td>
</tr>
</tbody>
</table>

Returns

0 if the event was not handled

See also

    Fl::add_handler(Fl_Event_Handler)
    Fl::event_dispatch(Fl_Event_Dispatch)

33.3.2.41  handle_()

int Fl::handle_ (  
    int e,  
    Fl_Window * window ) [static]

Handle events from the window system.
This function is called from the native event dispatch, unless the user sets another dispatch function. In that case,
the user dispatch function must decide when to call Fl::handle_(int, Fl_Window+).
Callbacks can set FL_REASON_CLOSED and FL_REASON_CANCELLED.
33.3 Events handling functions

Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>the event type (Fl::event_number() is not yet set)</td>
</tr>
<tr>
<td>window</td>
<td>the window that caused this event</td>
</tr>
</tbody>
</table>

Returns

0 if the event was not handled

See also

Fl::event_dispatch(Fl_Event_Dispatch)

33.3.2.42 pushed() [1/2]

static Fl_Widget * Fl::pushed ( ) [inline], [static]

Gets the widget that is being pushed.

See also

void pushed(Fl_Widget*)

33.3.2.43 pushed() [2/2]

void Fl::pushed ( Fl_Widget * o ) [static]

Sets the widget that is being pushed.

FL_DRAG or FL_RELEASE (and any more FL_PUSH) events will be sent to this widget.
If you change the pushed widget, the previous one and all parents (that don't contain the new widget) are sent FL_RELEASE events. Changing this does not send FL_PUSH to this or any widget, because sending FL_PUSH is supposed to test if the widget wants the mouse (by it returning non-zero from handle()).

33.3.2.44 remove_handler()

void Fl::remove_handler ( Fl_Event_Handler ha ) [static]

Removes a previously added event handler.

See also

Fl::handle(int, Fl_Window*)

33.3.2.45 remove_system_handler()

void Fl::remove_system_handler ( Fl_System_Handler ha ) [static]

Removes a previously added system event handler.

Parameters

| ha | The event handler function to remove |
See also

\texttt{Fl::add\_system\_handler(Fl\_System\_Handler)}

### 33.3.2.46 test\_shortcut()

```c
int Fl::test\_shortcut (Fl\_Shortcut shortcut) [static]
```

Tests the current event, which must be an \texttt{FL\_KEYBOARD} or \texttt{FL\_SHORTCUT}, against a shortcut value (described in \texttt{Fl\_Button}).

Not to be confused with \texttt{Fl\_Widget::test\_shortcut()}.

Returns

non-zero if there is a match.

### 33.3.3 Variable Documentation

#### 33.3.3.1 \texttt{fl\_callback\_reason\_names}

```c
const char* const fl_callback_reason_names[]
```

Initial value:

```c
= 
[ "FL\_REASON\_UNKNOWN", "FL\_REASON\_SELECTED", "FL\_REASON\_DESELECTED", 
"FL\_REASON\_RESELECTED", "FL\_REASON\_OPENED", "FL\_REASON\_CLOSED", 
"FL\_REASON\_DRAGGED", "FL\_REASON\_CANCELLED", "FL\_REASON\_CHANGED", 
"FL\_REASON\_GOT\_FOCUS", "FL\_REASON\_LOST\_FOCUS", "FL\_REASON\_RELEASED", 
"FL\_REASON\_ENTER\_KEY", NULL, NULL, NULL, 
NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, 
"FL\_REASON\_USER", "FL\_REASON\_USER+1", "FL\_REASON\_USER+2", "FL\_REASON\_USER+3", 
NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, 
NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, 
NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, 
NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, 
NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
]```

This is an array of callback reason names you can use to convert font numbers into names.
The array gets defined inline wherever your `#include <FL/names.h>` appears.

#### 33.3.3.2 \texttt{fl\_eventnames}

```c
const char* const fl_eventnames[]
```

This is an array of event names you can use to convert event numbers into names.
The array gets defined inline wherever your `#include <FL/names.h>` appears.

Example:

```c
#include <FL/names.h> // array will be defined here
int MyClass::handle(int e) {
    printf("Event was %s (%d)\n", fl_eventnames[e], e);
    // .resulting output might be e.g. "Event was FL\_PUSH (1)". .
   [..]
}
```

#### 33.3.3.3 \texttt{fl\_fontnames}

```c
const char* const fl_fontnames[]
```

Initial value:

```c
= 
[ "FL\_HELVETICA", "FL\_HELVETICA\_BOLD", 
"FL\_HELVETICA\_ITALIC", "FL\_HELVETICA\_BOLD\_ITALIC", 
"FL\_HELVETICA\_SLANT", "FL\_HELVETICA\_SLANT\_BOLD", 
"FL\_HELVETICA\_SLANT\_ITALIC", "FL\_HELVETICA\_SLANT\_BOLD\_ITALIC", 
"FL\_HELVETICA\_SANS\_SERIF", "FL\_HELVETICA\_SANS\_SERIF\_BOLD", 
"FL\_HELVETICA\_SANS\_SERIF\_ITALIC", "FL\_HELVETICA\_SANS\_SERIF\_BOLD\_ITALIC", 
"
```

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33.4 Selection & Clipboard functions

This is an array of font names you can use to convert font numbers into names.
The array gets defined inline wherever your `#include <FL/names.h>` appears.

Example:
```c
#include <FL/names.h> // array will be defined here
int MyClass::my_callback(Fl_Widget *w, void*) {
    int fnum = w->labelfont();
    // Resulting output might be e.g. "Label’s font is FL_HELVETICA (0)"
    printf("Label’s font is %s (%d)\n", fl_fontnames[fnum], fnum);
    // ..resulting output might be e.g. "Label’s font is FL_HELVETICA (0)"
    [...]}
```

### Functions

- **static void Fl::add_clipboard_notify (Fl_Clipboard_Notify_Handler h, void *data=0)**
  
  *FLTK will call the registered callback whenever there is a change to the selection buffer or the clipboard.*

- **static int Fl::clipboard_contains (const char *type)**
  
  *Returns non 0 if the clipboard contains data matching type.*

- **static void Fl::copy (const char *stuff, int len, int destination=0, const char *type=Fl::clipboard_plain_text)**
  
  *Copies the data pointed to by stuff to the selection buffer (destination is 0), the clipboard (destination is 1), or both (destination is 2).*

- **static int Fl::dnd ()**
  
  *Initiate a Drag And Drop operation.*

- **static void Fl::paste (Fl_Widget &receiver)**
  
  *Backward compatibility only.*

- **static void Fl::paste (Fl_Widget &receiver, int source, const char *type=Fl::clipboard_plain_text)**
  
  *Pastes the data from the selection buffer (source is 0) or the clipboard (source is 1) into receiver.*

- **static void Fl::remove_clipboard_notify (Fl_Clipboard_Notify_Handler h)**
  
  *Stop calling the specified callback when there are changes to the selection buffer or the clipboard.*

- **static void Fl::selection (Fl_Widget &owner, const char *, int len)**
  
  *Changes the current selection.*

- **static Fl_Widget * Fl::selection_owner ()**
  
  *back-compatibility only: Gets the widget owning the current selection*

- **static void Fl::selection_owner (Fl_Widget *)**
  
  *Back-compatibility only: The single-argument call can be used to move the selection to another widget or to set the owner to NULL, without changing the actual text of the selection.*

- **static int Fl::selection_to_clipboard ()**
  
  *Returns the current selection to clipboard mode.*

- **static void Fl::selection_to_clipboard (int mode)**
  
  *Copies selections on X11 directly to the clipboard if enabled.*
Variables

- static char const * const Fl::clipboard_image = "image"
  Denotes image data.
- static char const * const Fl::clipboard_plain_text = "text/plain"
  Denotes plain textual data.

33.4.1 Detailed Description

FLTK global copy/cut/paste functions declared in `<FL/Fl.H>`

33.4.2 Function Documentation

33.4.2.1 add_clipboard_notify()

```cpp
void Fl::add_clipboard_notify ( 
    Fl_Clipboard_Notify_Handler h,
    void * data = 0 ) [static]
```

FLTK will call the registered callback whenever there is a change to the selection buffer or the clipboard.
The source argument indicates which of the two has changed. Only changes by other applications are reported.
Example:

```cpp
void clip_callback(int source, void *data) {
    if ( source == 0 ) printf("CLIP CALLBACK: selection buffer changed\n");
    if ( source == 1 ) printf("CLIP CALLBACK: clipboard changed\n");
}
int main() {
    Fl::add_clipboard_notify(clip_callback);
}
```

Note

Some systems require polling to monitor the clipboard and may therefore have some delay in detecting changes.

33.4.2.2 clipboard_contains()

```cpp
int Fl::clipboard_contains ( 
    const char * type ) [static]
```

Returns non 0 if the clipboard contains data matching `type`.
The clipboard can contain both text and image data; in that situation this function returns non 0 to both requests.
This function is not meant to check whether the clipboard is empty. This function does not allow to query the
selection buffer because FLTK allows to copy/paste non-textual data only from/to the clipboard.

Parameters

| type      | can be Fl::clipboard_plain_text or Fl::clipboard_image. |

33.4.2.3 copy()

```cpp
void Fl::copy ( 
    const char * stuff,
    int len,
    int destination = 0,
    const char * type = Fl::clipboard_plain_text ) [static]
```
Copies the data pointed to by \texttt{stuff} to the selection buffer (destination is 0), the clipboard (destination is 1), or both (destination is 2).

Copying to both is only relevant on X11, on other platforms it maps to the clipboard (1). \texttt{len} is the number of relevant bytes in \texttt{stuff}. \texttt{type} is always \texttt{Fl::clipboard_plain_text}. The selection buffer is used for middle-mouse pastes and for drag-and-drop selections. The clipboard is used for traditional copy/cut/paste operations.

\textbf{Note}

This function is, at present, intended only to copy UTF-8 encoded textual data. To copy graphical data, use the \texttt{Fl_Copy_Surface} class. The \texttt{type} argument may allow in the future to copy other kinds of data. Copies data to the selection buffer, the clipboard, or both.

The \texttt{destination} can be:

- 0: selection buffer (see note below)
- 1: clipboard
- 2: both

The selection buffer exists only on the X11 platform and is used for middle-mouse pastes and for drag-and-drop selections. The clipboard is used for traditional copy/cut/paste operations. On all other platforms the selection buffer (destination = 0) is mapped to the clipboard, i.e. on platforms other than X11 all destinations are equivalent and the data is always copied to the clipboard.

\textbf{Note}

Please see \texttt{Fl::section_to_clipboard()} to enable duplication of the selection buffer to the clipboard on X11, i.e. if \texttt{destination} = 0 (selection buffer) and \texttt{Fl::section_to_clipboard()} is enabled, then the data is copied to both the selection buffer and the clipboard. This makes the X11 behavior similar to other platforms but keeps the selection buffer for X11 specific inter process communication.

\texttt{type} should always be \texttt{Fl::clipboard_plain_text} which is the default. Other values are ignored and reserved for future extensions.

\textbf{Note}

This function is, at present, intended only to copy UTF-8 encoded textual data. To copy graphical data, use the \texttt{Fl_Copy_Surface} class. The \texttt{type} argument may allow to copy other kinds of data in the future.

\textbf{Parameters}

<table>
<thead>
<tr>
<th>\texttt{in}</th>
<th>\texttt{out}</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\texttt{stuff}</td>
<td>text data to be copied</td>
<td></td>
</tr>
<tr>
<td>\texttt{len}</td>
<td>the number of relevant bytes in \texttt{stuff}</td>
<td></td>
</tr>
<tr>
<td>\texttt{destination}</td>
<td>0 = selection, 1 = clipboard, 2 = both (see description)</td>
<td></td>
</tr>
<tr>
<td>\texttt{type}</td>
<td>usually plain text (see description)</td>
<td></td>
</tr>
</tbody>
</table>

\section*{33.4.2.4 \texttt{dnd()}}

\texttt{int Fl::dnd () [static]}

Initiate a Drag And Drop operation.

The selection buffer should be filled with relevant data before calling this method. FLTK will then initiate the system wide drag and drop handling. Dropped data will be marked as text.

Create a selection first using: \texttt{Fl::copy(const char *stuff, int len, 0)}

\section*{33.4.2.5 \texttt{paste() [1/2]}}

\texttt{void Fl::paste ( Fl_Widget & receiver ) [static]}

---

Generated by Doxygen
Backward compatibility only. This calls Fl::paste(receiver, 0);

See also

Fl::paste(Fl_Widget &receiver, int clipboard, const char* type)

33.4.2.6 paste() [2/2]

void Fl::paste (  
    Fl_Widget & receiver,  
    int source,  
    const char * type = Fl::clipboard_plain_text ) [static]

Pastes the data from the selection buffer (source is 0) or the clipboard (source is 1) into receiver. The selection buffer (source is 0) is used for middle-mouse pastes and for drag-and-drop selections. The clipboard (source is 1) is used for copy/cut/paste operations.

If source is 1, the optional type argument indicates what type of data is requested from the clipboard. At present, Fl::clipboard_plain_text (requesting text data) and Fl::clipboard_image (requesting image data) are possible. Set things up so the handle function of the receiver widget will be called with an FL_PASTE event some time in the future if the clipboard does contain data of the requested type.

The handle function of receiver can process the FL_PASTE event as follows:

- If the receiver widget is known to only receive text data, the text string from the specified source is in Fl::event_text() with UTF-8 encoding, and the number of bytes is in Fl::event_length(). If Fl::paste() gets called during the drop step of a files-drag-and-drop operation, Fl::event_text() contains a list of filenames (see Drag and Drop Events).

- If the receiver widget can potentially receive non-text data, use Fl::event_clipboard_type() to determine what sort of data is being sent. If Fl::event_clipboard_type() returns Fl::clipboard_plain_text, proceed as above. It it returns Fl::clipboard_image, the pointer returned by Fl::event_clipboard() can be safely cast to type Fl_RGB_Image* to obtain a pointer to the pasted image. If receiver accepts the clipboard image, receiver.handle() should return 1 and the application should take ownership of this image (that is, delete it after use). Conversely, if receiver.handle() returns 0, the application must not use the image.

The receiver should be prepared to be called directly by this, or for it to happen later, or possibly not at all. This allows the window system to take as long as necessary to retrieve the paste buffer (or even to screw up completely) without complex and error-prone synchronization code in FLTK.

Platform details for image data:

- Unix/Linux platform: Clipboard images in PNG or BMP formats are recognized. Requires linking with the fltk_images library.
- Windows platform: Both bitmap and vectorial (Enhanced metafile) data from clipboard can be pasted as image data.
- Mac OS X platform: Both bitmap (TIFF) and vectorial (PDF) data from clipboard can be pasted as image data.

33.4.2.7 selection()

void Fl::selection (  
    Fl_Widget & owner,  
    const char * text,  
    int len ) [static]

Changes the current selection.

The block of text is copied to an internal buffer by FLTK (be careful if doing this in response to an FL_PASTE as this may be the same buffer returned by event_text()). The selection_owner() widget is set to the passed owner.
33.4.2.8 selection_owner() [1/2]

static Fl_Widget * Fl::selection_owner ( ) [inline], [static]
back-compatibility only: Gets the widget owning the current selection

See also

Fl_Widget* selection_owner(Fl_Widget*)

33.4.2.9 selection_owner() [2/2]

void Fl::selection_owner ( 
    Fl_Widget * owner ) [static]
Back-compatibility only: The single-argument call can be used to move the selection to another widget or to set the
owner to NULL, without changing the actual text of the selection.
FL_SELECTIONCLEAR is sent to the previous selection owner, if any.
Copying the buffer every time the selection is changed is obviously wasteful, especially for large selections. An
interface will probably be added in a future version to allow the selection to be made by a callback function. The
current interface will be emulated on top of this.

33.4.2.10 selection_to_clipboard() [1/2]

static int Fl::selection_to_clipboard ( ) [inline], [static]
Returns the current selection_to_clipboard mode.

See also

void selection_to_clipboard(int)

33.4.2.11 selection_to_clipboard() [2/2]

static void Fl::selection_to_clipboard ( 
    int mode ) [inline], [static]
Copies selections on X11 directly to the clipboard if enabled.
This method can be called on all platforms. Other platforms than X11 are not affected by this feature.
If this is switched on (mode = 1), Fl::copy() copies all data to the clipboard regardless of its destination
argument. If the destination is 0 (selection buffer) data is copied to both the selection buffer and the clipboard.
Drag and drop is also affected since drag-and-drop data is copied to the selection buffer.
You can use this to make the experience of data selection and copying more like that on other platforms (Windows,
macOS, and even Wayland).
The default operation mode is the standard X11 behavior (disabled).

Note

This feature is experimental and enabling it may have unexpected side effects. It is your own responsibility if
you enable it.

Since

1.4.0

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mode</td>
<td>1 = enable selection_to_clipboard, 0 = disable selection_to_clipboard</td>
</tr>
</tbody>
</table>
See also

\texttt{copy(const char *, int, int, const char *)}

### 33.5 Screen functions

\texttt{Fl} global screen functions declared in \texttt{<FL/Fl.H>}.  

#### Functions

- static int \texttt{Fl::h ()} 
  
  \textit{Returns the height in pixels of the main screen work area.}

- static void \texttt{Fl::keyboard_screen_scaling (int value)} 
  
  \textit{Controls the possibility to scale all windows by ctrl+/-/0/ or cmd+/-/0/.}

- static int \texttt{Fl::screen_count ()} 
  
  \textit{Gets the total count of available screens.}

- static void \texttt{Fl::screen_dpi (float \&h, float \&v, int n=0)} 
  
  \textit{Gets the screen resolution in dots-per-inch for the given screen.}

- static int \texttt{Fl::screen_num (int x, int y)} 
  
  \textit{Gets the screen number of a screen that contains the specified screen position x, y.}

- static int \texttt{Fl::screen_num (int x, int y, int w, int h)} 
  
  \textit{Gets the screen number for the screen which intersects the most with the rectangle defined by x, y, w, h.}

- static float \texttt{Fl::screen_scale (int \(n\))} 
  
  \textit{Current value of the GUI scaling factor for screen number \(n\) \([0, Fl::screen_count()-1]\).}

- static void \texttt{Fl::screen_scale (int \(n\), float factor)} 
  
  \textit{Sets the value of the GUI scaling factor for screen number \(n\) \([0, Fl::screen_count()-1]\).}

- static int \texttt{Fl::screen_scaling_supported ()} 
  
  \textit{See if scaling factors are supported by this platform.}

- static void \texttt{Fl::screen_work_area (int \&X, int \&Y, int \&W, int \&H)} 
  
  \textit{Gets the bounding box of the work area of the screen that contains the mouse pointer.}

- static void \texttt{Fl::screen_work_area (int \&X, int \&Y, int \&W, int \&H, int mx, int my)} 
  
  \textit{Gets the bounding box of the work area of a screen that contains the specified screen position \(mx, my\).}

- static void \texttt{Fl::screen_work_area (int \&X, int \&Y, int \&W, int \&H, int \(n\))} 
  
  \textit{Gets the bounding box of the work area of the given screen.}

- static void \texttt{Fl::screen_xywh (int \&X, int \&Y, int \&W, int \&H)} 
  
  \textit{Gets the bounding box of a screen that contains the mouse pointer.}

- static void \texttt{Fl::screen_xywh (int \&X, int \&Y, int \&W, int \&H, int mx, int my)} 
  
  \textit{Gets the bounding box of a screen that contains the specified screen position \(mx, my\).}

- static void \texttt{Fl::screen_xywh (int \&X, int \&Y, int \&W, int \&H, int mx, int my, int mw, int mh)} 
  
  \textit{Gets the screen bounding rect for the screen which intersects the most with the rectangle defined by \(mx, my, mw, mh\).}

- static void \texttt{Fl::screen_xywh (int \&X, int \&Y, int \&W, int \&H, int \(n\))} 
  
  \textit{Gets the screen bounding rect for the given screen.}

- static int \texttt{Fl::w ()} 
  
  \textit{Returns the width in pixels of the main screen work area.}

- static int \texttt{Fl::x ()} 
  
  \textit{Returns the leftmost x coordinate of the main screen work area.}

- static int \texttt{Fl::y ()} 
  
  \textit{Returns the topmost y coordinate of the main screen work area.}
33.5.1 Detailed Description

Fl global screen functions declared in `<FL/Fl.H>`.

FLTK supports high-DPI screens using a screen scaling factor. The scaling factor is initialized by the library to a value based on information obtained from the OS. If this initial value is not satisfactory, the `FLTK_SCALING_FACTOR` environment variable can be set to a value FLTK will multiply to the OS-given value. The 2 variants of functions `Fl::screen_scale()` allow to programmatically get and set scaling factor values. The scaling factor value can be further changed at runtime by typing ctrl+/+/-/0/ (cmd+/+/-/0/ under macOS). FLTK sends the `FL_ZOOM_EVENT` when the factor value is changed, to which a callback can be associated with `Fl::add_handler()`.

By default, FLTK displays the new scaling factor value in a yellow, transient window. This can be changed with option `Fl::OPTION_SHOW_SCALING`.

33.5.2 Function Documentation

33.5.2.1 keyboard_screen_scaling()

```cpp
def void Fl::keyboard_screen_scaling (int value) [static]
```

Controls the possibility to scale all windows by ctrl+/+/-/0/ or cmd+/+/-/0/.

This function should be called before `fl_open_display()` runs. If it is not called, the default is to handle these keys for window scaling.

Note

This function can currently only be used to switch the internal handler off, i.e. value must be 0 (zero) - all other values result in undefined behavior and are reserved for future extension.

Parameters

| value | 0 to stop recognition of ctrl+/+/-/0/ (or cmd+/+/-/0/ under macOS) keys as window scaling. |

33.5.2.2 screen_count()

```cpp
def int Fl::screen_count ( ) [static]
```

Gets the total count of available screens.

Note

Screen numbers range from 0 to `Fl::screen_count()-1` in the FLTK API.

33.5.2.3 screen_dpi()

```cpp
def void Fl::screen_dpi (float & h, float & v, int n = 0 ) [static]
```

Gets the screen resolution in dots-per-inch for the given screen.

Parameters

<table>
<thead>
<tr>
<th>out</th>
<th>h,v</th>
<th>horizontal and vertical resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>the screen number (0 to <code>Fl::screen_count() - 1</code>)</td>
</tr>
</tbody>
</table>
See also

```c
void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)
```

### 33.5.2.4 screen_num()[1/2]

```c
int Fl::screen_num ( 
    int x, 
    int y ) [static]
```

Gets the screen number of a screen that contains the specified screen position `x, y`.

**Parameters**

- `in x,y` the absolute screen position

**Returns**

- a screen number `[0, Fl::screen_count()-1]`

**Attention**

When the running system contains screens with different scaling factor values, this API may become ambiguous because a given value pair `(x, y)` may belong to distinct screens. In that situation, other APIs should be preferred, e.g., `Fl_Window::screen_num()` and `Fl::screen_scale(int)`.

### 33.5.2.5 screen_num()[2/2]

```c
int Fl::screen_num ( 
    int x, 
    int y, 
    int w, 
    int h ) [static]
```

Gets the screen number for the screen which intersects the most with the rectangle defined by `x, y, w, h`.

**Parameters**

- `in x,y,w,h` the rectangle to search for intersection with

**Returns**

- a screen number `[0, Fl::screen_count()-1]`

### 33.5.2.6 screen_scale()

```c
void Fl::screen_scale ( 
    int n, 
    float factor ) [static]
```

Sets the value of the GUI scaling factor for screen number `n` `[0, Fl::screen_count()-1]`. Also sets the scale factor value of all windows mapped to screen number `n`, if any.

### 33.5.2.7 screen_scaling_supported()

```c
int Fl::screen_scaling_supported ( ) [static]
```

See if scaling factors are supported by this platform.
Returns

0 if scaling factors are not supported by this platform, 1 if a single scaling factor value is shared by all screens,
2 if each screen can have its own scaling factor value.

See also

Fl::screen_scale(int)

33.5.2.8 screen_work_area() [1/3]

```c
void Fl::screen_work_area (  
  int & X,  
  int & Y,  
  int & W,  
  int & H ) [static]
```

Gets the bounding box of the work area of the screen that contains the mouse pointer.

Parameters

- **out X,Y,W,H** the work area bounding box

See also

```c
void screen_work_area(int &x, int &y, int &w, int &h, int mx, int my)
```

33.5.2.9 screen_work_area() [2/3]

```c
void Fl::screen_work_area (  
  int & X,  
  int & Y,  
  int & W,  
  int & H,  
  int mx,  
  int my ) [static]
```

Gets the bounding box of the work area of a screen that contains the specified screen position mx, my.

Parameters

- **out X,Y,W,H** the work area bounding box
- **in mx,my** the absolute screen position

33.5.2.10 screen_work_area() [3/3]

```c
void Fl::screen_work_area (  
  int & X,  
  int & Y,  
  int & W,  
  int & H,  
  int n ) [static]
```

Gets the bounding box of the work area of the given screen.
Parameters

<table>
<thead>
<tr>
<th>out</th>
<th>X,Y,W,H</th>
<th>the work area bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>the screen number (0 to Fl::screen_count() - 1)</td>
</tr>
</tbody>
</table>

See also

void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)

Note

Like all quantities accessible via public APIs of FLTK, values of X,Y,W,H are given in FLTK units, that is, in drawing units divided by the scaling factor of screen n.

33.5.2.11 screen_xywh() [1/4]

```cpp
void Fl::screen_xywh ( 
    int & X, 
    int & Y, 
    int & W, 
    int & H ) [static]
```

Gets the bounding box of a screen that contains the mouse pointer.

Parameters

| out | X,Y,W,H | the corresponding screen bounding box |

See also

void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)

33.5.2.12 screen_xywh() [2/4]

```cpp
void Fl::screen_xywh ( 
    int & X, 
    int & Y, 
    int & W, 
    int & H, 
    int mx, 
    int my ) [static]
```

Gets the bounding box of a screen that contains the specified screen position mx, my.

Parameters

<table>
<thead>
<tr>
<th>out</th>
<th>X,Y,W,H</th>
<th>the corresponding screen bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>mx,my</td>
<td>the absolute screen position</td>
</tr>
</tbody>
</table>

33.5.2.13 screen_xywh() [3/4]

```cpp
void Fl::screen_xywh ( 
    int & X, 
    int & Y, 
    int & W, 
    int & H, 
```
int & W,
int & H,
int mx,
int my,
int mw,
int mh ) [static]

Gets the screen bounding rect for the screen which intersects the most with the rectangle defined by mx, my, mw, mh.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>out X,Y,W,H</th>
<th>the corresponding screen bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>mx, my, mw, mh</td>
<td>X, Y, W, H</td>
<td>the rectangle to search for intersection with</td>
</tr>
</tbody>
</table>

**See also**

void screen_xywh(int &X, int &Y, int &W, int &H, int n)

### 33.5.2.14 screen_xywh() [4/4]

void Fl::screen_xywh (  
    int & X,
    int & Y,
    int & W,
    int & H,
    int n ) [static]

Gets the screen bounding rect for the given screen.
Under Windows, Mac OS X, and X11 + the Gnome desktop, screen #0 contains the menubar/taskbar

**Parameters**

<table>
<thead>
<tr>
<th>in n</th>
<th>out X,Y,W,H</th>
<th>the corresponding screen bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>X, Y, W, H</td>
<td>the screen number (0 to Fl::screen_count() - 1)</td>
</tr>
</tbody>
</table>

**Note**

Like all quantities accessible via public APIs of FLTK, values of X,Y,W,H are given in FLTK units, that is, in drawing units divided by the scaling factor of screen n.

**See also**

void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)

## 33.6 Color & Font functions

fl global color, font functions.

### Functions

- **FL_Color fl_color ()**
  
  Return the last fl_color() that was set.
- **void fl_color (FL_Color c)**
  
  Set the color for all subsequent drawing operations.
- **void fl_color (int c)**
for back compatibility - use fl_color(Fl_COLOR c) instead

- void fl_color (uchar r, uchar g, uchar b)
  Set the color for all subsequent drawing operations.

- Fl_COLOR fl_color_average (Fl_COLOR color1, Fl_COLOR color2, float weight)
  Returns the weighted average color between the two given colors.

- Fl_COLOR fl_contrast (Fl_COLOR fg, Fl_COLOR bg, Fl_Fontsize fs, int context)
  Returns a color that contrasts with the background color.

- void fl_contrast_function (Fl_Contrast_Function *f)
  Register a custom contrast function.

- int fl_contrast_level ()
  Get the contrast level (sensitivity) of the fl_contrast() method.

- void fl_contrast_level (int level)
  Set the contrast level (sensitivity) of the fl_contrast() method.

- int fl_contrast_mode ()
  Return the current contrast algorithm (mode).

- void fl_contrast_mode (int mode)
  Set the contrast algorithm (mode).

- int fl_descent ()
  Return the recommended distance above the bottom of a fl_height() tall box to draw the text at so it looks centered vertically in that box.

- Fl_Font fl_font ()
  Return the face set by the most recent call to fl_font().

- void fl_font (Fl_Font face, Fl_Fontsize fsize)
  Sets the current font, which is then used in various drawing routines.

- int fl_height ()
  Return the recommended minimum line spacing for the current font.

- int fl_height (int font, int size)
  This function returns the actual height of the specified font and size.

- Fl_COLOR fl_inactive (Fl_COLOR c)
  Returns the inactive, dimmed version of the given color.

- const char * fl_latin1_to_local (const char *t, int n=-1)
  Convert text from Windows/X11 latin1 character set to local encoding.

- double fl_lightness (Fl_COLOR color)
  Return the perceived lightness of a color.

- const char * fl_local_to_latin1 (const char *t, int n=-1)
  Convert text from local encoding to Windows/X11 latin1 character set.

- const char * fl_local_to_mac_roman (const char *t, int n=-1)
  Convert text from local encoding to Mac Roman character set.

- double fl_luminance (Fl_COLOR color)
  Return the raw / physical luminance of a color.

- const char * fl_mac_roman_to_local (const char *t, int n=-1)
  Convert text from Mac Roman character set to local encoding.

- Fl_Fontsize fl_show_colormap (Fl_COLOR oldcol)
  Pops up a window to let the user pick a colormap entry.

- Fl_Fontsize fl_size ()
  Return the size set by the most recent call to fl_font().

- void fl_text_extents (const char *txt)
  Determine the minimum pixel dimensions of a nul-terminated string using the current fl_font().

- void fl_text_extents (const char *txt, int n, int &dx, int &dy, int &w, int &h)
  Determine the minimum pixel dimensions of a sequence of n characters (bytes) using the current fl_font().

- double fl_width (const char *txt)
33.6 Color & Font functions

Return the typographical width of a nul-terminated string using the current font face and size.
• double \texttt{fl\_width(const char \ast \texttt{txt}, int \texttt{n})}
  Return the typographical width of a sequence of \texttt{n} characters using the current font face and size.
• double \texttt{fl\_width(unsigned int \texttt{c})}
  Return the typographical width of a single character using the current font face and size.

• static void \texttt{Fl::free\_color(Fl\_Color \texttt{i}, int overlay=0)}
  Frees the specified color from the colormap, if applicable.
• static unsigned \texttt{Fl::get\_color(Fl\_Color \texttt{i})}
  Returns the \texttt{RGB} value(s) for the given FLTK color index.
• static void \texttt{Fl::get\_color(Fl\_Color \texttt{i}, uchar \&\texttt{red}, uchar \&\texttt{green}, uchar \&\texttt{blue})}
  Returns the \texttt{RGB} value(s) for the given FLTK color index.
• static void \texttt{Fl::get\_color(Fl\_Color \texttt{i}, uchar \&\texttt{red}, uchar \&\texttt{green}, uchar \&\texttt{blue}, uchar \&\texttt{alpha})}
  Returns the \texttt{RGBA} value(s) for the given FLTK color index.

• static const char \ast \texttt{Fl::get\_font(Fl\_Font)}
  Gets the string for this face.
• static const char \ast \texttt{Fl::get\_font\_name(Fl\_Font, int \ast\texttt{attributes}=0)}
  Get a human-readable string describing the family of this face.
• static int \texttt{Fl::get\_font\_sizes(Fl\_Font, int \ast\&\texttt{sizep})}
  Return an array of sizes in \texttt{sizep}.

• static void \texttt{Fl::set\_color(Fl\_Color \texttt{i}, unsigned \texttt{c})}
  Sets an entry in the fl\_color index table.
• static void \texttt{Fl::set\_color(Fl\_Color, uchar, uchar, uchar)}
  Sets an entry in the fl\_color index table.
• static void \texttt{Fl::set\_color(Fl\_Color, uchar, uchar, uchar, uchar)}
  Sets an entry in the fl\_color index table.
• static void \texttt{Fl::set\_font(Fl\_Font, const char \ast)}
  Changes a face.
• static void \texttt{Fl::set\_font(Fl\_Font, Fl\_Font)}
  Copies one face to another.
• static Fl\_Font \texttt{Fl::set\_fonts(const char \ast=0)}
  FLTK will open the display, and add every fonts on the server to the face table.

33.6.1 Detailed Description

\texttt{fl} global color, font functions.
These functions are declared in \texttt{<FL/Fl.H>} or \texttt{<FL/fl\_draw.H>}

33.6.2 Function Documentation

33.6.2.1 \texttt{fl\_color()} [1/3]
\texttt{Fl\_Color fl\_color ( ) [inline]}
Return the last \texttt{fl\_color()} that was set.
This can be used for state save/restore.

33.6.2.2 \texttt{fl\_color()} [2/3]
void \texttt{fl\_color ( Fl\_Color \texttt{c} ) [inline]}
Set the color for all subsequent drawing operations.
For color-mapped displays, a color cell will be allocated out of \texttt{fl\_colormap} the first time you use a color. If the colormap fills up then a least-squares algorithm is used to find the closest color. If no valid graphical context (\texttt{fl\_gc}) is available, the foreground is not set for the current window.
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>c</th>
<th>color</th>
</tr>
</thead>
</table>

### 33.6.2.3 fl_color() [3/3]

```c
void fl_color (uchar r, uchar g, uchar b) [inline]
```

Set the color for all subsequent drawing operations. The closest possible match to the RGB color is used. The RGB color is used directly on TrueColor displays. For colormap visuals the nearest index in the gray ramp or color cube is used. If no valid graphical context (fl_gc) is available, the foreground is not set for the current window.

Parameters

| in  | r,g,b | color components |

### 33.6.2.4 fl_color_average()

```c
Fl_Color fl_color_average (Fl_Color color1, Fl_Color color2, float weight)
```

Returns the weighted average color between the two given colors. The red, green and blue values are averages using the following formula:

```
color = color1 * weight + color2 * (1 - weight)
```

Thus, a `weight` value of 1.0 will return the first color, while a value of 0.0 will return the second color.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>color1,color2</th>
<th>boundary colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>weight</td>
<td>weighting factor</td>
</tr>
</tbody>
</table>

### 33.6.2.5 fl_contrast()

```c
Fl_Color fl_contrast (Fl_Color fg, Fl_Color bg, Fl_Fontsize fs, int context)
```

Returns a color that contrasts with the background color. This will be the foreground color if it contrasts sufficiently with the background color. Otherwise, returns `FL_WHITE` or `FL_BLACK` depending on which color provides the best contrast.

FLTK 1.4.0 uses a different default contrast function than earlier releases (1.3.x) but you can use the old "legacy" contrast function by calling `fl_contrast_mode(FL_CONTRAST_LEGACY)` early in your main program.
Note

It is a known issue that static initialization using \texttt{fl_contrast()} may already have been executed before you call this function in main(). You should be aware of this and, if necessary, write your own (static) contrast initialization function. This should rarely be necessary.

You can change the behavior of \texttt{fl_contrast()} in several ways:

- Change the "level" (sensitivity) for contrast calculation, see \texttt{fl_contrast_level()}. Valid levels are 0 - 100, the default "medium" value is 50. If you raise the level above 50 the overall contrast will generally be higher, i.e. the required contrast to return the foreground color is raised and therefore the calculated color will switch "earlier" to either black or white. In other words, using the following values:
  - 0 will always use the foreground color
  - 50 will use the default, unmodified algorithm
  - 100 will always use black or white
  - values larger than 50 may yield slightly better results. Changing the level is particularly useful and intended for the "legacy mode" to improve the results partially. Values slightly above 50 (50 - 70) will likely return the best results (50 is the default, as used in FLTK 1.3.x).

Note

Different contrast modes (algorithms) can use their own values and defaults of \texttt{fl_contrast_level()}.

- Change the used contrast calculation function. You can either use the old (FLTK 1.3.x) function or use the better but slower function based on the CIELAB (L$^*$a$^*$b$^*$) color model, or you can define your own custom contrast function if you need even better contrast results.

The following contrast functions are available:

- \texttt{FL_CONTRAST_LEGACY}, the old FLTK 1.3.x compatible function. This is the fastest function (using integer arithmetic) but it provides worse results in border cases. You may want to use this on embedded or otherwise CPU constrained systems or if you need strict backwards compatibility. For slightly better results you may utilize the new \texttt{fl_contrast_level(int)} function (since 1.4.0) to increase the contrast sensitivity. This will provide slightly better results than FLTK 1.3.x and earlier but we recommend to use the new default function:

- \texttt{FL_CONTRAST_CIELAB}, based on the CIELAB (L$^*$a$^*$b$^*$) color model. This function is superior regarding the visual contrast perception but may be slower. This is the default since FLTK 1.4.0.

- \texttt{FL_CONTRAST_CUSTOM}, your own contrast calculation function.

In the future we may provide even more (and superior) contrast algorithms.
The new parameters \texttt{fs} and \texttt{context} (since 1.4.0) are defined for future extensions and are currently not used. Default values are 0.

Note

These new optional parameters must be provided in the custom contrast function which is the reason why they are added now. In the future we may use the fontsize to adjust the calculated contrast, and users defining their own contrast functions may use them in their functions.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\texttt{fg}</td>
<td>foreground (text) color</td>
</tr>
<tr>
<td>\texttt{bg}</td>
<td>background color</td>
</tr>
<tr>
<td>\texttt{fs}</td>
<td>font size (optional, default = 0 == undefined)</td>
</tr>
<tr>
<td>\texttt{context}</td>
<td>graphical context (optional, default = 0 == text)</td>
</tr>
</tbody>
</table>
Returns

contrasting color: fg, FL_BLACK, or FL_WHITE

See also

fl_contrast_level(int)
fl_contrast_mode(int)
fl_contrast_function()

33.6.2.6 fl_contrast_function()

void fl_contrast_function ( Fl_Contrast_Function * f )

Register a custom contrast function. Your custom contrast function will be called when fl_contrast() is called if and only if you previously registered your function and called fl_contrast_mode(FL_CONTRAST_CUSTOM).

Your custom contrast function must provide the signature

Fl_Color my_contrast_function(Fl_Color fg, Fl_Color bg, Fl_Fontsize fs, int context)

The arguments are the same as for the full fl_contrast() function since FLTK 1.4. You can use the supplied fontsize fs to modify the result. Depending on the caller the fs parameter can be 0 (default) or a valid fontsize.

The context parameter is not yet used and will always be 0 unless included in a call to fl_contrast(). The value 0 should be interpreted as text. In the future the context argument will be used to supply a different context than text (small icons, large icons, etc.). The exact usage is not yet specified.

Your function may also use fl_contrast_level() to modify the result accordingly.

Since

1.4.0

See also

fl_contrast_mode(int)
fl_contrast_level(int)
fl_contrast()
### 33.6 Color & Font functions

#### 33.6.2.8 \texttt{fl\_contrast\_level()} [2/2]

```c
void fl_contrast_level (  
    int level 
)  
```

Set the contrast level (sensitivity) of the \texttt{fl\_contrast()} method. This can be used to tune the legacy \texttt{fl\_contrast()} function to achieve slightly better results. The default value is defined per contrast mode (see below). Values between 50 and 70 are recommended but you can raise it up to 100. Lower values than 50 are probably not useful.

The contrast level affects not only the legacy (1.3.x) \texttt{fl\_contrast()} function but also the new CIELAB contrast mode which is the default since FLTK 1.4.0.

Other contrast modes are currently not affected by the contrast level.

You may use the contrast level if you define your own custom contrast function in mode FL\_CONTRAST\_CUSTOM.

Note

All contrast modes store their own contrast level because the behavior is slightly different. You must change the contrast mode \texttt{fl\_contrast\_mode()} before you set or get the contrast level.

The default contrast level is

- 50 in mode FL\_CONTRAST\_LEGACY (compatible with FLTK 1.3.x)
- 55 in mode FL\_CONTRAST\_CIELAB
- 0 (undefined) for all other modes

See the description of \texttt{fl\_contrast\_mode(int mode)} for more information about the contrast level per mode.

Example:

```c
fl_contrast_mode(FL\_CONTRAST\_LEGACY);
fl_contrast_level(65);
```

A level greater than 50 (probably best in the range 50 to 70) may achieve better results of the legacy \texttt{fl\_contrast()} function in some border cases of low contrast between foreground and background colors but we recommend to use the new default algorithm FL\_CONTRAST\_CIELAB unless you need strict backwards compatibility or use a CPU constrained embedded system.

**Parameters**

| in | \texttt{level} | valid range is 0 to 100 |

Since

1.4.0

#### 33.6.2.9 \texttt{fl\_contrast\_mode()} [1/2]

```c
int fl_contrast_mode ( )
```

Return the current contrast algorithm (mode).

**Returns**

Contrast algorithm (mode).

Since

1.4.0

See also

\texttt{fl\_contrast\_mode(int)}
### 33.6.2.10 `fl_contrast_mode()` [2/2]

```c
void fl_contrast_mode (  
   int mode  )
```

Set the contrast algorithm (mode).

You can use one of:

- FL_CONTRAST_NONE (not recommended: returns the foreground color)
- FL_CONTRAST_LEGACY (same as in FLTK 1.3.x)
- FL_CONTRAST_CIELAB (default since FLTK 1.4.0)
- FL_CONTRAST_CUSTOM (you must define your own contrast algorithm)

If you set FL_CONTRAST_CUSTOM you must also register your custom contrast function by calling `fl_contrast_function()`.

You may set the contrast level `fl_contrast_level(int)` after setting the contrast mode. This affects the contrast algorithm as described below:

- FL_CONTRAST_LEGACY: default level is 50 which is compatible with FLTK 1.3.x and older. This mode is no longer the default and is not recommended because it doesn't take human contrast perception into account and doesn't properly handle sRGB color values. You may get better contrasts if you set the level higher than 50. Values in the range 50 to 70 may be useful. Higher values result in higher contrast, i.e. the algorithm switches "earlier" to black or white mode.

- FL_CONTRAST_CIELAB: default level is 55 which appears to be a good value. The higher the level is, the more contrast is to be expected. Values in the range below 55 accept lower contrast and values above 55 switch "earlier" to black or white. Values between 45 and 65 may yield usable contrast experience.

**Parameters**

| in mode | if invalid, FL_CONTRAST_CIELAB will be selected |

Since

1.4.0

See also

- `fl_contrast_function(Fl_Contrast_Function *)`
- `fl_contrast_level(int)`

### 33.6.2.11 `fl_font()` [1/2]

```c
Fl_Font fl_font ( ) [inline]
```

Return the face set by the most recent call to `fl_font()`.

This can be used to save/restore the font.

### 33.6.2.12 `fl_font()` [2/2]

```c
void fl_font (  
   Fl_Font face,  
   Fl_Fontsize fsize  )
```

Sets the current font, which is then used in various drawing routines.

You may call this outside a draw context if necessary to measure text, for instance by calling `fl_width()`, `fl_measure()`, or `fl_text_extents()`, but on X this will open the display.

The font is identified by a face and a size. The size of the font is measured in pixels and not "points". Lines should be spaced size pixels apart or more.
33.6 Color & Font functions

33.6.2.13 \texttt{fl\_height()} [1/2]

\texttt{int fl\_height( ) [inline]}
Return the recommended minimum line spacing for the current font.
You can also use the value of \texttt{size} passed to \texttt{fl\_font()}.

33.6.2.14 \texttt{fl\_height()} [2/2]

\texttt{int fl\_height (}
\hspace{1em} int \texttt{font},
\hspace{1em} int \texttt{size})
This function returns the actual height of the specified \texttt{font} and \texttt{size}.
Normally the font height should always be 'size', but with the advent of XFT, there are (currently) complexities that
seem to only be solved by asking the font what its actual font height is. (See STR#2115)
This function was originally undocumented in 1.1.x, and was used only by \texttt{Fl\_Text\_Display}. We're now documenting
it in 1.3.x so that apps that need precise height info can get it with this function.

Returns

the height of the font in pixels.

\textbf{Todo} In the future, when the XFT issues are resolved, this function should simply return the 'size' value.

33.6.2.15 \texttt{fl\_latin1\_to\_local()}

\texttt{const char * fl\_latin1\_to\_local (}
\hspace{1em} const char * \texttt{t,}
\hspace{1em} int \texttt{n = -1})
Convert text from Windows/X11 latin1 character set to local encoding.

Parameters

| \textbf{in} | \texttt{t} | character string (latin1 encoding) |
| \textbf{in} | \texttt{n} | optional number of characters (bytes) to convert (default is all) |

Returns

pointer to internal buffer containing converted characters

33.6.2.16 \texttt{fl\_lightness()}

\texttt{double fl\_lightness (}
\hspace{1em} Fl\_Color \texttt{color})
Return the perceived lightness of a color.
This function calculates the perceived lightness of Fl\_Color \texttt{color}.
The returned lightness value \texttt{Lstar} according to the CIELAB (L*a*b*) color model is almost linear with respect to
human perception. It is in the range 0 (black) to 100 (white).
The result values of two colors can be compared directly and the difference is their perceived contrast.

Parameters

| \textbf{in} | \texttt{color} | Fl\_Color value |

Generated by Doxygen
Returns

perceived lightness (0 .. 100)

Since

1.4.0

33.6.2.17 fl_local_to_latin1()

const char * fl_local_to_latin1 (  
    const char * t,
    int n = -1 )

Convert text from local encoding to Windows/X11 latin1 character set.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>character string (local encoding)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>optional number of characters (bytes) to convert (default is all)</td>
</tr>
</tbody>
</table>

Returns

pointer to internal buffer containing converted characters

33.6.2.18 fl_local_to_mac_roman()

const char * fl_local_to_mac_roman (  
    const char * t,
    int n = -1 )

Convert text from local encoding to Mac Roman character set.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>character string (local encoding)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>optional number of characters to convert (default is all)</td>
</tr>
</tbody>
</table>

Returns

pointer to internal buffer containing converted characters

33.6.2.19 fl_luminance()

double fl_luminance (  
    Fl_Color color )

Return the raw / physical luminance of a color.
This function calculates the physical luminance of Fl_Color color.  
The returned luminance value (aka Y) is the physical luminance of the Fl_Color color.  
The result is in the range 0.0 (black) to 1.0 (white).
Note

This is probably not what you want if you are interested in perceived contrast or lightness calculation because the luminance $Y$ is **not** linear with respect to human perception.

See `fl_lightness(Fl_Color)` for a function that returns the perceived lightness of a color which can be used directly for contrast calculation.
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>color</th>
<th>Fl_Color value</th>
</tr>
</thead>
</table>

Returns

Raw (physical) luminance (0.0 .. 1.0)

Since

1.4.0

See also

fl_lightness(Fl_Color)

33.6.2.20 fl_mac_roman_to_local()

const char * fl_mac_roman_to_local ( const char * t, int n = -1 )

Convert text from Mac Roman character set to local encoding.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>character string (Mac Roman encoding)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>optional number of characters to convert (default is all)</td>
</tr>
</tbody>
</table>

Returns

pointer to internal buffer containing converted characters

33.6.2.21 fl_show_colormap()

Fl_Color fl_show_colormap ( Fl_Color oldcol )

Pops up a window to let the user pick a colormap entry.
33.6 Color & Font functions

Figure 33.1 fl_show_colormap

Parameters

| in | oldcol | color to be highlighted when grid is shown. |

Return values

| Fl_Color | value of the chosen colormap entry. |

See also

Fl_Color_Chooser

33.6.2.22 fl_size()

Fl_Fontsize fl_size ( ) [inline]

Return the size set by the most recent call to fl_font().

This can be used to save/restore the font.

33.6.2.23 fl_text_extents() [1/2]

void fl_text_extents (const char * c,
 int & dx,
 int & dy,
 int & w,
 int & h )

Determine the minimum pixel dimensions of a nul-terminated string using the current fl_font().

Usage: given a string "txt" drawn using fl_draw(txt, x, y) you would determine its pixel extents on the display using fl_text_extents(txt, dx, dy, wo, ho) such that a bounding box that exactly fits around the text could be drawn with
fl_rect(x+dx, y+dy, wo, ho). Note the dx, dy values hold the offset of the first "colored in" pixel of the string, from the draw origin.

Note the desired font and font size must be set with fl_font() before calling this function.
This differs slightly from fl_measure() in that the dx/dy values are also returned.
No FLTK symbol expansion will be performed.

Example use:

```c
inc dx, dy, W, H;
fl_font(FL_HELVETICA, 12); // set font face+size first
fl_text_extents("Some text", dx, dy, W, H); // get width and height of string
printf("text's width=%d, height=%d\n", W, H);
```

33.6.2.24 fl_text_extents() [2/2]

```c
void fl_text_extents (  
    const char * t,  
    int n,  
    int & dx,  
    int & dy,  
    int & w,  
    int & h ) [inline]
```

Determine the minimum pixel dimensions of a sequence of n characters (bytes) using the current fl_font().

Note
The string length is measured in bytes, not (UTF-8) characters.

See also

fl_text_extents(const char*, int& dx, int& dy, int& w, int& h)

33.6.2.25 fl_width()

```c
double fl_width (  
    unsigned int c ) [inline]
```

Return the typographical width of a single character using the current font face and size.

Note
If a valid fl_gc is NOT found then it uses the first window gc, or the screen gc if no flik window is available when called.

33.6.2.26 free_color()

```c
void Fl::free_color (  
    Fl_Color i,  
    int overlay = 0 ) [static]
```

Frees the specified color from the colormap, if applicable.
If overlay is non-zero then the color is freed from the overlay colormap.

33.6.2.27 get_color() [1/3]

```c
unsigned Fl::get_color (  
    Fl_Color i ) [static]
```

Returns the RGB value(s) for the given FLTK color index.
This form returns the RGB values packed in a 32-bit unsigned integer with the red value in the upper 8 bits, the green value in the next 8 bits, and the blue value in bits 8-15. The lower 8 bits will always be 0.
33.6.2.28 **get_color()** [2/3]

```cpp
void Fl::get_color (  
    Fl_Color i,  
    uchar & red,  
    uchar & green,  
    uchar & blue ) [static]
```

Returns the RGB value(s) for the given FLTK color index.
This form returns the red, green, and blue values separately in referenced variables.

See also

```cpp
unsigned get_color(Fl_Color c)
```

33.6.2.29 **get_color()** [3/3]

```cpp
void Fl::get_color (  
    Fl_Color i,  
    uchar & red,  
    uchar & green,  
    uchar & blue,  
    uchar & alpha ) [static]
```

Returns the RGBA value(s) for the given FLTK color index.
This form returns the red, green, blue, and alpha values separately in referenced variables.

See also

```cpp
unsigned get_color(Fl_Color c)
```

33.6.2.30 **get_font()**

```cpp
const char * Fl::get_font (  
    Fl_Font fnum ) [static]
```

Gets the string for this face.
This string is different for each face. Under X this value is passed to XListFonts to get all the sizes of this face.

33.6.2.31 **get_font_name()**

```cpp
const char * Fl::get_font_name (  
    Fl_Font fnum,  
    int * attributes = 0 ) [static]
```

Get a human-readable string describing the family of this face.
This is useful if you are presenting a choice to the user. There is no guarantee that each face has a different name.
The return value points to a static buffer that is overwritten each call.
The integer pointed to by attributes (if the pointer is not zero) is set to zero, FL_BOLD or FL_ITALIC or FL_←_BOLD | FL_ITALIC. To locate a “family” of fonts, search forward and back for a set with non-zero attributes, these faces along with the face with a zero attribute before them constitute a family.

33.6.2.32 **get_font_sizes()**

```cpp
int Fl::get_font_sizes (  
    Fl_Font fnum,  
    int * & sizep ) [static]
```

Return an array of sizes in sizep.
The return value is the length of this array. The sizes are sorted from smallest to largest and indicate what sizes can be given to fl_font() that will be matched exactly (fl_font() will pick the closest size for other sizes). A zero in the first location of the array indicates a scalable font, where any size works, although the array may list sizes that work “better” than others. Warning: the returned array points at a static buffer that is overwritten each call. Under X this will open the display.
33.6.2.33  set_color() [1/3]

void Fl::set_color (  
  Fl_Color i,  
  unsigned c ) [static]

Sets an entry in the fl_color index table.
You can set it to any 8-bit RGB color. The color is not allocated until fl_color(i) is used.

33.6.2.34  set_color() [2/3]

void Fl::set_color (  
  Fl_Color i,  
  uchar red,  
  uchar green,  
  uchar blue ) [static]

Sets an entry in the fl_color index table.
You can set it to any 8-bit RGB color. The color is not allocated until fl_color(i) is used.

33.6.2.35  set_color() [3/3]

void Fl::set_color (  
  Fl_Color i,  
  uchar red,  
  uchar green,  
  uchar blue,  
  uchar alpha ) [static]

Sets an entry in the fl_color index table.
You can set it to any 8-bit RGBA color.

Note

The color transparency is effective under the Wayland, hybrid Wayland/X11 and macOS platforms, whereas it
has no effect under the X11 and Windows platforms. It's also effective for widgets added to an Fl_Gl_Window.

Version

1.4

33.6.2.36  set_font()

void Fl::set_font (  
  Fl_Font fnum,  
  const char * name ) [static]

Changes a face.

Parameters

<table>
<thead>
<tr>
<th>fnum</th>
<th>The font number to be assigned a new face</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Name of the font to assign. The string pointer is simply stored, the string is not copied, so the string must be in static memory. The exact name to be used depends on the platform :</td>
</tr>
</tbody>
</table>

- Windows, X11, Xft: use the family name prefixed by one character to indicate the desired font variant. Characters ' ', 'I', 'B', 'P' denote plain, italic, bold, and bold-italic variants, respectively. For example, string "IGabriola" is to be used to denote the "Gabriola italic" font. The "Oblique" suffix, in whatever case, is to be treated as "italic", that is, prefix the family name with 'I'.

- Other platforms, i.e., X11 + Pango, Wayland, macOS: use the full font name as returned by function Fl::get_font_name() or as listed by applications test/fonts or test/utf8. No prefix is to be added.
33.6.2.37 set_fonts()

Fl_Font Fl::set_fonts (const char * xstarname = 0) [static]

FLTK will open the display, and add every fonts on the server to the face table. It will attempt to put “families” of faces together, so that the normal one is first, followed by bold, italic, and bold italic. The only argument to this function is somewhat obsolete since FLTK and most underlying operating systems move to support Unicode. For completeness, following is the original documentation and a few updates:

On X11, the optional argument is a string to describe the set of fonts to add. Passing NULL will select only fonts that have the ISO8859-1 character set (and are thus usable by normal text). Passing "-*" will select all fonts with any encoding as long as they have normal X font names with dashes in them. Passing "*" will list every font that exists (on X this may produce some strange output). Other values may be useful but are system dependent.

With Windows, NULL selects fonts with ANSI_CHARSET encoding and non-NUL selects all fonts. On macOS, this parameter is ignored.

The return value is how many faces are in the table after this is done.

33.7 Drawing functions

FLTK global graphics and GUI drawing functions.

Enumerations

- enum {
  
  FL_SOLID = 0, FL_DASH = 1, FL_DOT = 2, FL_DASHDOT = 3,
  FL_DASHDOTDOT = 4, FL_CAP_FLAT = 0x100, FL_CAP_ROUND = 0x200, FL_CAP_SQUARE = 0x300,
  FL_JOIN_MITER = 0x1000, FL_JOIN_ROUND = 0x2000, FL_JOIN_BEVEL = 0x3000
}

Functions

- int fl_add_symbol (const char * name, void(*drawit)(Fl_Color), int scalable)
  
  Adds a symbol to the system.

- int fl_antialias ()
  
  Return whether line drawings are currently antialiased.

- void fl_antialias (int state)
  
  Turn antialiased line drawings ON or OFF, if supported by platform.

- void fl_arc (double x, double y, double r, double start, double end)
  
  Add a series of points to the current path on the arc of a circle.

- void fl_arc (int x, int y, int w, int h, double a1, double a2)
  
  Draw ellipse sections using integer coordinates.

- void fl_begin_complex_polygon ()
  
  Start drawing a complex filled polygon.

- void fl_begin_line ()
  
  Start drawing a list of lines.

- void fl_begin_loop ()
  
  Start drawing a closed sequence of lines.

- void fl_begin_offscreen (Fl_Offscreen ctx)
  
  Send all subsequent drawing commands to this offscreen buffer.

- void fl_begin_points ()
  
  Start drawing a list of points.

- void fl_begin_polygon ()
  
  Start drawing a convex filled polygon.
• **char fl_can_do_alpha_blending ()**
  Check whether platform supports true alpha blending for RGBA images.

• **Fl_RGB_Image * fl_capture_window (Fl_Window * win, int x, int y, int w, int h)**
  Captures the content of a rectangular zone of a mapped window.

• **void fl_chord (int x, int y, int w, int h, double a1, double a2)**
  fl_chord declaration is a place holder - the function does not yet exist

• **void fl_circle (double x, double y, double r)**
  fl_circle(x,y,r) is equivalent to fl_arc(x,y,r,0,360), but may be faster.

• **void fl_clip (int x, int y, int w, int h)**
  Intersect the current clip region with a rectangle and push this new region onto the stack (deprecated).

• **int fl_clip_box (int x, int y, int w, int h, int &X, int &Y, int &W, int &H)**
  Intersect a rectangle with the current clip region and return the bounding box of the result.

• **Fl_Region fl_clip_region ()**
  Return the current clipping region.

• **void fl_clip_region (Fl_Region r)**
  Replace the top of the clipping stack with a clipping region of any shape.

• **void fl_copy_offscreen (int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy)**
  Copy a rectangular area of the given offscreen buffer into the current drawing destination.

• **Fl_Offscreen fl_create_offscreen (int w, int h)**
  Creation of an offscreen graphics buffer.

• **void fl_cursor (Fl_Cursor)**
  Sets the cursor for the current window to the specified shape and colors.

• **void fl_cursor (Fl_Cursor, Fl_Color fg, Fl_Color bg=FL_WHITE)**

• **void fl_curve (double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3)**
  Add a series of points on a Bézier curve to the path.

• **void fl_delete_offscreen (Fl_Offscreen ctx)**
  Deletion of an offscreen graphics buffer.

• **void fl_draw (const char * str, int n, int x, int y)**
  Draws starting at the given x, y location a UTF-8 string of length n bytes.

• **void fl_draw (const char * str, int x, int y)**
  Draw a nul-terminated UTF-8 string starting at the given x, y location.

• **void fl_draw (const char * str, int x, int y, int w, int h, Fl_Align align, Fl_Image * img=0, int draw_symbols=1)**
  Fancy string drawing function which is used to draw all the labels.

• **void fl_draw (const char * str, int x, int y, int w, int h, Fl_Align align, Fl_Image * img=0, int draw_symbols=1)**
  The same as fl_draw(const char *,int,int,int,Fl_Align,Fl_Image *,int) with the addition of the callthis parameter, which is a pointer to a text drawing function such as fl_draw(const char *, int, int, Fl_Align, Fl_Image *) to do the real work.

• **void fl_draw (int angle, const char *str, int x, int y, int w, int h, Fl_Align align, Fl_Image * img=0, int draw_symbols=1)**
  Draw at the given x, y location a UTF-8 string of length n bytes rotating angle degrees counter-clockwise.

• **void fl_draw (int angle, const char *str, int x, int y)**
  Draw a nul-terminated UTF-8 string starting at the given x, y location and rotating angle degrees counter-clockwise.

• **void fl_draw_arrow (Fl_Rect bb, Fl_Arrow_Type t, Fl_Orientation o, Fl_Color color)**
  Draw an "arrow like" GUI element for the selected scheme.

• **void fl_draw_box (Fl_Boxtype, int x, int y, int w, int h, Fl_Color)**
  Draws a box using given type, position, size and color.

• **void fl_draw_check (Fl_Rect bb, Fl_Color col)**
  Draw a check mark inside the given bounding box.

• **void fl_draw_circle (int x, int y, int w, int h, int D=3, int L=0)**
  Draw a potentially small, filled circle using a given color.

• **void fl_draw_image (const uchar * buf, int X, int Y, int W, int H, int D=3, int L=0)**
  Draw an 8-bit per color RGB or luminance image.
• void fl_draw_image (Fl_Draw_Image_Cb cb, void *data, int X, int Y, int W, int H, int D=3)
  Draw an image using a callback function to generate image data.

• void fl_draw_image_mono (const uchar *buf, int X, int Y, int W, int H, int D=1, int L=0)
  Draw a gray-scale (1 channel) image.

• void fl_draw_image_mono (Fl_Draw_Image_Cb cb, void *data, int X, int Y, int W, int H, int D=1)
  Draw a gray-scale image using a callback function to generate image data.

• int fl_draw_pixmap (const char *const *data, int x, int y, Fl_Color bg=FL_GRAY)
  Draw XPM image data, with the top-left corner at the given position.

• int fl_draw_pixmap (const char *const *data, int x, int y, int W, int H, Fl_Color bg=FLGRAY)
  Draw XPM image data, with the top-left corner at the given position.

• void fl_draw_radio (int x, int y, int d, Fl_Color color)
  Draw a round check mark (circle) of a radio button.

• int fl_draw_symbol (const char *label, int x, int y, int w, int h, Fl_Color)
  Draw the named symbol in the given rectangle using the given color.

• void fl_end_complex_polygon ()
  End complex filled polygon, and draw.

• void fl_end_line ()
  End list of lines, and draw.

• void fl_end_loop ()
  End closed sequence of lines, and draw.

• void fl_end_offscreen ()
  Quit sending drawing commands to the current offscreen buffer.

• void fl_end_points ()
  End list of points, and draw.

• void fl_end_polygon ()
  End convex filled polygon, and draw.

• const char * fl_expand_text (const char *from, char *buf, int maxbuf, double maxw, int &n, double &width, int wrap, int draw_symbols=0)
  Copy from to buf, replacing control characters with ^X.

• void fl_focus_rect (int x, int y, int w, int h)
  Draw a dotted rectangle, used to indicate keyboard focus on a widget.

• void fl_frame (const char *s, int x, int y, int w, int h)
  Draws a series of line segments around the given box.

• void fl_frame2 (const char *s, int x, int y, int w, int h)
  Draws a series of line segments around the given box.

• void fl_gap ()
  Separate loops of the path.

• void fl_line (int x, int y, int x1, int y1)
  Draw a line from (x,y) to (x1,y1)

• void fl_line (int x, int y, int x1, int y1, int x2, int y2)
  Draw a line from (x,y) to (x1,y1) and another from (x1,y1) to (x2,y2)

• void fl_line_style (int style, int width=0, char *dashes=0)
  Set how to draw lines (the “pen”).

• void fl_load_identity ()
  Set the transformation matrix to identity.

• void fl_load_matrix (double a, double b, double c, double d, double x, double y)
  Set the current transformation matrix.

• void fl_loop (int x, int y, int x1, int y1, int x2, int y2)
  Outline a 3-sided polygon with lines.

• void fl_loop (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
  Outline a 4-sided polygon with lines.
• void fl_measure (const char *str, int &x, int &y, int draw_symbols=1)
  Measure how wide and tall the string will be when printed by the fl_draw() function with align parameter.
• int fl_measure_pixmap (char *const *data, int &w, int &h)
  Get the dimensions of a pixmap.
• int fl_measure_pixmap (const char *const *cdata, int &w, int &h)
  Get the dimensions of a pixmap.
• void fl_multipart_matrix (double a, double b, double c, double d, double x, double y)
  Concatenate another transformation onto the current one.
• int fl_not_clipped (int x, int y, int w, int h)
  Does the rectangle intersect the current clip region?
• unsigned int fl_old_shortcut (const char *s)
  Emulation of XForms named shortcuts.
• void fl_overlay_clear ()
  Erase a selection rectangle without drawing a new one.
• void fl_overlay_rect (int x, int y, int w, int h)
  Draw a transient dotted selection rectangle.
• float fl_override_scale ()
  Removes any GUI scaling factor in subsequent drawing operations.
• void fl_pie (int x, int y, int w, int h, double a1, double a2)
  Draw filled ellipse sections using integer coordinates.
• void fl_point (int x, int y)
  Draw a single pixel at the given coordinates.
• void fl_polygon (int x, int y, int x1, int y1, int x2, int y2)
  Fill a 3-sided polygon.
• void fl_polygon (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
  Fill a 4-sided polygon.
• void fl_pop_clip ()
  Restore the previous clip region.
• void fl_pop_matrix ()
  Restore the current transformation matrix from the stack.
• void fl_push_clip (int x, int y, int w, int h)
  Intersect the current clip region with a rectangle and push this new region onto the stack.
• void fl_push_matix ()
  Save the current transformation matrix on the stack.
• void fl_push_no_clip ()
  Push an empty clip region onto the stack so nothing will be clipped.
• uchar *fl_read_image (uchar *p, int X, int Y , int W, int H, int alpha=0)
  Reads an RGB(A) image from the current window or off-screen buffer.
• void fl_rect (Fl_Rect r)
  Draw a border inside the given bounding box.
• void fl_rect (int x, int y, int w, int h)
  Draw a border inside the given bounding box.
• void fl_rect (int x, int y, int w, int h, Fl_Color c)
  Draw with passed color a border inside the given bounding box.
• void fl_rectf (Fl_Rect bb, uchar r, uchar g, uchar b)
  Color a rectangle with “exactly” the passed r, g, b color.
• void fl_rectf (Fl_Rect r)
  Color with current color a rectangle that exactly fills the given bounding box.
• void fl_rectf (Fl_Rect r, Fl_Color c)
  Color with passed color a rectangle that exactly fills the given bounding box.
• void fl_rectf (int x, int y, int w, int h)
Color with current color a rectangle that exactly fills the given bounding box.
• void fl_rectf (int x, int y, int w, int h, Fl_Color c)

Color with passed color a rectangle that exactly fills the given bounding box.
• void fl_rectf (int x, int y, int w, int h, uchar r, uchar g, uchar b)

Color a rectangle with "exactly" the passed r, g, b color.
• void fl_rescale_offscreen (Fl_Offscreen &ctx)

Adapts an offscreen buffer to a changed value of the scale factor.
• void fl_reset_spot (void)

Resets marked text.
• void fl_restore_clip ()

Undo any clobbering of the clip region done by your program.
• void fl_restore_scale (float s)

Restores the GUI scaling factor and the clipping region in subsequent drawing operations.
• void fl_rotate (double d)

Concatenate rotation transformation onto the current one.
• void fl_rounded_rect (int x, int y, int w, int h, int r)

Draw a rounded border inside the given bounding box.
• void fl_rounded_rectf (int x, int y, int w, int h, int r)

Color with current color a rounded rectangle that exactly fills the given bounding box.
• void fl_rtl_draw (const char *str, int n, int x, int y)

Draw a UTF-8 string of length n bytes right to left starting at the given x, y location.
• void fl_scale (double x)

Concatenate scaling transformation onto the current one.
• void fl_scale (double x, double y)

Concatenate scaling transformation onto the current one.
• void fl_scroll (int X, int Y, int W, int H, int dx, int dy, void(*draw_area)(void *, int, int, int, int), void *data)

Scroll a rectangle and draw the newly exposed portions.
• void fl_set_spot (int font, int size, int X, int Y, int W, int H, Fl_Window *win=0)

Inform text input methods about the current text insertion cursor.
• void fl_set_status (int X, int Y, int W, int H)

Related to text input methods under X11.
• const char * fl_shortcut_label (unsigned int shortcut)

Get a human-readable string from a shortcut value.
• const char * fl_shortcut_label (unsigned int shortcut, const char **eom)

Get a human-readable string from a shortcut value.
• double fl_transform_dx (double x, double y)

Transform distance using current transformation matrix.
• double fl_transform_dy (double x, double y)

Transform distance using current transformation matrix.
• double fl_transform_x (double x, double y)

Transform coordinate using the current transformation matrix.
• double fl_transform_y (double x, double y)

Transform coordinate using the current transformation matrix.
• void fl_transformed_vertex (double xf, double yf)

Add coordinate pair to the vertex list without further transformations.
• void fl_translate (double x, double y)

Concatenate translation transformation onto the current one.
• void fl_vertex (double x, double y)

Add a single vertex to the current path.
• void fl_xyline (int x, int y, int x1)

Draw a horizontal line from (x,y) to (x1,y).
• void fl_xyline (int x, int y, int x1, int y2)
  *Draw a horizontal line from \((x,y)\) to \((x1,y)\), then vertical from \((x1,y)\) to \((x1,y2)\).*

• void fl_xyline (int x, int y, int x1, int y2, int x3)
  *Draw a horizontal line from \((x,y)\) to \((x1,y)\), then a vertical from \((x1,y)\) to \((x1,y2)\) and then another horizontal from \((x1,y2)\) to \((x3,y2)\).*

• void fl_yxline (int x, int y, int y1)
  *Draw a vertical line from \((x,y)\) to \((x,y1)\)*

• void fl_yxline (int x, int y, int y1, int x2)
  *Draw a vertical line from \((x,y)\) to \((x,y1)\), then a horizontal from \((x,y1)\) to \((x2,y1)\).*

• void fl_yxline (int x, int y, int y1, int x2, int y3)
  *Draw a vertical line from \((x,y)\) to \((x,y1)\), then a horizontal from \((x,y1)\) to \((x2,y1)\), then another vertical from \((x2,y1)\) to \((x2,y3)\).*

33.7.1 Detailed Description

FLTK global graphics and GUI drawing functions.
These functions are declared in `<FL/fl_draw.H>`, and in `<FL/platform.H>` for offscreen buffer-related ones.

33.7.2 Enumeration Type Documentation

33.7.2.1 anonymous enum

anonymous enum

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_SOLID</td>
<td>line style: ________________</td>
</tr>
<tr>
<td>FL_DASH</td>
<td>line style: _ _ _ _ _ _ _ _</td>
</tr>
<tr>
<td>FL_DOT</td>
<td>line style: . . . . . . . .</td>
</tr>
<tr>
<td>FL_DASHDOT</td>
<td>line style: _ _ _ _ _ _ _ _</td>
</tr>
<tr>
<td>FL_DASHDOTDOT</td>
<td>line style: _ _ _ _ _ _ _ _ _ _ _</td>
</tr>
<tr>
<td>FL_CAP_FLAT</td>
<td>cap style: end is flat</td>
</tr>
<tr>
<td>FL_CAP_ROUND</td>
<td>cap style: end is round</td>
</tr>
<tr>
<td>FL_CAP_SQUARE</td>
<td>cap style: end wraps end point</td>
</tr>
<tr>
<td>FL_JOIN_MITER</td>
<td>join style: line join extends to a point</td>
</tr>
<tr>
<td>FL_JOIN_ROUND</td>
<td>join style: line join is rounded</td>
</tr>
<tr>
<td>FL_JOIN_BEVEL</td>
<td>join style: line join is tidied</td>
</tr>
</tbody>
</table>

33.7.3 Function Documentation

33.7.3.1 fl_add_symbol()

```c
int fl_add_symbol {
  const char * name,
  void(*) (Fl_Color) drawit,
  int scalable 
}
```

Adds a symbol to the system.
33.7 Drawing functions

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>name</th>
<th>name of symbol (without the &quot;@&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>drawit</td>
<td>function to draw symbol</td>
</tr>
<tr>
<td>in</td>
<td>scalable</td>
<td>set to 1 if drawit uses scalable vector drawing</td>
</tr>
</tbody>
</table>

Returns

1 on success, 0 on failure

33.7.3.2 fl_antialias()

void fl_antialias ( int state ) [inline]

Turn antialiased line drawings ON or OFF, if supported by platform. Currently, only the Windows platform allows to change whether line drawings are antialiased. Turning it OFF may accelerate heavy drawing operations.

33.7.3.3 fl_arc() [1/2]

void fl_arc ( double x, double y, double r, double start, double end ) [inline]

Add a series of points to the current path on the arc of a circle. You can get elliptical paths by using scale and rotate before calling fl_arc().

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>x,y,r</th>
<th>center and radius of circular arc</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>start,end</td>
<td>angles of start and end of arc measured in degrees counter-clockwise from 3 o’clock. If end is less than start then it draws the arc in a clockwise direction.</td>
</tr>
</tbody>
</table>

Examples:

![Figure 33.2 fl_arc(x,y,r,a1,a2)](image_url)

Generated by Doxygen
33.7.3.4 fl_arc() [2/2]

void fl_arc {
    int x,
    int y,
    int w,
    int h,
    double a1,
    double a2 ) [inline]

Draw ellipse sections using integer coordinates.
These functions match the rather limited circle drawing code provided by X and Windows. The advantage over using fl_arc with floating point coordinates is that they are faster because they often use the hardware, and they draw much nicer small circles, since the small sizes are often hard-coded bitmaps.
If a complete circle is drawn it will fit inside the passed bounding box. The two angles are measured in degrees counter-clockwise from 3 o’clock and are the starting and ending angle of the arc, \( a2 \) must be greater or equal to \( a1 \).
fl_arc() draws a series of lines to approximate the arc. Notice that the integer version of fl_arc() has a different number of arguments than the double version fl_arc(double x, double y, double r, double start, double end)

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>x,y,w,h</th>
<th>bounding box of complete circle</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>a1,a2</td>
<td>start and end angles of arc measured in degrees counter-clockwise from 3 o’clock. ( a2 ) must be greater than or equal to ( a1 ).</td>
</tr>
</tbody>
</table>

Figure 33.3 fl_pie() and fl_arc()
Note
For portability, you should only draw polygons that appear the same whether "even/odd" or "non-zero" winding rules are used to fill them. Holes should be drawn in the opposite direction to the outside loop.

33.7.3.6 fl_begin_offscreen()

```c
void fl_begin_offscreen ( Fl_Offscreen ctx )
```
Send all subsequent drawing commands to this offscreen buffer.

Parameters
- `ctx` the offscreen buffer.

Note
The `ctx` argument must have been created by `fl_create_offscreen()`.

33.7.3.7 fl_begin_points()

```c
void fl_begin_points ( ) [inline]
```
Start drawing a list of points.
Points are added to the list with `fl_vertex()`.

33.7.3.8 fl_can_do_alpha_blending()

```c
char fl_can_do_alpha_blending ( ) [inline]
```
Check whether platform supports true alpha blending for RGBA images.

Returns
- 1 if true alpha blending supported by platform
- 0 not supported so FLTK will use screen door transparency

33.7.3.9 fl_capture_window()

```c
Fl_RGB_Image * fl_capture_window ( Fl_Window * win, int x, int y, int w, int h )
```
Captures the content of a rectangular zone of a mapped window.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>win</code></td>
<td>a mapped <code>Fl_Window</code> (derived types including <code>Fl_Gl_Window</code> are also possible)</td>
</tr>
<tr>
<td><code>x,y,w,h</code></td>
<td>window area to be captured. Intersecting sub-windows are captured too.</td>
</tr>
</tbody>
</table>

Returns
The captured pixels as an `Fl_RGB_Image`. The raw and drawing sizes of the image can differ. Returns NULL when capture was not successful. The image depth may differ between platforms.
33.7.3.10  fl_circle()

```
void fl_circle (  
    double x,  
    double y,  
    double r  ) [inline]

fl_circle(x,y,r) is equivalent to fl_arc(x,y,r,0,360), but may be faster.
```

Parameters

```
in x,y,r  center and radius of circle
```

Note

fl_circle() is best used as part of the Drawing Complex Shapes API, that is, flanked by fl_begin_XXX() and fl_end_XXX() calls where XXX can be 'loop' or 'polygon' to draw, respectively a circle or a disk. Transformation functions (e.g., fl_scale(double, double)) can be also used for fl_circle() to draw empty of filled ellipses. It must be the only thing in the path: if you want a circle as part of a complex polygon you must use fl_arc(). Nevertheless, fl_circle() can also be used by itself to draw circles.

33.7.3.11  fl_clip()

```
void fl_clip (  
    int x,  
    int y,  
    int w,  
    int h  ) [inline]

Intersect the current clip region with a rectangle and push this new region onto the stack (deprecated).
```

Parameters

```
in x,y,w,h  position and size
```

**Deprecated** Please use fl_push_clip(int x, int y, int w, int h) instead. fl_clip(int, int, int) will be removed in FLTK 1.5.

33.7.3.12  fl_clip_box()

```
int fl_clip_box (  
    int x,  
    int y,  
    int w,  
    int h,  
    int & X,  
    int & Y,  
    int & W,  
    int & H  ) [inline]

Intersect a rectangle with the current clip region and return the bounding box of the result.
```
Returns non-zero if the resulting rectangle is different to the original. The given rectangle \((x, y, w, h)\) should be entirely inside its window, otherwise the result may be unexpected, i.e. this function may not clip the rectangle to the window coordinates and size. In particular \(x\) and \(y\) should not be negative.

The resulting bounding box can be used to limit the necessary drawing to this rectangle.

Example:
```c
void MyGroup::draw() {
    int X = 0, Y = 0, W = 0, H = 0;
    int ret = fl_clip_box(x(), y(), w(), h(), X, Y, W, H);
    if (ret == 0) { // entire group is visible (not clipped)
        // full drawing code here
    } else { // parts of this group are clipped
        // partial drawing code here (uses X, Y, W, and H to test)
    }
}
```

\(w\) and \(h\) are set to zero if the rectangle is completely outside the clipping region. In this case \(X\) and \(Y\) are undefined and should not be used. Possible values are \((0, 0)\), \((x, y)\), or anything else (platform dependent).

Note
This function is platform-dependent. If the given rectangle is not entirely inside the window, the results are not guaranteed to be the same on all platforms.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>(x, y, w, h)</th>
<th>position and size of rectangle</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>(X, Y, W, H)</td>
<td>position and size of resulting bounding box.</td>
</tr>
</tbody>
</table>

Returns
Non-zero if the resulting rectangle is different to the original.

See also
`fl_not_clipped()`

### 33.7.3.13 fl_clip_region() [1/2]

Fl_Region fl_clip_region ( ) [inline]

Return the current clipping region.

Note
This function is mostly intended for internal use by the FLTK library when drawing to the display. Its return value can be always NULL if the current drawing surface is not the display.

### 33.7.3.14 fl_clip_region() [2/2]

void fl_clip_region ( Fl_Region r ) [inline]

Replace the top of the clipping stack with a clipping region of any shape.
Fl_Region is an operating system specific type.

Note
This function is mostly intended for internal use by the FLTK library when drawing to the display. Its effect can be null if the current drawing surface is not the display.
33.7.3.15 fl_copy_offscreen()

```c
void fl_copy_offscreen (  
    int x,  
    int y,  
    int w,  
    int h,  
    Fl_Offscreen pixmap,  
    int srcx,  
    int srcy ) [inline]
```

Copy a rectangular area of the given offscreen buffer into the current drawing destination.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x,y</td>
<td>position where to draw the copied rectangle</td>
</tr>
<tr>
<td>w,h</td>
<td>size of the copied rectangle</td>
</tr>
<tr>
<td>pixmap</td>
<td>offscreen buffer containing the rectangle to copy</td>
</tr>
<tr>
<td>srcx,srcy</td>
<td>origin in offscreen buffer of rectangle to copy</td>
</tr>
</tbody>
</table>

33.7.3.16 fl_create_offscreen()

```c
Fl_Offscreen fl_create_offscreen (  
    int w,  
    int h )
```

Creation of an offscreen graphics buffer.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>w,h</td>
<td>width and height in FLTK units of the buffer.</td>
</tr>
</tbody>
</table>

Returns

the created graphics buffer.

The pixel size of the created graphics buffer is equal to the number of pixels in an area of the screen containing the current window sized at w,h FLTK units. This pixel size varies with the value of the scale factor of this screen.

Note

Work with the fl_XXX_offscreen() functions is equivalent to work with an Fl_Image_Surface object, as follows:

<table>
<thead>
<tr>
<th>Fl_Offscreen-based approach</th>
<th>Fl_Image_Surface-based approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fl_Offscreen off = fl_create_offscreen(w, h)</td>
<td>Fl_Image_Surface *surface = new Fl_Image_Surface(w, h, 1)</td>
</tr>
<tr>
<td>fl_begin_offscreen(off)</td>
<td>Fl_Surface_Device::push_current(surface)</td>
</tr>
<tr>
<td>fl_end_offscreen()</td>
<td>Fl_Surface_Device::pop_current()</td>
</tr>
<tr>
<td>fl_copy_offscreen(x,y,w,h, off, sx,sy)</td>
<td>fl_copy_offscreen(x,y,w,h, surface-&gt;offscreen(), sx,sy)</td>
</tr>
<tr>
<td>fl_rescale_offscreen(off)</td>
<td>surface-&gt;rescale()</td>
</tr>
<tr>
<td>fl_delete_offscreen(off)</td>
<td>delete surface</td>
</tr>
</tbody>
</table>
33.7.3.17 fl_cursor()

```c
void fl_cursor (Fl_Cursor c)
```

Sets the cursor for the current window to the specified shape and colors. The cursors are defined in the `<FL/Enumerations.H>` header file.

33.7.3.18 fl_curve()

```c
void fl_curve (double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3) [inline]
```

Add a series of points on a Bézier curve to the path. The curve ends (and two of the points) are at X0,Y0 and X3,Y3.

Parameters

| in | X0,Y0 | curve start point |
| in | X1,Y1 | curve control point |
| in | X2,Y2 | curve control point |
| in | X3,Y3 | curve end point |

33.7.3.19 fl_delete_offscreen()

```c
void fl_delete_offscreen (Fl_Offscreen ctx)
```

Deletion of an offscreen graphics buffer.

Parameters

| ctx | the buffer to be deleted |

Note

The `ctx` argument must have been created by `fl_create_offscreen()`.

33.7.3.20 fl_draw() (1/4)

```c
void fl_draw (const char * str, int x, int y)
```

Draw a nul-terminated UTF-8 string starting at the given x, y location. Text is aligned to the left and to the baseline of the font. To align to the bottom, subtract `fl_descent()` from y. To align to the top, subtract `fl_descent()` and add `fl_height()`. This version of fl_draw provides direct access to the text drawing function of the underlying OS. It does not apply any special handling to control characters.
### 33.7.3.21 fl_draw() [2/4]

```c
void fl_draw ( 
    const char * str, 
    int x, 
    int y, 
    int w, 
    int h, 
    Fl_Align align, 
    Fl_Image * img, 
    int draw_symbols )
```

Fancy string drawing function which is used to draw all the labels.
The string is formatted and aligned inside the passed box. Handles 't' and 'n', expands all other control characters to 'X', and aligns inside or against the edges of the box. See Fl_Widget::align() for values of align. The value FL_ALIGN_INSIDE is ignored, as this function always prints inside the box. If img is provided and is not NULL, the image is drawn above or below the text as specified by the align value. The draw_symbols argument specifies whether or not to look for symbol names starting with the '@' character.

### 33.7.3.22 fl_draw() [3/4]

```c
void fl_draw ( 
    int angle, 
    const char * str, 
    int n, 
    int x, 
    int y ) [inline]
```

Draw at the given x, y location a UTF-8 string of length n bytes rotating angle degrees counter-clockwise.

**Note**
When using X11 (Unix, Linux, Cygwin et al.) this needs Xft to work. Under plain X11 (w/o Xft) rotated text is not supported by FLTK. A warning will be issued to stderr at runtime (only once) if you use this method with an angle other than 0.

### 33.7.3.23 fl_draw() [4/4]

```c
void fl_draw ( 
    int angle, 
    const char * str, 
    int x, 
    int y )
```

Draw a nul-terminated UTF-8 string starting at the given x, y location and rotating angle degrees counter-clockwise.

This version of fl_draw provides direct access to the text drawing function of the underlying OS and is supported by all fltk platforms except X11 without Xft.

### 33.7.3.24 fl_draw_arrow()

```c
void fl_draw_arrow ( 
    Fl_Rect r, 
    Fl_Arrow_Type t, 
    Fl_Orientation o, 
    Fl_Color col )
```

Draw an "arrow like" GUI element for the selected scheme.
In the future this function should be integrated in Fl_Scheme as a virtual method, i.e. it would call a method like...

```c
Fl_Scheme::current()->draw_arrow(r, t, o, col);
```
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>r</th>
<th>bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>t</td>
<td>arrow type</td>
</tr>
<tr>
<td>in</td>
<td>o</td>
<td>orientation</td>
</tr>
<tr>
<td>in</td>
<td>col</td>
<td>arrow color</td>
</tr>
</tbody>
</table>

Since

1.4.0

33.7.3.25  fl_draw_box()

```c
void fl_draw_box (  
    Fl_Boxtype t,  
    int x,  
    int y,  
    int w,  
    int h,  
    Fl_Color c )
```

Draws a box using given type, position, size and color.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>box type</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x, y, w, h</td>
<td>position and size</td>
</tr>
<tr>
<td>in</td>
<td>col</td>
<td>color</td>
</tr>
</tbody>
</table>

33.7.3.26  fl_draw_check()

```c
void fl_draw_check (  
    Fl_Rect bb,  
    Fl_Color col )
```

Draws a check mark inside the given bounding box.

The check mark is allowed to fill the entire box but the algorithm used makes sure that a 1-pixel border is kept free if the box is large enough. You need to calculate margins for box borders etc. yourself.

The check mark size is limited (minimum and maximum size) and the check mark is always centered in the given box.

Note

If the box is too small (bad GUI design) the check mark will be drawn over the box borders. This is intentional for better user experience. Otherwise users might not be able to recognize if a box is checked.

The size limits are implementation details and may be changed at any time.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>bb</th>
<th>rectangle that defines the bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>col</td>
<td>Fl_Color to draw the check mark</td>
</tr>
</tbody>
</table>
Since 1.4.0

33.7.3.27  fl_draw_circle()

    void fl_draw_circle (    
        int x,                 
        int y,                 
        int d,                 
        Fl_Color color         
    )

Draw a potentially small, filled circle using a given color.
This function draws a filled circle bounded by rectangle \((x, y, d, d)\) using color \(\text{color}\)
This function is the same as \(\text{fl_pie}(x, y, d, d, 0, 360)\) except with some systems that don't draw small circles well. In that situation, the circle diameter \(d\) is converted from FLTK units to pixels and this function approximates a filled circle by drawing several filled rectangles if the converted diameter is 6 pixels.
The current drawing color \(\text{fl_color}()\) is preserved across the call.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>(x, y)</th>
<th>coordinates of top left of the bounding box</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>(d)</td>
<td>diameter == width and height of the bounding box in FLTK units</td>
</tr>
<tr>
<td>in</td>
<td>(\text{color})</td>
<td>the color used to draw the circle</td>
</tr>
</tbody>
</table>

Since 1.4.0

33.7.3.28  fl_draw_image() [1/2]

    void fl_draw_image (    
        const uchar * buf, 
        int X,               
        int Y,               
        int W,               
        int H,               
        int D = 3,           
        int L = 0             
    ) [inline]

Draw an 8-bit per color RGB or luminance image.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>(\text{buf})</th>
<th>points at the &quot;r&quot; data of the top-left pixel. Color data must be in (r, g, b) order. Luminance data is only one gray byte.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>(X, Y)</td>
<td>position where to put top-left corner of image</td>
</tr>
<tr>
<td>in</td>
<td>(W, H)</td>
<td>size of the image</td>
</tr>
<tr>
<td>in</td>
<td>(D)</td>
<td>delta to add to the pointer between pixels. It may be any value greater than or equal to 1, or it can be negative to flip the image horizontally</td>
</tr>
<tr>
<td>in</td>
<td>(L)</td>
<td>delta to add to the pointer between lines (if 0 is passed it uses (W \times D)), and may be larger than (W \times D) to crop data, or negative to flip the image vertically</td>
</tr>
</tbody>
</table>

It is highly recommended that you put the following code before the first \(\text{show()}\) of any window in your program to get rid of the dithering if possible:

\[
\text{Fl::visual(FL_RGB);} 
\]
Gray scale (1-channel) images may be drawn. This is done if \( \text{abs}(D) \) is less than 3, or by calling \texttt{fl_draw_image_mono()}. Only one 8-bit sample is used for each pixel, and on screens with different numbers of bits for red, green, and blue only gray colors are used. Setting \( D \) greater than 1 will let you display one channel of a color image.

Note: The X version does not support all possible visuals. If FLTK cannot draw the image in the current visual it will abort. FLTK supports any visual of 8 bits or less, and all common TrueColor visuals up to 32 bits.

### 33.7.3.29 \texttt{fl_draw_image()} [2/2]

```c
void fl_draw_image ( Fl_Draw_Image_Cb cb, 
                   void * data, 
                   int X, 
                   int Y, 
                   int W, 
                   int H, 
                   int D = 3 ) [inline]
```

Draw an image using a callback function to generate image data.
You can generate the image as it is being drawn, or do arbitrary decompression of stored data, provided it can be decompressed to individual scan lines.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\texttt{cb}</td>
<td>callback function to generate scan line data</td>
</tr>
<tr>
<td>\texttt{data}</td>
<td>user data passed to callback function</td>
</tr>
<tr>
<td>\texttt{X,Y}</td>
<td>screen position of top left pixel</td>
</tr>
<tr>
<td>\texttt{W,H}</td>
<td>image width and height</td>
</tr>
<tr>
<td>\texttt{D}</td>
<td>data size per pixel in bytes (must be greater than 0)</td>
</tr>
</tbody>
</table>

See also

\texttt{fl_draw_image(const uchar * buf, int X, int Y, int W, int H, int D, int L)}

The callback function \texttt{cb} is called with the \texttt{void* data} user data pointer to allow access to a structure of information about the image, and the \( x, y, \) and \( w \) of the scan line desired from the image. \( 0,0 \) is the upper-left corner of the image, not \( x, y \). A pointer to a buffer to put the data into is passed. You must copy \( w \) pixels from scanline \( y \), starting at pixel \( x \), to this buffer.

Due to cropping, less than the whole image may be requested. So \( x \) may be greater than zero, the first \( y \) may be greater than zero, and \( w \) may be less than \( W \). The buffer is long enough to store the entire \( W \times D \) pixels, this is for convenience with some decompression schemes where you must decompress the entire line at once: decompress it into the buffer, and then if \( x \) is not zero, copy the data over so the \( x \)’th pixel is at the start of the buffer.
You can assume the \( y \)’s will be consecutive, except the first one may be greater than zero.
If \( D \) is 4 or more, you must fill in the unused bytes with zero.

### 33.7.3.30 \texttt{fl_draw_image_mono()} [1/2]

```c
void fl_draw_image_mono ( const uchar * buf, 
                          int X, 
                          int Y, 
                          int W, 
                          int H, 
                          int D = 1, 
                          int L = 0 ) [inline]
```

Draw a gray-scale (1 channel) image.
See also

\[
\text{fl\_draw\_image}(\text{const} \text{ uchar}^* \text{ buf}, \text{int} \text{ X, int Y, int W, int H, int D, int L})
\]

### 33.7.3.31 \text{fl\_draw\_image\_mono()} [2/2]

\[
\text{void fl\_draw\_image\_mono} (\text{ Fl\_Draw\_Image\_Cb cb, void}^* \text{ data, int X, int Y, int W, int H, int D = 1}) \text{ [inline]}
\]

Draw a gray-scale image using a callback function to generate image data.

See also

\[
\text{fl\_draw\_image}(\text{Fl\_Draw\_Image\_Cb cb, void}^* \text{ data, int X, int Y, int W, int H, int D})
\]

### 33.7.3.32 \text{fl\_draw\_pixmap()} [1/2]

\[
\text{int fl\_draw\_pixmap} (\text{char}^* \text{ const}^* \text{ data, int x, int y, Fl\_Color bg = FL\_GRAY}) \text{ [inline]}
\]

Draw XPM image data, with the top-left corner at the given position.

See also

\[
\text{fl\_draw\_pixmap}(\text{const char}^* \text{ const}^* \text{ data, int x, int y, Fl\_Color bg})
\]

### 33.7.3.33 \text{fl\_draw\_pixmap()} [2/2]

\[
\text{int fl\_draw\_pixmap} (\text{const char}^* \text{ const}^* \text{ data, int x, int y, Fl\_Color bg = FL\_GRAY})
\]

Draw XPM image data, with the top-left corner at the given position.
The image is dithered on 8-bit displays so you won't lose color space for programs displaying both images and pixmaps.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>data</th>
<th>pointer to XPM image data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x,y</td>
<td>position of top-left corner</td>
</tr>
<tr>
<td>in</td>
<td>bg</td>
<td>background color</td>
</tr>
</tbody>
</table>

**Returns**

0 if there was any error decoding the XPM data.
33.7.3.34  fl_draw_radio()

void fl_draw_radio (  
  int x,  
  int y,  
  int d,  
  Fl_Color color  )

Draw a round check mark (circle) of a radio button.
This draws only the round "radio button mark", it does not draw the (also typically round) box of the radio button.
Call this only if the radio button is ON.
This method draws a scheme specific "circle" with a particular light effect if the scheme is gtk+. For all other schemes
this function draws a simple, small circle.
The color must be chosen by the caller so it has enough contrast with the background.
The bounding box of the circle is the rectangle \((x, y, d, d)\).
The current drawing color \(\text{fl_color()}\) is preserved across the call.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x, y)</td>
<td>coordinates of top left of the bounding box</td>
</tr>
<tr>
<td>(d)</td>
<td>diameter == width and height of the bounding box in FLTK units</td>
</tr>
<tr>
<td>(color)</td>
<td>the base color used to draw the circle</td>
</tr>
</tbody>
</table>

Since

1.4.0

33.7.3.35  fl_draw_symbol()

int fl_draw_symbol (  
  const char * label,  
  int x,  
  int y,  
  int w,  
  int h,  
  Fl_Color col  )

Draw the named symbol in the given rectangle using the given color.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(label)</td>
<td>name of symbol</td>
</tr>
<tr>
<td>(x, y)</td>
<td>position of symbol</td>
</tr>
<tr>
<td>(w, h)</td>
<td>size of symbol</td>
</tr>
<tr>
<td>(col)</td>
<td>color of symbox</td>
</tr>
</tbody>
</table>

Returns

1 on success, 0 on failure

33.7.3.36  fl_expand_text()

const char * fl_expand_text (  
  const char * from,  
  char * buf,  
  int maxbuf,  
  ...
double maxw,
int & n,
double & width,
int wrap,
int draw_symbols )

Copy from to buf, replacing control characters with \^X.
Stop at a newline or if maxbuf characters written to buffer. Also word-wrap if width exceeds maxw. Returns a
pointer to the start of the next line of characters. Sets n to the number of characters put into the buffer. Sets width
to the width of the string in the current font.

33.7.3.37  fl_focus_rect()

void fl_focus_rect (  
    int x,
    int y,
    int w,
    int h )  [inline]

Draw a dotted rectangle, used to indicate keyboard focus on a widget.
This method draws the rectangle in the current color and independent of the Fl::visible_focus() option. You may
need to set the current color with fl_color() before you call this.

33.7.3.38  fl_frame()

void fl_frame (  
    const char * s,
    int x,
    int y,
    int w,
    int h )

Draws a series of line segments around the given box.
The string s must contain groups of 4 letters which specify one of 24 standard grayscale values, where 'A' is black
and 'X' is white. The order of each set of 4 characters is: top, left, bottom, right. The result of calling fl_frame() with
a string that is not a multiple of 4 characters in length is undefined. The only difference between this function and
fl_frame2() is the order of the line segments.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>s</th>
<th>sets of 4 grayscale values in top, left, bottom, right order</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x,y,w,h</td>
<td>position and size</td>
</tr>
</tbody>
</table>

33.7.3.39  fl_frame2()

void fl_frame2 (  
    const char * s,
    int x,
    int y,
    int w,
    int h )

Draws a series of line segments around the given box.
The string s must contain groups of 4 letters which specify one of 24 standard grayscale values, where 'A' is black
and 'X' is white. The order of each set of 4 characters is: bottom, right, top, left. The result of calling fl_frame2() with
a string that is not a multiple of 4 characters in length is undefined. The only difference between this function and
fl_frame() is the order of the line segments.

Parameters

| in | s | sets of 4 grayscale values in bottom, right, top, left order |
33.7 Drawing functions

Parameters

| in | \(x,y,w,h\) | position and size |

33.7.3.40 fl_gap()

```c
void fl_gap ( ) [inline]
```

Separate loops of the path.
It is unnecessary but harmless to call fl_gap() before the first vertex, after the last vertex, or several times in a row.

33.7.3.41 fl_line_style()

```c
void fl_line_style ( 
    int style,
    int width = 0,
    char * dashes = 0 ) [inline]
```

Set how to draw lines (the "pen").
If you change this it is your responsibility to set it back to the default using fl_line_style(0).

Parameters

| in | style | A bitmask which is a bitwise-OR of a line style, a cap style, and a join style. If you don't specify a dash type you will get a solid line. If you don't specify a cap or join type you will get a system-defined default of whatever value is fastest. |
| in | width | The thickness of the lines in pixels. Zero results in the system defined default, which on both X and Windows is somewhat different and nicer than 1. |
| in | dashes | A pointer to an array of dash lengths, measured in pixels. The first location is how long to draw a solid portion, the next is how long to draw the gap, then the solid, etc. It is terminated with a zero-length entry. A NULL pointer or a zero-length array results in a solid line. Odd array sizes are not supported and result in undefined behavior. |

Note

Because of how line styles are implemented on Win32 systems, you must set the line style after setting the drawing color. If you set the color after the line style you will lose the line style settings.

The dashes array does not work under the (unsupported!) operating systems Windows 95, 98 or Me, since those operating systems do not support complex line styles.

33.7.3.42 fl_load_matrix()

```c
void fl_load_matrix ( 
    double a,
    double b,
    double c,
    double d,
    double x,
    double y ) [inline]
```

Set the current transformation matrix.

Parameters

| in | \(a,b,c,d,x,y\) | transformation matrix elements |
33.7.3.43 fl_measure()

```c
void fl_measure (  
    const char * str,  
    int & w,           
    int & h,           
    int draw_symbols )
```

Measure how wide and tall the string will be when printed by the `fl_draw()` function with `align` parameter. If the incoming `w` is non-zero it will wrap to that width.

The current font is used to do the width/height calculations, so unless its value is known at the time `fl_measure()` is called, it is advised to first set the current font with `fl_font()`. With event-driven GUI programming you can never be sure which widget was exposed and redrawn last, nor which font it used. If you have not called `fl_font()` explicitly in your own code, the width and height may be set to unexpected values, even zero!

**Note:** In the general use case, it’s a common error to forget to set `w` to 0 before calling `fl_measure()` when wrap behavior isn’t needed.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>str</th>
<th>nul-terminated string</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>w,h</td>
<td>width and height of string in current font</td>
</tr>
<tr>
<td>in</td>
<td>draw_symbols</td>
<td>non-zero to enable @symbol handling [default=1]</td>
</tr>
</tbody>
</table>

// Example: Common use case for `fl_measure()
```c
const char *s = "This is a test";
int wi=0, hi=0;  // initialize to zero before calling `fl_measure()
fl_font(FL_HELVETICA, 14);  // set current font face/size to be used for measuring
fl_measure(s, wi, hi);  // returns pixel width/height of string in current font
```

33.7.3.44 fl_measure_pixmap() [1/2]

```c
int fl_measure_pixmap (  
    char *const * data,  
    int & w,  
    int & h )
```

Get the dimensions of a pixmap.

An XPM image contains the dimensions in its data. This function returns the width and height.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>data</th>
<th>pointer to XPM image data.</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>w,h</td>
<td>width and height of image</td>
</tr>
</tbody>
</table>

**Returns**

- non-zero if the dimensions were parsed OK
- 0 if there were any problems

33.7.3.45 fl_measure_pixmap() [2/2]

```c
int fl_measure_pixmap (  
    char *const * cdata,  
    int & w,  
    int & h )
```

Get the dimensions of a pixmap.
See also

\texttt{fl\_measure\_ pixmap(char* const data, int \&w, int \&h)}

### 33.7.3.46 fl\_mult\_matrix()

```c
void fl\_mult\_matrix (  
double a,  
double b,  
double c,  
double d,  
double x,  
double y )  \[\text{inline}\]
```

Concatenate another transformation onto the current one.

**Parameters**

| in   | a,b,c,d,x,y | transformation matrix elements such that \(X' = aX + cY + x\) and \(Y' = bX + dY + y\) |

### 33.7.3.47 fl\_not\_clipped()

```c
int fl\_not\_clipped (  
int x,  
int y,  
int w,  
int h )  \[\text{inline}\]
```

Does the rectangle intersect the current clip region?

**Parameters**

| in   | x,y,w,h | position and size of rectangle |

**Returns**

- non-zero if any of the rectangle intersects the current clip region. If this returns 0 you don't have to draw the object.

**Note**

- Under X this returns 2 if the rectangle is partially clipped and 1 if it is entirely inside the clip region.

See also

\texttt{fl\_clip\_box()}

### 33.7.3.48 fl\_old\_shortcut()

```c
unsigned int fl\_old\_shortcut (  
const char * s )
```

Emulation of XForms named shortcuts.

Converts ASCII shortcut specifications (eg. "\^c") into the FLTK integer equivalent (eg. FL_CTRL+\'c\')

These ASCII characters are used to specify the various keyboard modifier keys:
These special characters can be combined to form chords of modifier keys. (See 'Remarks' below)

Examples:

```
"c" -- Uses 'c' as the shortcut
"#c" -- Same as FL_ALT|FL_CTRL|'c'
"^c" -- Same as FL_ALT|FL_CTRL|FL_META|'c'
"&c" -- Same as FL_COMMAND|'c' (see FL_COMMAND for platform specific behavior)
"0x63" -- Same as "c" (hex 63=='c')
"99" -- Same as "c" (dec 99=='c')
"0143" -- Same as "c" (octal 0143=='c')
"0x63" -- Same as (FL_CTRL|'c'), or (FL_CTRL|0x63)
"99" -- Same as (FL_CTRL|'c'), or (FL_CTRL|99)
"0143" -- Same as (FL_CTRL|'c'), or (FL_CTRL|0143)
```

Remarks

Due to XForms legacy, there are some odd things to consider when using the modifier characters.

1. You can use the special modifier keys for chords only if the modifiers are provided in this order: #, +, ^, !, @. Other ordering can yield undefined results.

So for instance, Ctrl-Alt-c must be specified as "#^c" (and not "^#c"), due to the above ordering rule.

2. If you want to make a shortcut that uses one of the special modifier characters (as the character being modified), then to avoid confusion, specify the numeric equivalent, e.g.

<table>
<thead>
<tr>
<th>If you want...</th>
<th>Then use...</th>
</tr>
</thead>
<tbody>
<tr>
<td>'}' as the shortcut..</td>
<td>&quot;0x23&quot; (instead of just &quot;)&quot;).</td>
</tr>
<tr>
<td>'+' as the shortcut..</td>
<td>&quot;0x2b&quot; (instead of just &quot;+&quot;)..</td>
</tr>
<tr>
<td>Alt-^ as the shortcut..</td>
<td>&quot;0x5c&quot; (instead of &quot;+&quot;)..</td>
</tr>
</tbody>
</table>

As a general rule that's easy to remember, unless the shortcut key to be modified is a single alpha-numeric character [A-Z,a-z,0-9], it's probably best to use the numeric equivalents.

Don't fix these silly legacy issues in a future release. Nobody is using this anymore.

### 33.7.3.49 fl_overlay_clear()

void fl_overlay_clear ( )

Erase a selection rectangle without drawing a new one.

See also

fl_overlay_rect(int x, int y, int w, int h)

### 33.7.3.50 fl_overlay_rect()

void fl_overlay_rect ( int x, int y, int w, int h )
Draw a transient dotted selection rectangle.
This function saves the current screen content and then draws a dotted selection rectangle into the front screen buffer. If another selection rectangle was drawn earlier, the previous screen graphics are restored first.

To clear the selection rectangle, call \texttt{fl\_overlay\_clear()}.
The typical (and only) use for this function is to draw a selection rectangle during a mouse drag event sequence without having to redraw the entire content of the widget.

Your event handle should look similar to this (also see \texttt{test/mandelbrot.cxx}):

\begin{verbatim}
int MyWidget::handle(int event) {
    static int ix, iy;
    switch (event) {
    case FL_PUSH:
        ix = Fl::event_x(); iy = Fl::event_y();
        return 1;
    case FL_DRAG:
        this->make_current();
        fl_overlay_rect(ix, iy, ix-Fl::event_x(), iy-Fl::event_y());
        return 1;
    case FL_RELEASE:
        this->make_current();
        fl_overlay_clear();
        \hfill // select the element under the rectangle
        return 1;
    }
    return MySuperWidget::handle(event);
}
\end{verbatim}

\textbf{Note}

Between drawing an overlay rect and clearing it, the content of the widget must not change.

\texttt{fl\_overlay\_rect()} and \texttt{fl\_overlay\_clear()} should be called when the actual event occurs, and not within \texttt{MySuperWidget::draw()}.

\texttt{fl\_overlay\_rect()} and \texttt{fl\_overlay\_clear()} should not be mixed with \texttt{Fl\_Overlay\_Window}. \texttt{Fl\_Overlay\_Window} provides an entirely different way of drawing selection outlines and is not limited to rectangles.

\textbf{Parameters}

\begin{tabular}{|c|c|}
\hline
\texttt{x,y,w,h} & position and size of the overlay rectangle. \\
\hline
\end{tabular}

\textbf{See also}

\texttt{fl\_overlay\_clear()}

\subsection{33.7.3.51 fl\_override\_scale()}

\begin{verbatim}
float fl\_override\_scale ( )
\end{verbatim}

Removes any GUI scaling factor in subsequent drawing operations.
This must be matched by a later call to \texttt{fl\_restore\_scale()}. This function can be used to transiently perform drawing operations that are not rescaled by the current value of the GUI scaling factor. The resulting drawing context has no clipping region.

\textbf{Returns}

The GUI scaling factor value that was in place when the function started.

\subsection{33.7.3.52 fl\_pie()}

\begin{verbatim}
void fl\_pie ( 
    int x, 
    int y, 
    int w, 
    int h,
\end{verbatim}

\hfill Generated by Doxygen
Draw filled ellipse sections using integer coordinates. Like `fl_arc()`, but `fl_pie()` draws a filled-in pie slice. This slice may extend outside the line drawn by `fl_arc()`; to avoid this use `w - 1` and `h - 1`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x, y, w, h</th>
<th>bounding box of complete circle</th>
</tr>
</thead>
</table>

| in | a1, a2  | start and end angles of arc measured in degrees counter-clockwise from 3 o'clock. a2 must be greater than or equal to a1. |

**Figure 33.4 fl_pie() and fl_arc()**

### 33.7.3.53 fl_polygon() [1/2]

```c
void fl_polygon (  
    int x,  
    int y,  
    int x1,  
    int y1,  
    int x2,  
    int y2 ) [inline]
```

Fill a 3-sided polygon.
The polygon must be convex.

### 33.7.3.54 fl_polygon() [2/2]

```c
void fl_polygon (  
    int x,  
    int y,  
    int x1,  
    int y1,  
    int x2,  
    int y2,  
    int x3,  
    int y3 ) [inline]
```

Fill a 4-sided polygon.
The polygon must be convex.

### 33.7.3.55 fl_pop_clip()

```c
void fl_pop_clip ( ) [inline]
```

Restore the previous clip region.
You must call `fl_pop_clip()` once for every time you call `fl_push_clip()`. Unpredictable results may occur if the clip stack is not empty when you return to FLTK.
33.7 Drawing functions

33.7.36 fl_push_clip()

```c
void fl_push_clip (  
  int x,  
  int y,  
  int w,  
  int h ) [inline]
```

Intersect the current clip region with a rectangle and push this new region onto the stack.

Parameters

| in | x,y,w,h | position and size |

33.7.37 fl_push_matrix()

```c
void fl_push_matrix ( ) [inline]
```

Save the current transformation matrix on the stack. The maximum depth of the stack is 32.

33.7.38 fl_read_image()

```c
uchar * fl_read_image (  
  uchar * p,  
  int X,  
  int Y,  
  int w,  
  int h,  
  int alpha )
```

Reads an RGB(A) image from the current window or off-screen buffer.

Parameters

| in | p | pixel buffer, or NULL to allocate one |
| in | X,Y | position of top-left of image to read |
| in | w,h | width and height of image to read |
| in | alpha | alpha value for image (0 for none) |

Returns

pointer to pixel buffer, or NULL if allocation failed.

The `p` argument points to a buffer that can hold the image and must be at least `w*h*3` bytes when reading RGB images, or `w*h*4` bytes when reading RGBA images. If NULL, `fl_read_image()` will create an array of the proper size which can be freed using `delete[]`.

The `alpha` parameter controls whether an alpha channel is created and the value that is placed in the alpha channel. If 0, no alpha channel is generated.

See also

`fl_capture_window()`

33.7.39 fl_rect() [1/3]

```c
void fl_rect (  
  Fl_Rect r ) [inline]
```

Draw a border inside the given bounding box.

This is the same as `fl_rect(int x, int y, int w, int h)` but with `Fl_Rect r` as input argument.
### 33.7.3.60 fl_rect() [2/3]

```c
void fl_rect (int x, int y, int w, int h) [inline]
```

Draw a **border inside** the given bounding box. This function is meant for quick drawing of simple boxes. The behavior is undefined for line widths that are not 1.

### 33.7.3.61 fl_rect() [3/3]

```c
void fl_rect (int x, int y, int w, int h, Fl_Color c) [inline]
```

Draw with passed color a **border inside** the given bounding box. **Warning**

The current color is changed to `c` upon return.

### 33.7.3.62 fl_rectf() [1/4]

```c
void fl_rectf (Fl_Rect bb, uchar r, uchar g, uchar b) [inline]
```

Color a rectangle with "exactly" the passed `r, g, b` color. This is the same as `fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b)` but with `Fl_Rect bb` (bounding box) as argument instead of `(x, y, w, h)`.

**See also**

`fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b)`

### 33.7.3.63 fl_rectf() [2/4]

```c
void fl_rectf (Fl_Rect x, Fl_Color c) [inline]
```

Color with passed color a rectangle that exactly fills the given bounding box. **Warning**

The current color is changed to `c` upon return.

### 33.7.3.64 fl_rectf() [3/4]

```c
void fl_rectf (int x, int y, int w, int h, Fl_Color c) [inline]
```

Color with passed color a rectangle that exactly fills the given bounding box.
Warning
The current color is changed to \texttt{c} upon return.

33.7.3.65 \texttt{fl_rectf()} [4/4]

\begin{verbatim}
void fl_rectf (
  int x, 
  int y, 
  int w, 
  int h, 
  uchar r, 
  uchar g, 
  uchar b ) {inline}
\end{verbatim}

Color a rectangle with “exactly” the passed \texttt{r,g,b} color. 
On screens with less than 24 bits of color this is done by drawing a solid-colored block using \texttt{fl_draw_image()} so that the correct color shade is produced. On other screens, the current color is changed to \texttt{fl_color(r,g,b)} upon return.

33.7.3.66 \texttt{fl_rescale_offscreen()}

\begin{verbatim}
void fl_rescale_offscreen ( 
  FL_Offscreen & ctx )
\end{verbatim}

Adapts an offscreen buffer to a changed value of the scale factor. 
The \texttt{ctx} argument must have been created by \texttt{fl_create_offscreen()} and the calling context must not be between \texttt{fl_begin_offscreen()} and \texttt{fl_end_offscreen()}. The graphical content of the offscreen is preserved. The current scale factor value is given by \texttt{Fl_Graphics_Driver::default_driver().scale()}. 

Version
1.4

33.7.3.67 \texttt{fl_reset_spot()}

\begin{verbatim}
void fl_reset_spot ( 
  void )
\end{verbatim}

Resets marked text. 
In many languages, typing a character can involve multiple keystrokes. For example, the Å can be composed of two dots (¨) on top of the character, followed by the letter A (on a Mac with U.S. keyboard, you’d type Alt-U, Shift-A. To inform the user that the dots may be followed by another character, the ¨ is underlined). 
Call this function if character composition needs to be aborted for some reason. One such example would be the text input widget losing focus.

33.7.3.68 \texttt{fl_restore_scale()}

\begin{verbatim}
void fl_restore_scale ( 
  float s )
\end{verbatim}

Restores the GUI scaling factor and the clipping region in subsequent drawing operations.

Parameters
\begin{itemize}
  \item \texttt{s} Value returned by a previous call to \texttt{fl_override_scale()}. 
\end{itemize}
33.7.3.69  **fl_rotate()**

```c
void fl_rotate ( double d ) [inline]
```

Concatenate rotation transformation onto the current one.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>rotation angle, counter-clockwise in degrees (not radians)</td>
</tr>
</tbody>
</table>

33.7.3.70  **fl_rounded_rect()**

```c
void fl_rounded_rect ( int x, int y, int w, int h, int r ) [inline]
```

Draw a rounded border inside the given bounding box.
The radius code is optimized for speed and works best for values between 5 and 15 units.

33.7.3.71  **fl_rounded_rectf()**

```c
void fl_rounded_rectf ( int x, int y, int w, int h, int r ) [inline]
```

Color with current color a rounded rectangle that exactly fills the given bounding box.
The radius code is optimized for speed and works best for values between 5 and 15 units.

33.7.3.72  **fl_scale()[1/2]**

```c
void fl_scale ( double x ) [inline]
```

Concatenate scaling transformation onto the current one.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>scale factor in both x-direction and y-direction</td>
</tr>
</tbody>
</table>

33.7.3.73  **fl_scale()[2/2]**

```c
void fl_scale ( double x, double y ) [inline]
```

Concatenate scaling transformation onto the current one.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>x, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>scale factors in x-direction and y-direction</td>
</tr>
</tbody>
</table>
### 33.7.3.74 fl_scroll()

```c
void fl_scroll ( int X, int Y, int W, int H, int dx, int dy, void(*) (void*, int, int, int, int) draw_area, void* data )
```

Scroll a rectangle and draw the newly exposed portions.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X,Y</td>
<td>position of top-left of rectangle</td>
</tr>
<tr>
<td>W,H</td>
<td>size of rectangle</td>
</tr>
<tr>
<td>dx,dy</td>
<td>pixel offsets for shifting rectangle</td>
</tr>
<tr>
<td>draw_area</td>
<td>callback function to draw rectangular areas</td>
</tr>
<tr>
<td>data</td>
<td>pointer to user data for callback</td>
</tr>
</tbody>
</table>

The contents of the rectangular area is first shifted by `dx` and `dy` pixels. The `draw_area` callback is then called for every newly exposed rectangular area.

### 33.7.3.75 fl_set_spot()

```c
void fl_set_spot ( int font, int size, int X, int Y, int W, int H, Fl_Window* win = 0 )
```

Inform text input methods about the current text insertion cursor.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>font</td>
<td>Font currently in use in text input.</td>
</tr>
<tr>
<td>size</td>
<td>Size of the current font.</td>
</tr>
<tr>
<td>X,Y</td>
<td>Position of the bottom of the current text insertion cursor.</td>
</tr>
<tr>
<td>W,H</td>
<td>Width and height of the current text insertion cursor.</td>
</tr>
<tr>
<td>win</td>
<td>Points to the Fl_Window object containing the current text widget, or NULL.</td>
</tr>
</tbody>
</table>

### 33.7.3.76 fl_set_status()

```c
void fl_set_status ( int X, int Y, int W, int H )
```

Related to text input methods under X11.

This function is presently used only by the utf8 test application and only for the X11 platform. This function is apparently not indispensable for text input to work correctly as suggested by other apps that don’t use it (e.g.,...
editor).

33.7.3.77 \texttt{fl_shortcut_label()} [1/2]

\begin{verbatim}
const char * fl_shortcut_label ( 
    unsigned int shortcut ) 
Get a human-readable string from a shortcut value.
Unparse a shortcut value as used by \texttt{Fl_Button} or \texttt{Fl_Menu_Item} into a human-readable string like "Alt+N". This only works if the shortcut is a character key or a numbered function key. If the shortcut is zero then an empty string is returned. The return value points at a static buffer that is overwritten with each call.

Since
FLTK 1.3.4 modifier key names can be localized, but key names can not yet be localized. This may be added to a future FLTK version.

Modifier key names (human-readable shortcut names) can be defined with the following global const char * pointer variables:

\begin{itemize}
    \item fl\_local\_ctrl = name of FL$\_CTRL$
    \item fl\_local\_alt = name of FL$\_ALT$
    \item fl\_local\_shift = name of FL$\_SHIFT$
    \item fl\_local\_meta = name of FL$\_META$
\end{itemize}

fl\_local\_ctrl = "Strg";  // German for "Ctrl"
fl\_local\_shift = "Umschalt";  // German for "Shift"

Note
Due to random static initialization order this should always be done from code in main() or called by main() as opposed to static initialization since the default strings in the FLTK library are set by static initializers. Otherwise this might result in the wrong order so FLTK's internal initialization overwrites your strings.

The shortcut name will be constructed by adding all modifier names in the order defined above plus the name of the key. A '+' character is added to each modifier name unless it has a trailing '\' or a trailing '+'.

Example:
Ctrl+Alt+Shift+Meta+F12

The default values for modifier key names are as given above for all platforms except macOS. macOS uses graphical characters that represent the typical macOS modifier names in menus, e.g. cloverleaf, saucepan, etc. You may, however, redefine macOS modifier names as well.

Parameters

\begin{itemize}
    \item \texttt{shortcut} the integer value containing the ASCII character or extended keystroke plus modifiers
\end{itemize}

Returns

a pointer to a static buffer containing human readable text for the shortcut

33.7.3.78 \texttt{fl_shortcut_label()} [2/2]

\begin{verbatim}
const char * fl_shortcut_label ( 
    unsigned int shortcut, 
    const char ** eom ) 
Get a human-readable string from a shortcut value.

Parameters

\begin{itemize}
    \item \texttt{shortcut} the integer value containing the ASCII character or extended keystroke plus modifiers
\end{itemize}
### 33.7 Drawing functions

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>eom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>if this pointer is set, it will receive a pointer to the end of the modifier text</td>
</tr>
</tbody>
</table>

**Returns**

a pointer to a static buffer containing human readable text for the shortcut

**See also**

- fl_shortcut_label(unsigned int shortcut)

#### 33.7.3.79 fl_transform_dx()

double fl_transform_dx (  
  double x,  
  double y ) [inline]

Transform distance using current transformation matrix.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x,y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coordinate</td>
</tr>
</tbody>
</table>

#### 33.7.3.80 fl_transform_dy()

double fl_transform_dy (  
  double x,  
  double y ) [inline]

Transform distance using current transformation matrix.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x,y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coordinate</td>
</tr>
</tbody>
</table>

#### 33.7.3.81 fl_transform_x()

double fl_transform_x (  
  double x,  
  double y ) [inline]

Transform coordinate using the current transformation matrix.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x,y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coordinate</td>
</tr>
</tbody>
</table>

#### 33.7.3.82 fl_transform_y()

double fl_transform_y (  
  double x,  
  double y ) [inline]
Transform coordinate using the current transformation matrix.

Parameters

| in x,y coordinate |

33.7.3.83  fl_transformed_vertex()

```c
void fl_transformed_vertex (  
    double xf,  
    double yf ) [inline]
```

Add coordinate pair to the vertex list without further transformations.

Parameters

| in xf,yf transformed coordinate |

33.7.3.84  fl_translate()

```c
void fl_translate (  
    double x,  
    double y ) [inline]
```

Concatenate translation transformation onto the current one.

Parameters

| in x,y translation factor in x-direction and y-direction |

33.7.3.85  fl_vertex()

```c
void fl_vertex (  
    double x,  
    double y ) [inline]
```

Add a single vertex to the current path.

Parameters

| in x,y coordinate |

33.8  Multithreading support functions

fl multithreading support functions declared in `<FL/Fl.H>`

Functions

- static int Fl::awake (Fl_Awake_Handler cb, void *message=0)
  
  See void awake(void *message=0).
- static void Fl::awake (void *message=0)
  
  Sends a message pointer to the main thread, causing any pending Fl::wait() call to terminate so that the main thread can retrieve the message and any pending redraws can be processed.
33.8 Multithreading support functions

- static int Fl::lock()
  The lock() method blocks the current thread until it can safely access FLTK widgets and data.
- static void Fl::thread_message()
  The thread_message() method returns the last message that was sent from a child by the awake() method.
- static void Fl::unlock()
  The unlock() method releases the lock that was set using the lock() method.

33.8.1 Detailed Description

fl multithreading support functions declared in `<FL/Fl.H>`

33.8.2 Function Documentation

33.8.2.1 awake() [1/2]

```c
int Fl::awake (  
  Fl_Awake_Handler func,  
  void * data = 0 ) [static]
```

See void awake(void* message=0).
Let the main thread know an update is pending and have it call a specific function.
Registers a function that will be called by the main thread during the next message handling cycle. Returns 0 if the callback function was registered, and -1 if registration failed. Over a thousand awake callbacks can be registered simultaneously.

See also
- Fl::awake(void* message=0)

33.8.2.2 awake() [2/2]

```c
void Fl::awake (  
  void * msg = 0 ) [static]
```

Sends a message pointer to the main thread, causing any pending Fl::wait() call to terminate so that the main thread can retrieve the message and any pending redraws can be processed.
Multiple calls to Fl::awake() will queue multiple pointers for the main thread to process, up to a system-defined (typically several thousand) depth. The default message handler saves the last message which can be accessed using the Fl::thread_message() function.
In the context of a threaded application, a call to Fl::awake() with no argument will trigger event loop handling in the main thread. Since it is not possible to call Fl::flush() from a subsidiary thread, Fl::awake() is the best (and only, really) substitute.
It's not necessary to wrap calls to any form of Fl::awake() by Fl::lock() and Fl::unlock(). Nevertheless, the early, single call to Fl::lock() used to initialize threading support is necessary.
Function Fl::awake() in all its forms is typically called by worker threads, but it can be used safely by the main thread too, as a means to break the event loop.

See also
- Multithreading

33.8.2.3 lock()

```c
int Fl::lock ( ) [static]
```

The lock() method blocks the current thread until it can safely access FLTK widgets and data.
Child threads should call this method prior to updating any widgets or accessing data. The main thread must call `lock()` to initialize the threading support in FLTK. `lock()` will return non-zero if threading is not available on the platform.

Child threads must call `unlock()` when they are done accessing FLTK. When the `wait()` method is waiting for input or timeouts, child threads are given access to FLTK. Similarly, when the main thread needs to do processing, it will wait until all child threads have called `unlock()` before processing additional data.

Returns

0 if threading is available on the platform; non-zero otherwise.

See also: Multithreading

### 33.8.2.4 thread_message()

```c
void * Fl::thread_message ( ) [static]
```

The `thread_message()` method returns the last message that was sent from a child by the `awake()` method.

See also: Multithreading

### 33.8.2.5 unlock()

```c
void Fl::unlock ( ) [static]
```

The `unlock()` method releases the lock that was set using the `lock()` method.

Child threads should call this method as soon as they are finished accessing FLTK.

See also: Multithreading

### 33.9 Safe widget deletion support functions

These functions, declared in `<FL/Fl.H>`, support deletion of widgets inside callbacks.

**Functions**

- static void `Fl::clear_widget_pointer (Fl_Widget const *w)`
  
  Clears a widget pointer in the watch list.

- static void `Fl::delete_widget (Fl_Widget *w)`
  
  Schedules a widget for deletion at the next call to the event loop.

- static void `Fl::do_widget_deletion ()`
  
  Deletes widgets previously scheduled for deletion.

- static void `Fl::release_widget_pointer (Fl_Widget *&w)`
  
  Releases a widget pointer from the watch list.

- static void `Fl::watch_widget_pointer (Fl_Widget *&w)`
  
  Adds a widget pointer to the widget watch list.

### 33.9.1 Detailed Description

These functions, declared in `<FL/FL.H>`, support deletion of widgets inside callbacks. `Fl::delete_widget()` should be called when deleting widgets or complete widget trees (`Fl_Group`, `Fl_Window`, ...) inside callbacks.

The other functions are intended for internal use. The preferred way to use them is by using the helper class `Fl_Widget_Tracker`.

The following is to show how it works ...

There are three groups of related methods:

1. scheduled widget deletion
   
   - `Fl::delete_widget()` schedules widgets for deletion
   - `Fl::do_widget_deletion()` deletes all scheduled widgets
2. widget watch list ("smart pointers")

- Fl::watch_widget_pointer() adds a widget pointer to the watch list
- Fl::release_widget_pointer() removes a widget pointer from the watch list
- Fl::clear_widget_pointer() clears a widget pointer in the watch list

3. the class Fl_Widget_Tracker:

- the constructor calls Fl::watch_widget_pointer()
- the destructor calls Fl::release_widget_pointer()
- the access methods can be used to test, if a widget has been deleted

See also

Fl_Widget_Tracker.

### 33.9.2 Function Documentation

#### 33.9.2.1 clear_widget_pointer()

```c
void Fl::clear_widget_pointer ( 
    Fl_Widget const * w ) [static]
```

Clears a widget pointer in the watch list.
This is called when a widget is destroyed (by its destructor). You should never call this directly.

Note

Internal use only !

This method searches the widget watch list for pointers to the widget and clears each pointer that points to it. Widget pointers can be added to the widget watch list by calling Fl::watch_widget_pointer() or by using the helper class Fl_Widget_Tracker (recommended).

See also

Fl::watch_widget_pointer()

class Fl_Widget_Tracker

#### 33.9.2.2 delete_widget()

```c
void Fl::delete_widget ( 
    Fl_Widget * wi ) [static]
```

Schedules a widget for deletion at the next call to the event loop.
Use this method to delete a widget inside a callback function.
To avoid early deletion of widgets, this function should be called toward the end of a callback and only after any call to the event loop (Fl::wait(), Fl::flush(), Fl::check(), fl_ask(), etc.).
When deleting groups or windows, you must only delete the group or window widget and not the individual child widgets.

Since

FLTK 1.3.4 the widget will be hidden immediately, but the actual destruction will be delayed until the event loop is finished. Up to FLTK 1.3.3 windows wouldn't be hidden before the event loop was done, hence you had to hide() a window in your window close callback if you called Fl::delete_widget() to destroy (and hide) the window.

FLTK 1.3.0 it is not necessary to remove widgets from their parent groups or windows before calling this, because it will be done in the widget's destructor, but it is not a failure to do this nevertheless.
Note

In FLTK 1.1 you **must** remove widgets from their parent group (or window) before deleting them.

See also

Fl_Widget::~Fl_Widget()

### 33.9.2.3 do_widget_deletion()

```cpp
void Fl::do_widget_deletion ( ) [static]
```

Deletes widgets previously scheduled for deletion.

This is for internal use only. You should never call this directly.

*Fl::do_widget_deletion()* is called from the FLTK event loop or whenever you call *Fl::wait()*.

The previously scheduled widgets are deleted in the same order they were scheduled by calling *Fl::delete_widget()*.

See also

*Fl::delete_widget(Fl_Widget *, wi)*

### 33.9.2.4 release_widget_pointer()

```cpp
void Fl::release_widget_pointer ( Fl_Widget *& w ) [static]
```

Releases a widget pointer from the watch list.

This is used to remove a widget pointer that has been added to the watch list with *Fl::watch_widget_pointer()*,

when it is not needed anymore.

Note

Internal use only, please use class *Fl_Widget_Tracker* instead.

See also

*Fl::watch_widget_pointer()*

### 33.9.2.5 watch_widget_pointer()

```cpp
void Fl::watch_widget_pointer ( Fl_Widget *& w ) [static]
```

Adds a widget pointer to the widget watch list.

Note

Internal use only, please use class *Fl_Widget_Tracker* instead.

This can be used, if it is possible that a widget might be deleted during a callback or similar function. The widget pointer must be added to the watch list before calling the callback. After the callback the widget pointer can be queried, if it is NULL. If it is NULL, then the widget has been deleted during the callback and must not be accessed anymore. If the widget pointer is not NULL, then the widget has not been deleted and can be accessed safely.

After accessing the widget, the widget pointer must be released from the watch list by calling *Fl::release_widget_pointer()*.

Example for a button that is clicked (from its handle() method):

```cpp
Fl_Widget *wp = this; // save 'this' in a pointer variable
Fl::watch_widget_pointer(wp); // add the pointer to the watch list
set_changed(); // set the changed flag
do_callback(); // call the callback
if (!wp) { // the widget has been deleted
    // DO NOT ACCESS THE DELETED WIDGET !
} else {
    // the widget still exists
    clear_changed(); // reset the changed flag
}
Fl::release_widget_pointer(wp); // remove the pointer from the watch list
```

This works, because all widgets call *Fl::clear_widget_pointer()* in their destructors.
An easier and more convenient method to control widget deletion during callbacks is to use the class Fl_Widget_Tracker with a local (automatic) variable. 

See also

class Fl_Widget_Tracker

### 33.10 Cairo Support Functions and Classes

#### Classes

- class Fl_Cairo_State  
  Contains all the necessary info on the current cairo context.
- class Fl_Cairo_Window  
  This defines an FLTK window with Cairo support.

#### Functions

- static bool Fl::cairo_autolink_context ()  
  Gets the current autolink mode for Cairo support.
- static void Fl::cairo_autolink_context (bool alink)  
  When FLTK_HAVE_CAIRO is defined and cairo_autolink_context() is true, any current window dc is linked to a current Cairo context.
- static cairo_t * Fl::cairo_cc ()  
  Gets the current Cairo context linked with a fltk window.
- static void Fl::cairo_cc (cairo_t *c, bool own=false)  
  Sets the current Cairo context to c.
- static void Fl::cairo_flush (cairo_t *c)  
  Flush Cairo drawings on Cairo context c.
- static cairo_t * Fl::cairo_make_current (Fl_Window *w)  
  Provides a Cairo context for window wi.

#### 33.10.1 Detailed Description

#### 33.10.2 Function Documentation

##### 33.10.2.1 cairo_autolink_context() [1/2]

static bool Fl::cairo_autolink_context () [inline], [static]

Gets the current autolink mode for Cairo support.

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>if no Cairo context autolink is made for each window.</td>
</tr>
<tr>
<td>true</td>
<td>if any fltk window is attached a Cairo context when it is current.</td>
</tr>
</tbody>
</table>

See also

void cairo_autolink_context(bool alink)
Note
Only available when configure has the –enable-cairo option

33.10.2.2  cairo_autolink_context() [2/2]

static void Fl::cairo_autolink_context (  
    bool alink ) [inline], [static]
When FLTK_HAVE_CAIRO is defined and cairo_autolink_context() is true, any current window dc is linked to a  
current Cairo context.
This is not the default, because it may not be necessary to add Cairo support to all fltk supported windows. When  
you wish to associate a Cairo context in this mode, you need to call explicitly in your draw() overridden method,  
Fl::cairo_make_current(Fl_Window*). This will create a Cairo context only for this Window. Still in custom Cairo  
application it is possible to handle completely this process automatically by setting alink to true. In this last case,  
you don't need anymore to call Fl::cairo_make_current(). You can use Fl::cairo_cc() to get the current Cairo context  
anytime.

Note
Only available when configure has the –enable-cairo option

33.10.2.3  cairo_cc()

static void Fl::cairo_cc (  
    cairo_t *c,  
    bool own = false ) [inline], [static]
Sets the current Cairo context to c.
Set own to true if you want fltk to handle this cc deletion.

Note
Only available when configure has the –enable-Cairo option

33.10.2.4  cairo_flush()

static void Fl::cairo_flush (  
    cairo_t *c ) [inline], [static]
Flush Cairo drawings on Cairo context c.
This is required on Windows if you use the Cairo context provided by the "Cairo autolink" option. Call this when all  
your drawings on the Cairo context are finished. This is maybe not necessary on other platforms than Windows but  
it does no harm if you call it always.
You don't need to use this if you use an Fl_Cairo_Window which does this automatically after the draw callback  
returns.
Code example for "Cairo autolink" mode:
In the overridden draw() method of your subclass of Fl_Window or any widget:
cairo_t *cc = Fl::cairo_cc();  // get the "autolink" Cairo context  
// ... your Cairo drawings are here ...  
Fl::cairo_flush(cc);  // flush Cairo drawings to the device
If you configure FLTK with '--enable-cairo' or CMake option 'OPTION_CAIRO' (i.e. without  
'--enable-cairoext' or CMake option 'OPTION_CAIROEXT') or if you don't enable the 'autolink'  
Cairo context you may do the equivalent to use Cairo drawings in an overridden draw() method of derived classes  
by using
// get the Cairo context for the \c window  
cairo_t *cc = Fl::cairo_make_current(window);  
// ... your Cairo drawings are here ...  
Fl::cairo_flush(cc);  // flush Cairo drawings to the device
33.10.2.5  cairo_make_current()

cairo_t * Fl::cairo_make_current ( 
   Fl_Window * wi )  [static]

Provides a Cairo context for window wi.
This is needed in a draw() override if Fl::cairo_autolink_context() returns false, which is the default. The cairo_←
context() does not need to be freed as it is freed every time a new Cairo context is created. When the program
terminates, a call to Fl::cairo_make_current(0) will destroy any residual context.

Note

A new Cairo context is not always re-created when this method is used. In particular, if the current graphical
context and the current window didn’t change between two calls, the previous gc is internally kept, thus op-
timizing the drawing performances. Also, after this call, Fl::cairo_cc() is adequately updated with this Cairo
context.

Only available when configure has the –enable-cairo option

Returns

The valid cairo_t *cairo context associated to this window.

Return values

NULL if wi is NULL or maybe with GL windows under Wayland

33.11  Unicode and UTF-8 functions

fl global Unicode and UTF-8 handling functions declared in <FL/fl_utf8.h>

Macros

• #define ERRORS_TO_CP1252 1
   Set to 1 to turn bad UTF-8 bytes in the 0x80-0x9f range into the Unicode index for Microsoft’s CP1252 character set.

• #define ERRORS_TO_ISO8859_1 1
   Set to 1 to turn bad UTF-8 bytes into ISO-8859-1.

• #define NBC 0xFFFF + 1

• #define STRICT_RFC3629 0
   A number of Unicode code points are in fact illegal and should not be produced by a UTF-8 converter.

Functions

• int fl_access (const char *f, int mode)
   Cross-platform function to test a files access() with a UTF-8 encoded name or value.

• int fl_chdir (const char *path)
   Cross-platform function to change the current working directory, given as a UTF-8 encoded string.

• int fl_chmod (const char *f, int mode)
   Cross-platform function to set a files mode() with a UTF-8 encoded name or value.

• int fl_close_fd (int fd)
Cross-platform function to close a file descriptor.

- int fl_execvp (const char *file, char **argv)
- FILE * fl_fopen (const char *f, const char *mode)
  
Cross-platform function to open files with a UTF-8 encoded name.

- char * fl_getcwd (char *buf, int len)
  
Cross-platform function to get the current working directory as a UTF-8 encoded value.

- char * fl_getenv (const char *v)
  
Cross-platform function to get environment variables with a UTF-8 encoded name or value.

- char fl_make_path (const char *path)
  
Cross-platform function to recursively create a path in the file system.

- void fl_make_path_for_file (const char *path)
  
Cross-platform function to create a path for the file in the file system.

- int fl_mkdir (const char *f, int mode)
  
Cross-platform function to create a directory with a UTF-8 encoded name.

- unsigned int fl_nonspacing (unsigned int ucs)
  
Returns true if the Unicode character ucs is non-spacing.

- int fl_open (const char *fname, int oflags,...)
  
Cross-platform function to open files with a UTF-8 encoded name.

- int fl_open_ext (const char *fname, int binary, int oflags,...)
  
Cross-platform function to open files with a UTF-8 encoded name.

- int fl_putenv (const char *var)
  
Cross-platform function to write environment variables with a UTF-8 encoded name or value.

- int fl_rename (const char *f, const char *n)
  
Cross-platform function to rename a filesystem object using UTF-8 encoded names.

- int fl_rmdir (const char *f)
  
Cross-platform function to remove a directory with a UTF-8 encoded name.

- int fl_stat (const char *f, struct stat *b)
  
Cross-platform function to stat() a file using a UTF-8 encoded name or value.

- int fl_system (const char *cmd)
  
Cross-platform function to run a system command with a UTF-8 encoded string.

- int fl_tolower (unsigned int ucs)
  
Returns the Unicode lower case value of ucs.

- int fl_toupper (unsigned int ucs)
  
Returns the Unicode upper case value of ucs.

- unsigned fl_ucs_to_Utf16 (const unsigned ucs, unsigned short *dst, const unsigned dstlen)
  
Convert a single 32-bit Unicode codepoint into an array of 16-bit characters.

- int fl_unlink (const char *fname)
  
Cross-platform function to unlink() (that is, delete) a file using a UTF-8 encoded filename.

- char * fl_utf2mbcs (const char *s)
  
Converts UTF-8 string s to a local multi-byte character string.

- unsigned fl_utf8from_mb (char *dst, unsigned dstlen, const char *src, unsigned srclen)
  
Convert a filename from the locale-specific multibyte encoding used by Windows to UTF-8 as used by FLTK.

- unsigned fl_utf8froma (char *dst, unsigned dstlen, const char *src, unsigned srclen)

- int fl_utf8bytes (unsigned ucs)
  
Return the number of bytes needed to encode the given UCS4 character in UTF-8.

- unsigned fl_utf8decode (const char *p, const char *start, const char *end)
  
Decode a single UTF-8 encoded character starting at p.

- int fl_utf8encode (unsigned ucs, char *buf)
  
Write the UTF-8 encoding of ucs into buf and return the number of bytes written.
33.11 Unicode and UTF-8 functions

Convert an ISO-8859-1 (ie normal c-string) byte stream to UTF-8.

- unsigned fl_utf8fromwc (char *dst, unsigned dstlen, const wchar_t *src, unsigned srclen)
  Turn "wide characters" as returned by some system calls (especially on Windows) into UTF-8.
- const char * fl_utf8fwd (const char *p, const char *start, const char *end)
  Move p forward until it points to the start of a UTF-8 character.
- int fl_utf8len (char c)
  Returns the byte length of the UTF-8 sequence with first byte c, or -1 if c is not valid.
- int fl_utf8len1 (char c)
  Returns the byte length of the UTF-8 sequence with first byte c, or 1 if c is not valid.
- int fl_utf8locale ()
  Return true if the "locale" seems to indicate that UTF-8 encoding is used.
- int fl_utf8strlen (const char *text, int len)
  Return the length in bytes of a UTF-8 string.
- int fl_utf8test (const char *src, unsigned srclen)
  Examines the first srclen bytes in src and returns a verdict on whether it is UTF-8 or not.
- unsigned fl_utf8toa (const char *src, unsigned srclen, char *dst, unsigned dstlen)
  Convert a UTF-8 sequence into an array of 1-byte characters.
- unsigned fl_utf8to_mb (const char *src, unsigned srclen, char *dst, unsigned dstlen)
  Convert the UTF-8 used by FLTK to the locale-specific encoding used for filenames (and sometimes used for data in files).
- unsigned fl_utf8toUtf16 (const char *src, unsigned srclen, unsigned short *dst, unsigned dstlen)
  Convert a UTF-8 sequence into an array of 16-bit characters.
- unsigned fl_utf8towc (const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen)
  Converts a UTF-8 string into a wide character string.
- int fl_utf_nb_char (const unsigned char *buf, int len)
  Returns the number of Unicode chars in the UTF-8 string.
- int fl_utf_strcasecmp (const char *s1, const char *s2)
  UTF-8 aware strcasecmp - converts to Unicode and tests.
- int fl_utf_strncasecmp (const char *s1, const char *s2, int n)
  UTF-8 aware strncasecmp - converts to lower case Unicode and tests.
- int fl_utf_tolower (const unsigned char *str, int len, char *buf)
  Converts the string str to its lower case equivalent into buf.
- int fl_utf_toupper (const unsigned char *str, int len, char *buf)
  Converts the string str to its upper case equivalent into buf.
- int fl_wcwidth (const char *src)
  extended wrapper around fl_wcwidth_(unsigned int ucs) function.
- int fl_wcwidth_ (unsigned int ucs)
  Wrapper to adapt Markus Kuhn's implementation of wcwidth() for FLTK.

33.11.1 Detailed Description

fl global Unicode and UTF-8 handling functions declared in <FL/fl_utf8.h>

33.11.2 Macro Definition Documentation

33.11.2.1 ERRORS_TO_CP1252

#define ERRORS_TO_CP1252 1
Set to 1 to turn bad UTF-8 bytes in the 0x80-0x9f range into the Unicode index for Microsoft's CP1252 character set.
You should also set ERRORS_TO_ISO8859_1. With this a huge amount of more available text (such as all web pages) are correctly converted to Unicode.

Generated by Doxygen
33.11.2.2 ERRORS_TO_ISO8859_1

#define ERRORS_TO_ISO8859_1 1
Set to 1 to turn bad UTF-8 bytes into ISO-8859-1. If this is zero they are instead turned into the Unicode REPLACEMENT CHARACTER, of value 0xfffd. If this is on `fl_utf8decode()` will correctly map most (perhaps all) human-readable text that is in ISO-8859-1. This may allow you to completely ignore character sets in your code because virtually everything is either ISO-8859-1 or UTF-8.

33.11.2.3 STRICT_RFC3629

#define STRICT_RFC3629 0
A number of Unicode code points are in fact illegal and should not be produced by a UTF-8 converter. Turn this on will replace the bytes in those encodings with errors. If you do this then converting arbitrary 16-bit data to UTF-8 and then back is not an identity, which will probably break a lot of software.

33.11.3 Function Documentation

33.11.3.1 fl_access()

int fl_access ( const char * f, int mode )
Cross-platform function to test a files access() with a UTF-8 encoded name or value. This function is especially useful on the Windows platform where the standard access() function fails with UTF-8 encoded non-ASCII filenames. Windows defines the mode values 0 for existence, 2 for writable, 4 for readable, and 6 of readable and writable. On other systems, the modes `X_OK`, `W_OK`, and `R_OK` are usually defined as 1, 2, and 4. Upon successful completion, the value 0 is returned on all platforms.

Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in f</td>
<td>the UTF-8 encoded filename</td>
</tr>
<tr>
<td>in mode</td>
<td>the mode to test</td>
</tr>
</tbody>
</table>

Returns

the return value of `_waccess()` on Windows or access() on other platforms.

33.11.3.2 fl_chdir()

int fl_chdir ( const char * path )
Cross-platform function to change the current working directory, given as a UTF-8 encoded string. This function is especially useful on the Windows platform where the standard `_wchdir()` function needs a `path` in UTF-16 encoding. The `path` is converted to a system specific encoding if necessary and the system specific `chdir(converted←` _path`) function is called. The function returns 0 on success and -1 on error. Depending on the platform, `errno` may be set if an error occurs.

Note

The possible `errno` values are platform specific. Refer to the documentation of the platform specific `chdir()` function.

If the function is not implemented on a particular platform the default implementation returns -1 and `errno` is not set.
If the path is NULL the function returns -1, but_errno is not changed. This is a convenience feature of \texttt{fl_chdir()} as opposed to \texttt{chdir()}. 
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>path</th>
<th>the target directory for chdir (may be NULL)</th>
</tr>
</thead>
</table>

Returns

0 if successful, -1 on error (errno may be set)

### 33.11.3.3 fl_chmod()

```c
int fl_chmod (const char *f, int mode)
```

Cross-platform function to set a files mode() with a UTF-8 encoded name or value. This function is especially useful on the Windows platform where the standard chmod() function fails with UTF-8 encoded non-ASCII filenames.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>f</th>
<th>the UTF-8 encoded filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>mode</td>
<td>the mode to set</td>
</tr>
</tbody>
</table>

Returns

the return value of _wchmod() on Windows or chmod() on other platforms.

### 33.11.3.4 fl_close_fd()

```c
int fl_close_fd (int fd)
```

Cross-platform function to close a file descriptor.

Returns

0 in case of success, or -1 in case of error.

### 33.11.3.5 fl_fopen()

```c
FILE * fl_fopen (const char *f, const char *mode)
```

Cross-platform function to open files with a UTF-8 encoded name. This function is especially useful on the Windows platform where the standard fopen() function fails with UTF-8 encoded non-ASCII filenames.

Parameters

<table>
<thead>
<tr>
<th>f</th>
<th>the UTF-8 encoded filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>mode</td>
<td>same as the second argument of the standard fopen() function</td>
</tr>
</tbody>
</table>
Returns

a FILE pointer upon successful completion, or NULL in case of error.

See also

fl_open().

33.11.3.6 fl_getcwd()

char * fl_getcwd (  
    char * buf,  
    int len )

Cross-platform function to get the current working directory as a UTF-8 encoded value.
This function is especially useful on the Windows platform where the standard _wgetcwd() function returns UTF-16
encoded non-ASCII filenames.
If buf is NULL a buffer of size (len+1) is allocated, filled with the current working directory, and returned. In this
case the buffer must be released by the caller with free() to prevent memory leaks.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>buf</th>
<th>the buffer to populate (may be NULL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>len</td>
<td>the length of the buffer</td>
</tr>
</tbody>
</table>

Returns

the CWD encoded as UTF-8

33.11.3.7 fl.getenv()

char * fl.getenv (  
    const char * v )

Cross-platform function to get environment variables with a UTF-8 encoded name or value.
This function is especially useful on the Windows platform where non-ASCII environment variables are encoded as
wide characters. The returned value of the variable is encoded in UTF-8 as well.
On platforms other than Windows this function calls getenv directly. The return value is returned as-is.
The return value is a pointer to an implementation defined buffer:

- an internal buffer that is (re)allocated as needed (Windows) or
- the string in the environment itself (Unix, Linux, MacOS) or
- any other implementation (other platforms). This string must be considered read-only and must not be freed
  by the caller.

If the resultant string is to be used later it must be copied to a safe place. The next call to fl.getenv() or any other
environment changes may overwrite the string.

Note

This function is not thread-safe.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>v</th>
<th>the UTF-8 encoded environment variable</th>
</tr>
</thead>
</table>
Returns
the environment variable in UTF-8 encoding, or NULL in case of error.

33.11.3.8 fl_make_path()

```c
char fl_make_path ( const char * path )
```

Cross-platform function to recursively create a path in the file system.
This function creates a path in the file system by recursively creating all directories.

Parameters
- `path` a Unix style ('/' forward slashes) absolute or relative pathname

Returns
1 if the path was created, 0 if creating the path failed at some point

33.11.3.9 fl_make_path_for_file()

```c
void fl_make_path_for_file ( const char * path )
```

Cross-platform function to create a path for the file in the file system.
This function strips the filename from the given path and creates a path in the file system by recursively creating all directories.

33.11.3.10 fl_mkdir()

```c
int fl_mkdir ( const char * f, int mode )
```

Cross-platform function to create a directory with a UTF-8 encoded name.
This function is especially useful on the Windows platform where the standard _wmkdir() function expects UTF-16 encoded non-ASCII filenames.

Parameters
- `f` the UTF-8 encoded filename
- `mode` the mode of the directory

Returns
the return value of _wmkdir() on Windows or mkdir() on other platforms.

33.11.3.11 fl_nonspacing()

```c
unsigned int fl_nonspacing ( unsigned int ucs )
```

Returns true if the Unicode character `ucs` is non-spacing.
Non-spacing characters in Unicode are typically combining marks like tilde (~), diaeresis (¨), or other marks that are added to a base character, for instance 'a' (base character) + '¨' (combining mark) = 'ä' (German Umlaut).

- [http://unicode.org/glossary/#base_character](http://unicode.org/glossary/#base_character)
33.11.3.12 fl_open()

```c
int fl_open ( const char * fname,
               int oflags,
               ... )
```

Cross-platform function to open files with a UTF-8 encoded name. This function is especially useful on the Windows platform where the standard open() function fails with UTF-8 encoded non-ASCII filenames.

**Parameters**

- **fname**: the UTF-8 encoded filename
- **oflags**...: other arguments are as in the standard open() function

**Returns**

- a file descriptor upon successful completion, or -1 in case of error.

**See also**

- fl_fopen(), fl_open_ext(), fl_close_fd(int fd).

33.11.3.13 fl_open_ext()

```c
int fl_open_ext ( const char * fname,
                   int binary,
                   int oflags,
                   ... )
```

Cross-platform function to open files with a UTF-8 encoded name. In comparison with fl_open(), this function allows to control whether the file is opened in binary (a.k.a. untranslated) mode. This is especially useful on the Windows platform where files are by default opened in text (translated) mode.

**Parameters**

- **fname**: the UTF-8 encoded filename
- **binary**: if non-zero, the file is to be accessed in binary (a.k.a. untranslated) mode.
- **oflags**...: these arguments are as in the standard open() function. Setting oflags to zero opens the file for reading.

**Returns**

- a file descriptor upon successful completion, or -1 in case of error.

33.11.3.14 fl_putenv()

```c
int fl_putenv ( const char * var )
```
Cross-platform function to write environment variables with a UTF-8 encoded name or value. This function is especially useful on the Windows platform where non-ASCII environment variables are encoded as wide characters.

The given argument `var` must be encoded in UTF-8 in the form "name=value". The 'name' part must conform to platform dependent restrictions on environment variable names.

The string given in `var` is copied and optionally converted to the required encoding for the platform. On platforms other than Windows this function calls `putenv` directly.

The return value is zero on success and non-zero in case of error. The value in case of error is platform specific and returned as-is.

Note

The copied string is allocated on the heap and "lost" on some platforms, i.e. calling `fl_putenv()` to change environment variables frequently may cause memory leaks. There may be an option to avoid this in a future implementation.

This function is not thread-safe.

Parameters

```c
in var the UTF-8 encoded environment variable 'name=value'
```

Returns

0 on success, non-zero in case of error.

**33.11.3.15 fl_rename()**

```c
int fl_rename (const char * f, const char * n )
```

Cross-platform function to rename a filesystem object using UTF-8 encoded names. This function is especially useful on the Windows platform where the standard `_wrename()` function expects UTF-16 encoded non-ASCII filenames.

Parameters

```c
in f the UTF-8 encoded filename to change
in n the new UTF-8 encoded filename to set
```

Returns

the return value of `_wrename()` on Windows or `rename()` on other platforms.

**33.11.3.16 fl_rmdir()**

```c
int fl_rmdir (const char * f )
```

Cross-platform function to remove a directory with a UTF-8 encoded name. This function is especially useful on the Windows platform where the standard `_wrmdir()` function expects UTF-16 encoded non-ASCII filenames.

Parameters

```c
in f the UTF-8 encoded filename to remove
```
33.11 Unicode and UTF-8 functions

Returns

the return value of _wrmdir() on Windows or rmdir() on other platforms.

33.11.3.17 fl_stat()

```c
int fl_stat (const char *f, struct stat *b)
```

Cross-platform function to stat() a file using a UTF-8 encoded name or value. This function is especially useful on the Windows platform where the standard stat() function fails with UTF-8 encoded non-ASCII filenames.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>f</th>
<th>the UTF-8 encoded filename</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>the stat struct to populate</td>
</tr>
</tbody>
</table>

Returns

the return value of _wstat() on Windows or stat() on other platforms.

33.11.3.18 fl_system()

```c
int fl_system (const char *cmd)
```

Cross-platform function to run a system command with a UTF-8 encoded string. This function is especially useful on the Windows platform where non-ASCII program (file) names must be encoded as wide characters. On platforms other than Windows this function calls system() directly.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cmd</th>
<th>the UTF-8 encoded command string</th>
</tr>
</thead>
</table>

Returns

the return value of _wsystem() on Windows or system() on other platforms.

33.11.3.19 fl_ucs_to_Utf16()

```c
unsigned fl_ucs_to_Utf16 (const unsigned ucs, unsigned short *dst, const unsigned dstlen)
```

Convert a single 32-bit Unicode codepoint into an array of 16-bit characters. These are used by some system calls, especially on Windows. ucs is the value to convert.

dst points at an array to write, and dstlen is the number of locations in this array. At most dstlen words will be written, and a 0 terminating word will be added if dstlen is large enough. Thus this function will never overwrite the buffer and will attempt return a zero-terminated string if space permits. If dstlen is zero then dst can be set to NULL and no data is written, but the length is returned.
The return value is the number of 16-bit words that would be written to dst if it is large enough, not counting any terminating zero.
If the return value is greater than `dstlen` it indicates truncation, you should then allocate a new array of size `return+1` and call this again.

Unicode characters in the range 0x10000 to 0x10ffff are converted to “surrogate pairs” which take two words each (in UTF-16 encoding). Typically, setting `dstlen` to 2 will ensure that any valid Unicode value can be converted, and setting `dstlen` to 3 or more will allow a NULL terminated sequence to be returned.

### 33.11.3.20 fl_unlink()

```c
int fl_unlink (const char *fname)
```

Cross-platform function to `unlink()` (that is, delete) a file using a UTF-8 encoded filename. This function is especially useful on the Windows platform where the standard function expects UTF-16 encoded non-ASCII filenames.

**Parameters**

- `fname` the filename to unlink

**Returns**

the return value of `_wunlink()` on Windows or `unlink()` on other platforms.

### 33.11.3.21 fl_utf8back()

```c
const char * fl_utf8back (const char *p, const char *start, const char *end)
```

Move `p` backward until it points to the start of a UTF-8 character. If it already points at the start of one then it is returned unchanged. Any UTF-8 errors are treated as though each byte of the error is an individual character.

`start` is the start of the string and is used to limit the backwards search for the start of a UTF-8 character. `end` is the end of the string and is assumed to be a break between characters. It is assumed to be greater than `p).

If you wish to decrement a UTF-8 pointer, pass `p-1` to this.

### 33.11.3.22 fl_utf8bytes()

```c
int fl_utf8bytes (unsigned ucs)
```

Return the number of bytes needed to encode the given UCS4 character in UTF-8. Returns number of bytes that `utf8encode()` will use to encode the character `ucs`.

**Parameters**

- `in` `ucs` UCS4 encoded character

**Returns**

number of bytes required

### 33.11.3.23 fl_utf8decode()

```c
unsigned fl_utf8decode (const char *p, const char *end, int *len)
```

Generated by Doxygen
Decode a single UTF-8 encoded character starting at \( p \).
The resulting Unicode value (in the range 0-0x10ffff) is returned, and \( len \) is set to the number of bytes in the UTF-8 encoding (adding \( len \) to \( p \) will point at the next character).

If \( p \) points at an illegal UTF-8 encoding, including one that would go past \( end \), or where a code uses more bytes than necessary, then \((\text{unsigned char}*)p\) is translated as though it is in the Microsoft CP1252 character set and \( len \) is set to 1. Treating errors this way allows this to decode almost any ISO-8859-1 or CP1252 text that has been mistakenly placed where UTF-8 is expected, and has proven very useful.

If you want errors to be converted to error characters (as the standards recommend), adding a test to see if the length is unexpectedly 1 will work:

```c
if (*p & 0x80) { // what should be a multibyte encoding
    code = fl_utf8decode(p, end, &len);
} else if (len<2) code = 0xFFFD; // Turn errors into REPLACEMENT CHARACTER
else { // handle the 1-byte UTF-8 encoding:
    code = *p;
    len = 1;
}
```

Direct testing for the 1-byte case (as shown above) will also speed up the scanning of strings where the majority of characters are ASCII.

### 33.11.3.24 fl_utf8encode()

```c
int fl_utf8encode {
    unsigned ucs,
    char * buf }
```

Write the UTF-8 encoding of \( ucs \) into \( buf \) and return the number of bytes written.

Up to 4 bytes may be written. If you know that \( ucs \) is less than 0x10000 then at most 3 bytes will be written. If you wish to speed this up, remember that anything less than 0x80 is written as a single byte.

If \( ucs \) is greater than 0x100ff this is an illegal character according to RFC 3629. These are converted as though they are 0xFFFD (REPLACEMENT CHARACTER).

RFC 3629 also says many other values for \( ucs \) are illegal (in the range 0xd800 to 0xdfff, or ending with \( 0xfffe \) or \( 0xffff \)). However I encode these as though they are legal, so that utf8encode/fl_utf8decode will be the identity for all codes between 0 and 0x10fff.

### 33.11.3.25 fl_utf8from_mb()

```c
unsigned fl_utf8from_mb {
    char * dst,
    unsigned dstlen,
    const char * src,
    unsigned srclen }
```

Convert a filename from the locale-specific multibyte encoding used by Windows to UTF-8 as used by FLTK.

Up to \( dstlen \) bytes are written to \( dst \), including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to \( dstlen \) then if you malloc a new array of size \( n+1 \) you will have the space needed for the entire string. If \( dstlen \) is zero then nothing is written and this call just measures the storage space needed.

On Unix or on Windows when a UTF-8 locale is in effect, this does not change the data. You may also want to check if fl_utf8test() returns non-zero, so that the filesystem can store filenames in UTF-8 encoding regardless of the locale.

### 33.11.3.26 fl_utf8froma()

```c
unsigned fl_utf8froma {
    char * dst,
    unsigned dstlen,
    const char * src,
    unsigned srclen }
```

Convert an ISO-8859-1 (ie normal c-string) byte stream to UTF-8.

It is possible this should convert Microsoft's CP1252 to UTF-8 instead. This would translate the codes in the range 0x80-0x9f to different characters. Currently it does not do this.

Up to \( dstlen \) bytes are written to \( dst \), including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to \( dstlen \) then if you malloc a new array of
Module Documentation

size n+1 you will have the space needed for the entire string. If dstlen is zero then nothing is written and this call just measures the storage space needed.

tsrlen is the number of bytes in src to convert.

If the return value equals srclen then this indicates that no conversion is necessary, as only ASCII characters are in the string.

33.11.3.27  fl_utf8fromwc()

unsigned fl_utf8fromwc (char ∗ dst, unsigned dstlen, const wchar_t ∗ src, unsigned srclen )

Turn "wide characters" as returned by some system calls (especially on Windows) into UTF-8.
Up to dstlen bytes are written to dst, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to dstlen then if you malloc a new array of size n+1 you will have the space needed for the entire string. If dstlen is zero then nothing is written and this call just measures the storage space needed.

srclen is the number of words in src to convert. On Windows this is not necessarily the number of characters, due to there possibly being "surrogate pairs" in the UTF-16 encoding used. On Unix wchar_t is 32 bits and each location is a character.

On Unix if a src word is greater than 0x10ffff then this is an illegal character according to RFC 3629. These are converted as though they are 0xFFFD (REPLACEMENT CHARACTER). Characters in the range 0xd800 to 0xdfff, or ending with 0xfffe or 0xffff are also illegal according to RFC 3629. However I encode these as though they are legal, so that fl_utf8towc will return the original data.
On Windows "surrogate pairs" are converted to a single character and UTF-8 encoded (as 4 bytes). Mismatched halves of surrogate pairs are converted as though they are individual characters.

33.11.3.28  fl_utf8fwd()

const char ∗ fl_utf8fwd (const char ∗ p, const char ∗ start, const char ∗ end )

Move p forward until it points to the start of a UTF-8 character.

If it already points at the start of one then it is returned unchanged. Any UTF-8 errors are treated as though each byte of the error is an individual character.

start is the start of the string and is used to limit the backwards search for the start of a UTF-8 character.

end is the end of the string and is assumed to be a break between characters. It is assumed to be greater than p.

This function is for moving a pointer that was jumped to the middle of a string, such as when doing a binary search for a position. You should use either this or fl_utf8back() depending on which direction your algorithm can handle the pointer moving. Do not use this to scan strings, use fl_utf8decode() instead.

33.11.3.29  fl_utf8len()

int fl_utf8len (char c )

Returns the byte length of the UTF-8 sequence with first byte c, or -1 if c is not valid.

This function is helpful for finding faulty UTF-8 sequences.

See also

fl_utf8len1

33.11.3.30  fl_utf8len1()

int fl_utf8len1 (char c )
33.11 Unicode and UTF-8 functions

Returns the byte length of the UTF-8 sequence with first byte \( c \), or 1 if \( c \) is not valid. This function can be used to scan faulty UTF-8 sequences, albeit ignoring invalid codes.

See also

fl_utf8len

33.11.3.31 fl_utf8locale()

int fl_utf8locale ( void )

Return true if the "locale" seems to indicate that UTF-8 encoding is used. If true the fl_utf8to_mb and fl_utf8from_mb don't do anything useful.

It is highly recommended that you change your system so this does return true. On Windows this is done by setting the "codepage" to CP_UTF8. On Unix this is done by setting $LC_CTYPE to a string containing the letters "utf" or "UTF" in it, or by deleting all $LC and $LANG environment variables. In the future it is likely that all non-Asian Unix systems will return true, due to the compatibility of UTF-8 with ISO-8859-1.

33.11.3.32 fl_utf8strlen()

int fl_utf8strlen ( const char * text, int len )

Return the length in bytes of a UTF-8 string.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>text</th>
<th>encoded in UTF-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>len</td>
<td>number of Unicode characters, -1 to test until the end of text</td>
</tr>
</tbody>
</table>

Returns

number of bytes that make up the Unicode string

See also

fl_utf_nb_char(const unsigned char *buf, int len)

33.11.3.33 fl_utf8test()

int fl_utf8test ( const char * src, unsigned srclen )

Examines the first srclen bytes in src and returns a verdict on whether it is UTF-8 or not.

- Returns 0 if there is any illegal UTF-8 sequences, using the same rules as fl_utf8decode(). Note that some UCS values considered illegal by RFC 3629, such as 0xffff, are considered legal by this.
- Returns 1 if there are only single-byte characters (ie no bytes have the high bit set). This is legal UTF-8, but also indicates plain ASCII. It also returns 1 if srclen is zero.
- Returns 2 if there are only characters less than 0x800.
- Returns 3 if there are only characters less than 0x10000.
- Returns 4 if there are characters in the 0x10000 to 0x10ffff range.

Because there are many illegal sequences in UTF-8, it is almost impossible for a string in another encoding to be confused with UTF-8. This is very useful for transitioning Unix to UTF-8 filenames, you can simply test each filename with this to decide if it is UTF-8 or in the locale encoding. My hope is that if this is done we will be able to cleanly transition to a locale-less encoding.
33.11.3.34 fl_utf8to_mb()

unsigned fl_utf8to_mb (  
    const char * src,  
    unsigned srclen,  
    char * dst,  
    unsigned dstlen )  

Convert the UTF-8 used by FLTK to the locale-specific encoding used for filenames (and sometimes used for data in files).
Unfortunately due to stupid design you will have to do this as needed for filenames. This is a bug on both Unix and Windows.
Up to dstlen bytes are written to dst, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to dstlen then if you malloc a new array of size n+1 you will have the space needed for the entire string. If dstlen is zero then nothing is written and this call just measures the storage space needed.
If fl_utf8locale() returns true then this does not change the data.

33.11.3.35 fl_utf8toa()

unsigned fl_utf8toa (  
    const char * src,  
    unsigned srclen,  
    char * dst,  
    unsigned dstlen )  

Convert a UTF-8 sequence into an array of 1-byte characters.
If the UTF-8 decodes to a character greater than 0xff then it is replaced with '?'.
Errors in the UTF-8 sequence are converted as individual bytes, same as fl_utf8decoder() does. This allows ISO-8859-1 text mistakenly identified as UTF-8 to be printed correctly (and possibly CP1252 on Windows).
src points at the UTF-8 sequence, and srclen is the number of bytes to convert.
Up to dstlen bytes are written to dst, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to dstlen then if you malloc a new array of size n+1 you will have the space needed for the entire string. If dstlen is zero then nothing is written and this call just measures the storage space needed.

33.11.3.36 fl_utf8toUtf16()

unsigned fl_utf8toUtf16 (  
    const char * src,  
    unsigned srclen,  
    unsigned short * dst,  
    unsigned dstlen )  

Convert a UTF-8 sequence into an array of 16-bit characters.
These are used by some system calls, especially on Windows.
src points at the UTF-8, and srclen is the number of bytes to convert.
dst points at an array to write, and dstlen is the number of locations in this array. At most dstlen-1 words will be written there, plus a 0 terminating word. Thus this function will never overwrite the buffer and will always return a zero-terminated string. If dstlen is zero then dst can be null and no data is written, but the length is returned.
The return value is the number of 16-bit words that would be written to dst if it were long enough, not counting the terminating zero. If the return value is greater or equal to dstlen it indicates truncation, you can then allocate a new array of size return+1 and call this again.
Errors in the UTF-8 are converted as though each byte in the erroneous string is in the Microsoft CP1252 encoding. This allows ISO-8859-1 text mistakenly identified as UTF-8 to be printed correctly.
Unicode characters in the range 0x10000 to 0x10ffff are converted to "surrogate pairs" which take two words each (this is called UTF-16 encoding).

33.11.3.37 fl_utf8towc()

unsigned fl_utf8towc (  
    const char * src,  
    GENERATED BY DOXYGEN
Converts a UTF-8 string into a wide character string.
This function generates 32-bit wchar_t (e.g. "ucs4" as it were) except on Windows where it is equivalent to fl_utf8toUtf16 and returns UTF-16.

`src` points at the UTF-8, and `srclen` is the number of bytes to convert.
`dst` points at an array to write, and `dstlen` is the number of locations in this array. At most `dstlen-1` wchar_t will be written there, plus a 0 terminating wchar_t.
The return value is the number of wchar_t that would be written to `dst` if it were long enough, not counting the terminating zero. If the return value is greater or equal to `dstlen` it indicates truncation, you can then allocate a new array of size return+1 and call this again.

Notice that sizeof(wchar_t) is 2 on Windows and is 4 on Linux and most other systems. Where wchar_t is 16 bits, Unicode characters in the range 0x10000 to 0x10ffff are converted to "surrogate pairs" which take two words each (this is called UTF-16 encoding). If wchar_t is 32 bits this rather nasty problem is avoided.

Note that Windows includes Cygwin, i.e. compiled with Cygwin's POSIX layer (cygwin1.dll, --enable-cygwin), either native (GDI) or X11.

### 33.11.3.38 fl_utf_nb_char()

```c
int fl_utf_nb_char (  
  const unsigned char ∗buf,  
  int len )
```

Returns the number of Unicode chars in the UTF-8 string.

See also

```c
fl_utf8strlen(const char ∗text, int len)
```

### 33.11.3.39 fl_utf_strcasecmp()

```c
int fl_utf_strcasecmp (  
  const char ∗s1,  
  const char ∗s2 )
```

UTF-8 aware strcasecmp - converts to Unicode and tests.

Returns

```
result of comparison
```

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the strings are equal</td>
</tr>
<tr>
<td>1</td>
<td>if s1 is greater than s2</td>
</tr>
<tr>
<td>-1</td>
<td>if s1 is less than s2</td>
</tr>
</tbody>
</table>

### 33.11.3.40 fl_utf_strncasecmp()

```c
int fl_utf_strncasecmp (  
  const char ∗s1,  
  const char ∗s2,  
  int n )
```

UTF-8 aware strncasecmp - converts to lower case Unicode and tests.
Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>s1, s2</td>
<td>the UTF-8 strings to compare</td>
</tr>
<tr>
<td>n</td>
<td>the maximum number of UTF-8 characters to compare</td>
</tr>
</tbody>
</table>

Returns

result of comparison

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the strings are equal</td>
</tr>
<tr>
<td>&gt;0</td>
<td>if s1 is greater than s2</td>
</tr>
<tr>
<td>&lt;0</td>
<td>if s1 is less than s2</td>
</tr>
</tbody>
</table>

33.11.3.41  fl_utf_tolower()

```c
int fl_utf_tolower (const unsigned char * str, int len, char * buf )
```

Converts the string str to its lower case equivalent into buf.
Warning: to be safe buf length must be at least 3 \( \times \) len [for 16-bit Unicode]

33.11.3.42  fl_utf_toupper()

```c
int fl_utf_toupper (const unsigned char * str, int len, char * buf )
```

Converts the string str to its upper case equivalent into buf.
Warning: to be safe buf length must be at least 3 \( \times \) len [for 16-bit Unicode]

33.11.3.43  fl_wcwidth()

```c
int fl_wcwidth (const char * src )
```

extended wrapper around fl_wcwidth_(unsigned int ucs) function.

Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>src</td>
</tr>
</tbody>
</table>

Returns

width of character in columns

Depending on build options, this function may map C1 control characters (0x80 to 0x9f) to CP1252, and return the width of that character instead. This is not the same behaviour as fl_wcwidth_(unsigned int ucs).
Note that other control characters and DEL will still return -1, so if you want different behaviour, you need to test for those characters before calling fl_wcwidth(), and handle them separately.

33.11.3.44  fl_wcwidth_()

```c
int fl_wcwidth_ (unsigned int ucs )
```
Wrapper to adapt Markus Kuhn's implementation of wcwidth() for FLTK.

Parameters

| in   | ucs       | Unicode character value |

Returns

width of character in columns

See [http://www.cl.cam.ac.uk/~mgk25/ucs/wcwidth.c](http://www.cl.cam.ac.uk/~mgk25/ucs/wcwidth.c) for Markus Kuhn's original implementation of wcwidth() and wcswidth() (defined in IEEE Std 1002.1-2001) for Unicode.

**WARNING:** this function returns widths for "raw" Unicode characters. It does not even try to map C1 control characters (0x80 to 0x9F) to CP1252, and C0/C1 control characters and DEL will return -1. You are advised to use `fl_width(const char * src)` instead.

## 33.12 String handling functions

String handling functions declared in `<FL/fl_string_functions.h>`

### Functions

- `char * fl_strdup (const char *s)`
  
  Cross platform interface to POSIX function `strdup()`.

## 33.12.1 Detailed Description

String handling functions declared in `<FL/fl_string_functions.h>`

## 33.12.2 Function Documentation

### 33.12.2.1 fl_strdup()

```c
char * fl_strdup (const char * s)
```

Cross platform interface to POSIX function `strdup()`.

The `fl_strdup()` function returns a pointer to a new string which is a duplicate of the string 's'. Memory for the new string is obtained with `malloc(3)`, and can be freed with `free(3)`.

Implementation:

- **POSIX:** `strdup()`
- **WinAPI:** `_strdup()`

## 33.13 Mac OS X-specific symbols

Mac OS X-specific symbols declared in `<FL/platform.H>`

### Classes

- class `Fl_Mac_App_Menu`
Functions

- **Fl_Window * fl_mac_find (FLWindow *)**
  Returns the Fl_Window corresponding to the given macOS-specific window reference.

- **CGContextRef fl_mac_gc ()**
  Returns the macOS-specific graphics context for the current window.

- **void fl_mac_set_about (Fl_Callback *cb, void *user_data, int shortcut=0)**
  Attaches a callback to the "About myprog" item of the system application menu.

- **FLWindow * fl_mac_xid (const Fl_Window *win)**
  Returns the macOS-specific window reference corresponding to the given Fl_Window object.

- **void fl_open_callback (void(*cb)(const char *))**
  Registers a function called for each file dropped onto an application icon.

Variables

- **int fl_mac_os_version**
  The version number of the running Mac OS X (e.g., 100604 for 10.6.4, 101300 for 10.13, 140102 for 14.1.2).

33.13.1 Detailed Description

Mac OS X-specific symbols declared in `<FL/platform.H>`

See also

- The Apple OS X Interface

33.13.2 Function Documentation

33.13.2.1 fl_mac_set_about()

void fl_mac_set_about (Fl_Callback *cb, void *user_data, int shortcut = 0)

Attaches a callback to the "About myprog" item of the system application menu.

For back-compatibility. Equivalent to Fl_Sys_Menu_Bar::about(Fl_Callback *cb, void *user_data).

33.13.2.2 fl_open_callback()

void fl_open_callback (void(*cb)(const char *))

Register a function called for each file dropped onto an application icon.

This function is effective only on the Mac OS X platform. cb will be called with a single Unix-style file name and path. If multiple files were dropped, cb will be called multiple times.

This function should be called before fl_open_display() is called, either directly or indirectly (this happens at the first show() of a window), to be effective for files dropped on the application icon at launch time. It can also be called at any point to change the function used to open dropped files. A call with a NULL argument, after a previous call, makes the app ignore files dropped later.

33.13.3 Variable Documentation
33.13.3.1  fl_mac_os_version

```c
int fl_mac_os_version [extern]
```

The version number of the running Mac OS X (e.g., 100604 for 10.6.4, 101300 for 10.13, 140102 for 14.1.2). FLTK initializes this global variable before main() begins running. If the value is needed in a static initializer, a previous call to `Fl::system_driver()` makes sure `fl_mac_os_version` has been initialized.

33.14  Common Dialog Classes and Functions

Common dialog functions for file selection, message output, and more.

**Files**

- file `fl_ask.cxx`
  
  Utility functions for common dialogs.

**Classes**

- class `Fl_Color_Chooser`
  
  The `Fl_Color_Chooser` widget provides a standard RGB color chooser.

- class `Fl_File_Chooser`
  
  The `Fl_File_Chooser` widget displays a standard file selection dialog that supports various selection modes.

**Functions**

- void `fl_alert` (const char *fmt,...)
  
  Shows an alert message dialog box.

- int `fl_ask` (const char *fmt,...)
  
  Shows a dialog displaying the `fmt` message, this dialog features 2 yes/no buttons.

- void `fl_beep` (int type)
  
  Emits a system beep.

- int `fl_choice` (const char *fmt, const char *b0, const char *b1, const char *b2,...)
  
  Shows a dialog displaying the printf style `fmt` message.

- int `fl_choice_n` (const char *fmt, const char *b0, const char *b1, const char *b2,...)
  
  Shows a dialog displaying the printf style `fmt` message.

- int `fl_color_chooser` (const char *name, double &r, double &g, double &b, int cmode)
  
  Pops up a window to let the user pick an arbitrary RGB color.

- int `fl_color_chooser` (const char *name, uchar &r, uchar &g, uchar &b, int cmode)
  
  Pops up a window to let the user pick an arbitrary RGB color.

- char * `fl_dir_chooser` (const char *message, const char *fname, int relative)
  
  Shows a file chooser dialog and gets a directory.

- char * `fl_file_chooser` (const char *message, const char *pat, const char *fname, int relative)
  
  Shows a file chooser dialog and gets a filename.

- void `fl_file_chooser_callback` (void(*)(const char *))
  
  Set the file chooser callback.

- void `fl_file_chooser_ok_label` (const char *l)
  
  Set the "OK" button label.

- const char * `fl_input` (const char *fmt, const char *defstr,...)
  
  Shows an input dialog displaying the `fmt` message with variable arguments.

- const char * `fl_input` (int maxchar, const char *fmt, const char *defstr,...)
  
  Shows an input dialog displaying the `fmt` message with variable arguments.

- void `fl_message` (const char *fmt,...)
  
  Shows an information message dialog box.
• int fl_message_hotspot ()
  Gets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer.

• void fl_message_hotspot (int enable)
  Sets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer.

• Fl_Widget * fl_message_icon ()
  Gets the Fl_Box icon container of the current default dialog used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• void fl_message_icon_label (const char *str)
  Sets the icon label of the dialog window used in many common dialogs.

• void fl_message_position (const int x, const int y, const int center)
  Sets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• void fl_message_position (Fl_Widget *widget)
  Sets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• int fl_message_position (int *x, int *y)
  Gets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• void fl_message_title (const char *title)
  Sets the title of the dialog window used in many common dialogs.

• void fl_message_title_default (const char *title)
  Sets the default title of the dialog window used in many common dialogs.

• const char *fl_password (const char *fmt, const char *defstr,...)
  Shows an input dialog displaying the fmt message with variable arguments.

• const char *fl_password (int maxchar, const char *fmt, const char *defstr,...)
  Shows an input dialog displaying the fmt message with variable arguments.

Variables

• static void(* Fl::error ) (const char *,...) = Fl_System_Driver::error
  FLTK calls Fl::error() to output a normal error message.

• static void(* Fl::fatal ) (const char *,...) = Fl_System_Driver::fatal
  FLTK calls Fl::fatal() to output a fatal error message.

• const char *fl_cancel = "Cancel"
  string pointer used in common dialogs, you can change it to another language

• const char *fl_close = "Close"
  string pointer used in common dialogs, you can change it to another language

• Fl_Font fl_message_font_ = FL_HELVETICA

• Fl_Fontsize fl_message_size_ = -1

• const char *fl_no = "No"
  string pointer used in common dialogs, you can change it to another language

• const char *fl_ok = "OK"
  string pointer used in common dialogs, you can change it to another language

• const char *fl_yes = "Yes"
  string pointer used in common dialogs, you can change it to another language

• static void(* Fl::warning ) (const char *,...) = Fl_System_Driver::warning
  FLTK calls Fl::warning() to output a warning message.

33.14.1 Detailed Description

Common dialog functions for file selection, message output, and more.
33.14 Common Dialog Classes and Functions

33.14.2 Function Documentation

33.14.2.1 fl_alert()

```c
void fl_alert ( 
    const char * fmt, 
    ... )
```

Shows an alert message dialog box.
`#include <FL/fl_alert.H>

Parameters

| in  | fmt               | can be used as an sprintf-like format and variables for the message text |

33.14.2.2 fl_ask()

```c
int fl_ask ( 
    const char * fmt, 
    ... )
```

Shows a dialog displaying the `fmt` message, this dialog features 2 yes/no buttons.
`#include <FL/fl_ask.H>

Parameters

| in  | fmt               | can be used as an sprintf-like format and variables for the message text |

Return values

| 0   | if the no button is selected |
| 1   | if yes is selected |

Deprecated fl_ask() is deprecated since it uses "Yes" and "No" for the buttons which does not conform to the current FLTK Human Interface Guidelines. Use fl_choice() with the appropriate verbs instead.

33.14.2.3 fl_beep()

```c
void fl_beep ( 
    int type )
```

Emits a system beep.
This function is platform specific. Depending on the input `type` a different sound may be played or the system speaker may beep with a different volume.
On X the system speaker is used which may not work at all on newer systems that don't have a speaker. Since 1.4.0 FL_BEEP_DEFAULT and other types honor the system or user settings whereas FL_BEEP_ERROR uses 100% volume. This may be changed in a future version.
On Wayland an ASCII BEL (0x07) is output to stderr.
On Windows the MessageBeep() function is used to play different sounds depending on the type argument.
On macOS the system beep function NSBeep() is used for FL_BEEP_DEFAULT and FL_BEEP_ERROR. Other types are ignored.
On other platforms the behavior is undefined and may change in the future.

---

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### Parameters

| in | type | The beep type from the Fl_Beep enumeration (optional) |

```c
#include <FL/fl_ask.H>
```

#### 33.14.2.4 fl_choice()

```c
int fl_choice (const char ∗fmt, const char ∗b0, const char ∗b1, const char ∗b2, ... )
```

Shows a dialog displaying the printf style `fmt` message. This dialog features up to 3 customizable choice buttons which are specified in order of right-to-left in the dialog, e.g.

![Figure 33.5 fl_choice() button ordering](image)

Include `<FL/fl_ask.H>`

Three choices with printf() style formatting:

![Figure 33.6 fl_choice() three choices with printf formatting](image)

```c
int num_msgs = GetNumberOfMessages();
switch ( fl_choice("What to do with %d messages?", "Send", "Save", "Delete", num_msgs) ) {
    case 0: .. // Send
    case 1: .. // Save (default)
    case 2: .. // Delete
    ..
}
```

Three choice example:

![Figure 33.7 fl_choice() three choices](image)

```c
switch ( fl_choice("How many bedrooms?", "Zero", "One", "Two") ) {
    case 0: .. // "Zero"
    case 1: .. // "One" (default)
    case 2: .. // "Two"
}
```

Two choice example:

![Figure 33.8 fl_choice() two choices](image)

```c
switch ( fl_choice("Empty trash?", "Yes", "No", 0) ) {
```
33.14 Common Dialog Classes and Functions

```c
    case 0: .. // Yes
    case 1: .. // No (default)
```

One choice example:

![Figure 33.9 fl_choice() one choice](image)

```c
fl_choice("All hope is lost.", "OK", 0, 0); // "OK" default
```

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>fmt</code></td>
<td>Can be used as an sprintf-like format and variables for the message text</td>
</tr>
<tr>
<td><code>b0</code></td>
<td>Text label for right button 0</td>
</tr>
<tr>
<td><code>b1</code></td>
<td>Text label for middle button 1 (can be 0)</td>
</tr>
<tr>
<td><code>b2</code></td>
<td>Text label for left button 2 (can be 0)</td>
</tr>
</tbody>
</table>

### Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>If the button with <code>b0</code> text is pushed or the user pressed the Escape key or clicked the window close button</td>
</tr>
<tr>
<td>1</td>
<td>If the button with <code>b1</code> text is pushed or the user pressed the Return key</td>
</tr>
<tr>
<td>2</td>
<td>If the button with <code>b2</code> text is pushed</td>
</tr>
</tbody>
</table>

#### 33.14.2.5 fl_choice_n()

```c
int fl_choice_n (  
    const char * fmt,  
    const char * b0,  
    const char * b1,  
    const char * b2,  
    ...  
)
```

Shows a dialog displaying the printf style `fmt` message.

This function is like `fl_choice()` but returns -1 if the dialog window was closed by pressing the Escape key or the window close button rather than pushing one of the dialog buttons.

See also

- `fl_choice()`

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>fmt</code></td>
<td>Can be used as an sprintf-like format and variables for the message text</td>
</tr>
<tr>
<td><code>b0</code></td>
<td>Text label for right button 0</td>
</tr>
<tr>
<td><code>b1</code></td>
<td>Text label for middle button 1 (can be 0)</td>
</tr>
<tr>
<td><code>b2</code></td>
<td>Text label for left button 2 (can be 0)</td>
</tr>
</tbody>
</table>

### Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>Reserved, FLTK 1.3 only: another dialog is still open (not possible in 1.4)</td>
</tr>
<tr>
<td>-2</td>
<td>If the dialog was closed by pushing the window close button</td>
</tr>
<tr>
<td>-1</td>
<td>If the dialog was closed by hitting Escape</td>
</tr>
</tbody>
</table>

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Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the button with b0 text is pushed</td>
</tr>
<tr>
<td>1</td>
<td>if the button with b1 text is pushed</td>
</tr>
<tr>
<td>2</td>
<td>if the button with b2 text is pushed</td>
</tr>
</tbody>
</table>

33.14.2.6 fl_color_chooser() [1/2]

```c
int fl_color_chooser (const char * name, double & r, double & g, double & b, int cmode) ;
```

Pops up a window to let the user pick an arbitrary RGB color.

Note

```c
#include <FL/Fl_Color_Chooser.H>
```

![Figure 33.10 fl_color_chooser](image)

**Figure 33.10 fl_color_chooser**

**Parameters**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>name</td>
</tr>
<tr>
<td>in,out</td>
<td>r,g,b</td>
</tr>
<tr>
<td>in</td>
<td>cmode</td>
</tr>
</tbody>
</table>

**Return values**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if user confirms the selection</td>
</tr>
<tr>
<td>0</td>
<td>if user cancels the dialog</td>
</tr>
</tbody>
</table>
33.14.2.7 fl_color_chooser() [2/2]

```c
int fl_color_chooser(
    const char * name,
    uchar & r,
    uchar & g,
    uchar & b,
    int cmode ) [related]
```

Pops up a window to let the user pick an arbitrary RGB color.

Note

```c
#include <FL/Fl_Color_Chooser.H>
```

![Image of fl_color_chooser](image)

**Figure 33.11 fl_color_chooser**

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>name</td>
<td>Title label for the window</td>
</tr>
<tr>
<td>in,out</td>
<td>r,g,b</td>
<td>Color components in the range 0 to 255.</td>
</tr>
<tr>
<td>in</td>
<td>cmode</td>
<td>Optional mode for color chooser. See mode(int). Default -1 if none (rgb mode).</td>
</tr>
</tbody>
</table>

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if user confirms the selection</td>
</tr>
<tr>
<td>0</td>
<td>if user cancels the dialog</td>
</tr>
</tbody>
</table>

33.14.2.8 fl_dir_chooser()

```c
char * fl_dir_chooser(
    const char * message,
    const char * fname,
    int relative ) [related]
```

Shows a file chooser dialog and gets a directory.
#include `<FL/Fl_File_Chooser.H>`

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>message</code></td>
<td>Title bar text</td>
</tr>
<tr>
<td><code>fname</code></td>
<td>Initial/default directory name</td>
</tr>
<tr>
<td><code>relative</code></td>
<td>0 for absolute path return, relative otherwise</td>
</tr>
</tbody>
</table>

**Returns**

The directory path string chosen by the user or NULL if user cancels.

### 33.14.2.9 fl_file_chooser()

```c
char * fl_file_chooser (const char * message, const char * pat, const char * fname, int relative) [related]
```

Shows a file chooser dialog and gets a filename.

**Note**

#include `<FL/Fl_File_Chooser.H>`

---

![FI_File_Chooser Test](image_file)

**Figure 33.12 FI_File_Chooser**

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### 33.14 Common Dialog Classes and Functions

#### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>message</code></td>
<td>text in title bar</td>
</tr>
<tr>
<td><code>pat</code></td>
<td>filename pattern filter</td>
</tr>
<tr>
<td><code>fname</code></td>
<td>initial/default filename selection</td>
</tr>
<tr>
<td><code>relative</code></td>
<td>0 for absolute path name, relative path name otherwise</td>
</tr>
</tbody>
</table>

Returns

the user selected filename, in absolute or relative format or NULL if user cancels

#### 33.14.2.10  fl_file_chooser_callback()

```c
void fl_file_chooser_callback (const char * cb) [related]
```

Set the file chooser callback.

**Note**

```c
#include <FL/Fl_File_Chooser.H>
```

#### 33.14.2.11  fl_file_chooser_ok_label()

```c
void fl_file_chooser_ok_label (const char * l) [related]
```

Set the "OK" button label.

**Note**

```c
#include <FL/Fl_File_Chooser.H>
```

#### 33.14.2.12  fl_input() [1/2]

```c
const char * fl_input (const char * fmt, const char * defstr, ...)
```

Shows an input dialog displaying the `fmt` message with variable arguments.

Returns the string in an internally allocated buffer that may be changed later. You **must** copy the string immediately after return from this method - at least before the next execution of the event loop.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>fmt</code></td>
<td>can be used as a sprintf-like format and variables for the message text</td>
</tr>
<tr>
<td><code>defstr</code></td>
<td>defines the default returned string if no text is entered</td>
</tr>
</tbody>
</table>

Returns

the user string input if OK was pushed

**Return values**

- `NULL` if Cancel was pushed or the window was closed by the user
33.14.2.13 fl_input() [2/2]

const char * fl_input (  
   int maxchar,  
   const char * fmt,  
   const char * defstr,  
   ... )

Shows an input dialog displaying the fmt message with variable arguments. This is the same as const char *fl_input(const char *fmt, const char *defstr, ...) except that it has an additional parameter to limit the number of characters the user can input. Returns the string in an internally allocated buffer that may be changed later. You must copy the string immediately after return from this method - at least before the next execution of the event loop.

```
#include <FL/fl_ask.h>
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in maxchar</td>
<td>maximum number of characters the user can input (UTF-8 aware)</td>
</tr>
<tr>
<td>in fmt</td>
<td>can be used as an sprintf-like format and variables for the message text</td>
</tr>
<tr>
<td>in defstr</td>
<td>defines the default returned string if no text is entered</td>
</tr>
</tbody>
</table>

**Returns**

the user string input if OK was pushed

**Return values**

- **NULL** if Cancel was pushed or the window was closed by the user

33.14.2.14 fl_message()

void fl_message (  
   const char * fmt,  
   ... )

Shows an information message dialog box.

```
#include <FL/fl_ask.h>
```

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in fmt</td>
<td>can be used as an sprintf-like format and variables for the message text</td>
</tr>
</tbody>
</table>

33.14.2.15 fl_message_hotspot() [1/2]

int fl_message_hotspot (  
   void )

Gets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer. This is a permanent setting. It remains active and affects the window position unless overridden by an explicit positioning request by means of one of the fl_message_position() variants.

```
#include <FL/fl_ask.h>
```
33.14.2.16 fl_message_hotspot() [2/2]

void fl_message_hotspot (  
    int enable  )

Sets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer. The default is enabled, so that the default button is the hotspot and appears at the mouse position.

#include <FL/fl_ask.H>

Parameters

| in | enable | non-zero enables hotspot behavior, 0 disables hotspot |

33.14.2.17 fl_message_icon()

Fl_Widget * fl_message_icon ( )

Gets the Fl_Box icon container of the current default dialog used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password(). The return value cannot be Null. The object pointed to is an Fl_Box widget. The returned pointer (Fl_Widget *) can be safely cast to an Fl_Box* pointer.

Note

You can set some attributes of this default icon box. These attributes are sticky, i.e. they will be used in all subsequent common dialogs unless overridden by specific "one shot" variables. Setting any attribute except those mentioned below causes undefined behavior.

Supported icon attributes:

- box()
- labelfont()
- labelsize()
- color()
- labelcolor()
- image()
- align()

The icon size can not be changed. If you set an image() you should scale it to the available size, i.e. w() and h() of the icon box.

#include <FL/fl_ask.H>
33.14.2.18 fl_message_icon_label()

```c
void fl_message_icon_label (  
    const char * str )
```

Sets the icon label of the dialog window used in many common dialogs. This icon label will be used in the next call of one of the common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.

The label `str` is stored internally as a reference, it must be in scope until the dialog function (e.g. `fl_choice()`) is called.

It applies only to the next call of one of the common dialogs and will be reset after that call so the next dialog will use its default label unless set again.

**Note**

This label string must be short, usually only one character so it fits in the icon box. You can use any valid UTF-8 character, e.g. the Euro sign (“€”) which is three bytes in UTF-8 encoding.

```c
#include <FL/fl_ask.H>
```

**Parameters**

- `in str icon label`

33.14.2.19 fl_message_position() [1/3]

```c
void fl_message_position (  
    const int x,  
    const int y,  
    const int center )
```

Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.

The position set with this method overrides the hotspot setting, i.e. setting a position has higher priority than the hotspot mode set by `fl_message_hotspot(int)`.

The preferred position set by any of the `fl_message_position()` variants affects only the next call of one of the common dialogs. The preferred position is reset to 0 (unset) as soon as the dialog is shown.

If the optional argument `center` is non-zero (true) the message box will be centered at the given coordinates rather than using the X/Y position as the window position (top left corner).

```c
#include <FL/fl_ask.H>
```

**Parameters**

- `in x Preferred X position`
- `in y Preferred Y position`
- `in center 1 = centered, 0 = absolute`

See also

- `int fl_message_position(int *x, int *y)`

33.14.2.20 fl_message_position() [2/3]

```c
void fl_message_position (  
    Fl_Widget * widget )
```

Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.

The message box will be centered over the given widget or window extensions.
Everything else is like `fl_message_position(int, int, int)` with argument 'center' set to 1.

```c
#include <FL/fl_ask.H>
```
Parameters

| in  | widget | Widget or window to position the message box over. |

See also

```c
int fl_message_position(int x, int y, int center)
```

### 33.14.2.21  fl_message_position() [3/3]

```c
int fl_message_position (    
    int * x,          
    int * y )
```

Gets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.

```c
#include "FL/fl_ask.H"
```

The position set with this method overrides the hotspot setting, i.e. setting a position has higher priority than the hotspot mode set by `fl_message_hotspot(int)`.

The preferred position set by any of the `fl_message_position()` variants affects only the next call of one of the common dialogs. The preferred position is reset to 0 (unset) as soon as the dialog is shown.

Parameters

<table>
<thead>
<tr>
<th>out</th>
<th>x</th>
<th>Preferred X position, returns -1 if not set</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>y</td>
<td>Preferred Y position, returns -1 if not set</td>
</tr>
</tbody>
</table>

Returns

whether position is currently set or not

Return values

<table>
<thead>
<tr>
<th>0</th>
<th>position is not set (hotspot may be enabled or not)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>position is set (window position)</td>
</tr>
<tr>
<td>2</td>
<td>position is set (message box centered)</td>
</tr>
</tbody>
</table>

See also

- `fl_message_hotspot()`
- `fl_message_hotspot(int)`
- `fl_message_position(int, int)`
- `fl_message_position(const int x, const int y, const int center)`
- `fl_message_position(Fl_Widget *)`

### 33.14.2.22  fl_message_title()

```c
void fl_message_title (    
    const char * title )
```

Sets the title of the dialog window used in many common dialogs. This window title will be used in the next call of one of the common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.
33.14 Common Dialog Classes and Functions

The *title* string is copied internally, so that you can use a local variable or free the string immediately after this call. It applies only to the *next* call of one of the common dialogs and will be reset to an empty title (the default for all dialogs) after that call.

```c
#include <FL/fl_ask.H>
```

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>in</code></td>
<td><code>title</code></td>
<td>window label, string copied internally</td>
</tr>
</tbody>
</table>

33.14.2.23 **fl_message_title_default()**

```c
void fl_message_title_default (  
    const char * title  
)
```

Sets the default title of the dialog window used in many common dialogs. This window *title* will be used in all subsequent calls of one of the common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`, unless a specific title has been set with `fl_message_title(const char *title)`. The default is no title. You can override the default title for a single dialog with `fl_message_title(const char *title)`. The *title* string is copied internally, so that you can use a local variable or free the string immediately after this call.

```c
#include <FL/fl_ask.H>
```

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>in</code></td>
<td><code>title</code></td>
<td>default window label, string copied internally</td>
</tr>
</tbody>
</table>

33.14.2.24 **fl_password()** [1/2]

```c
const char * fl_password (  
    const char * fmt,  
    const char * defstr,  
    ...  
)
```

Shows an input dialog displaying the *fmt* message with variable arguments. Like `fl_input()` except the input text is not shown, "*" or similar replacement characters are displayed instead.

```c
#include <FL/fl_ask.H>
```

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>in</code></td>
<td><code>fmt</code></td>
<td>can be used as an sprintf-like format and variables for the message text</td>
</tr>
<tr>
<td><code>in</code></td>
<td><code>defstr</code></td>
<td>defines the default returned string if no text is entered</td>
</tr>
</tbody>
</table>

**Returns**

the user string input if OK was pushed

**Return values**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>NULL</code></td>
<td>if Cancel was pushed or the window was closed by the user</td>
</tr>
</tbody>
</table>

33.14.2.25 **fl_password()** [2/2]

```c
const char * fl_password (  
    int maxchar,  
)
```

Generated by Doxygen
const char * fmt,
const char * defstr,
...

Shows an input dialog displaying the fmt message with variable arguments.
Like fl_input() except the input text is not shown, '*' or similar replacement characters are displayed instead.

#include <FL/fl_ask.H>

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>maxchar</th>
<th>input length limit in chars, 0 = no limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>fmt</td>
<td>can be used as an sprintf-like format and variables for the message text</td>
</tr>
<tr>
<td>in</td>
<td>defstr</td>
<td>defines the default returned string if no text is entered</td>
</tr>
</tbody>
</table>

Returns
the user string input if OK was pushed

Return values

NULL | if Cancel was pushed or the window was closed by the user |

33.14.3 Variable Documentation

33.14.3.1 error

void(* Fl::error)(const char * format,...) = Fl_System_Driver::error [static]

FLTK calls Fl::error() to output a normal error message.
The default version on Windows displays the error message in a MessageBox window.
The default version on all other platforms prints the error message to stderr.
You can override the behavior by setting the function pointer to your own routine.
Fl::error() means there is a recoverable error such as the inability to read an image file. The default implementation
returns after displaying the message.

Note

#include <FL/Fl.H>

33.14.3.2 fatal

void(* Fl::fatal)(const char * format,...) = Fl_System_Driver::fatal [static]

FLTK calls Fl::fatal() to output a fatal error message.
The default version on Windows displays the error message in a MessageBox window.
The default version on all other platforms prints the error message to stderr.
You can override the behavior by setting the function pointer to your own routine.
Fl::fatal() must not return, as FLTK is in an unusable state, however your version may be able to use longjmp or an
exception to continue, as long as it does not call FLTK again. The default implementation exits with status 1 after
displaying the message.

Note

#include <FL/Fl.H>
33.14.3.3 warning

```cpp
void(* Fl::warning)(const char *format,...) = Fl_System_Driver::warning [static]
```

FLTK calls `Fl::warning()` to output a warning message. The default version on Windows returns without printing a warning message, because Windows programs normally don't have stderr (a console window) enabled. The default version on all other platforms prints the warning message to stderr.

You can override the behavior by setting the function pointer to your own routine. `Fl::warning()` means that there was a recoverable problem, the display may be messed up, but the user can probably keep working - all X protocol errors call this, for example. The default implementation returns after displaying the message.

Note

```cpp
#include <FL/Fl.H>
```

## 33.15 File names and URI utility functions

File names and URI functions defined in `<FL/filename.H>`

### Macros

- ```cpp
   #define FL_PATH_MAX 2048
   all path buffers should use this length
   ```

### Typedefs

- ```cpp
   typedef int() Fl_File_Sort_F(struct dirent **, struct dirent **)
   File sorting function.
   ```

### Functions

- ```cpp
   void fl_decode_uri (char *uri)
   Decodes a URL-encoded string.
   ```

- ```cpp
   int fl_filename_absolute (char *to, int tolen, const char *from)
   Makes a filename absolute from a relative filename to the current working directory.
   ```

- ```cpp
   int fl_filename_absolute (char *to, int tolen, const char *from, const char *cwd)
   Concatenate the absolute path base with from to form the new absolute path in to.
   ```

- ```cpp
   int fl_filename_expand (char *to, int tolen, const char *from)
   Expands a filename containing shell variables and tilde (~).
   ```

- ```cpp
   const char * fl_filename_ext (const char *buf)
   Gets the extension of a filename.
   ```

- ```cpp
   void fl_filename_free_list (struct dirent ***, int n)
   Free the list of filenames that is generated by `fl_filename_list()`.
   ```

- ```cpp
   int fl_filename_isdir (const char *name)
   Determines if a file exists and is a directory from its filename.
   ```

- ```cpp
   int fl_filename_list (const char *d, struct dirent ***, Fl_File_Sort_F *s=fl_numericsort)
   Portable and const-correct wrapper for the scandir() function.
   ```

- ```cpp
   int fl_filename_match (const char *name, const char *pattern)
   Checks if a string s matches a pattern p.
   ```

- ```cpp
   const char * fl_filename_name (const char *filename)
   Gets the file name from a path.
   ```

- ```cpp
   int fl_filename_relative (char *to, int tolen, const char *from)
   Makes a filename relative to the current working directory.
   ```

- ```cpp
   int fl_filename_relative (char *to, int tolen, const char *from, const char *cwd)
   ```
Makes a filename relative to any other directory.

- `char * fl_filename_setext (char *to, int tolen, const char *ext)`
  
  Replaces the extension in buf of max.

- `int fl_open_uri (const char *uri, char *msg, int msglen)`
  
  Opens the specified Uniform Resource Identifier (URI).

### 33.15.1 Detailed Description

File names and URI functions defined in `<FL/filename.H>`

### 33.15.2 Typedef Documentation

#### 33.15.2.1 Fl_File_Sort_F

```c
typedef int() Fl_File_Sort_F(struct dirent **, struct dirent **)
```

File sorting function.

See also:

- `fl_filename_list()`

### 33.15.3 Function Documentation

#### 33.15.3.1 fl_decode_uri()

```c
void fl_decode_uri (char *uri)
```

Decodes a URL-encoded string.

In a Uniform Resource Identifier (URI), all non-ASCII bytes and several others (e.g., `'<', '', ' '`) are URL-encoded using 3 bytes by `%XY` where XY is the hexadecimal value of the byte. This function decodes the URI restoring its original UTF-8 encoded content. Decoding is done in-place.

#### 33.15.3.2 fl_filename_absolute() [1/2]

```c
int fl_filename_absolute (char * to, int tolen, const char * from)
```

Makes a filename absolute from a relative filename to the current working directory.

```c
#include <FL/filename.H>
```

```c
fl_chdir("/var/tmp");
fl_filename_absolute(out, sizeof(out), "foo.txt"); // out="/var/tmp/foo.txt"
fl_filename_absolute(out, sizeof(out), ".:/foo.txt"); // out="/var/tmp/foo.txt"
fl_filename_absolute(out, sizeof(out), ".:/log/messages"); // out="/var/log/messages"
```

**Parameters**

<table>
<thead>
<tr>
<th>out</th>
<th>to</th>
<th>resulting absolute filename</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>tolen</td>
<td>size of the absolute filename buffer</td>
</tr>
<tr>
<td>in</td>
<td>from</td>
<td>relative filename</td>
</tr>
</tbody>
</table>

**Returns**

0 if no change, non zero otherwise
33.15 File names and URI utility functions

33.15.3.3

405

fl_filename_absolute() [2/2]

int fl_filename_absolute (
char ∗ to,
int tolen,
const char ∗ from,
const char ∗ base )

Concatenate the absolute path base with from to form the new absolute path in to.
#include <FL/filename.H>
char out[FL_PATH_MAX];
fl_filename_absolute(out, sizeof(out), "../foo.txt", "/var/tmp");
// out="/var/foo.txt"
fl_filename_absolute(out, sizeof(out), "../local/bin", "/usr/bin"); // out="/usr/local/bin"

Parameters

out
in
in
in

to

resulting absolute filename

tolen
from
base

size of the absolute filename buffer
relative filename
from is relative to this absolute file path

Returns
0 if no change, non zero otherwise

33.15.3.4

fl_filename_expand()

int fl_filename_expand (
char ∗ to,
int tolen,
const char ∗ from )

Expands a filename containing shell variables and tilde (∼).
Currently handles these variants:
"~username"
"~/file"
"$VARNAME"

// if ’username’ does not exist, result will be unchanged
// does NOT handle ${VARNAME}

Examples:
#include <FL/filename.H>
[..]
putenv("TMPDIR=/var/tmp");
fl_filename_expand(out, sizeof(out), "~fred/.cshrc");
fl_filename_expand(out, sizeof(out), "~/.cshrc");
fl_filename_expand(out, sizeof(out), "$TMPDIR/foo.txt");

Parameters

out
in
in

to

resulting expanded filename

tolen

size of the expanded filename buffer

from

filename containing shell variables

Returns
0 if no change, non zero otherwise

33.15.3.5

fl_filename_ext()

const char ∗ fl_filename_ext (
const char ∗ buf )

Gets the extension of a filename.
#include <FL/filename.H>

Generated by Doxygen

// out="/usr/fred/.cshrc"
// out="/usr/<yourname>/.cshrc"
// out="/var/tmp/foo.txt"


const char *out;
out = fl_filename_ext("/some/path/foo.txt"); // result: ".txt"
out = fl_filename_ext("/some/path/foo"); // result: NULL

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>buf</th>
<th>the filename to be parsed</th>
</tr>
</thead>
</table>

Returns

- a pointer to the extension (including '.') if any or NULL otherwise

### 33.15.3.6 fl_filename_free_list()

```c
void fl_filename_free_list (  
    struct dirent **list,  
    int n )
```

Free the list of filenames that is generated by `fl_filename_list()`. Free everything that was allocated by a previous call to `fl_filename_list()`. Use the return values as parameters for this function.

Parameters

<table>
<thead>
<tr>
<th>in,out</th>
<th>list</th>
<th>table containing the resulting directory listing</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>number of entries in the list</td>
</tr>
</tbody>
</table>

### 33.15.3.7 fl_filename_isdir()

```c
int fl_filename_isdir (  
    const char * n )
```

Determines if a file exists and is a directory from its filename.

```c
#include <FL/filename.H>
```

```c
fl_filename_isdir("/etc"); // returns non-zero
fl_filename_isdir("/etc/hosts"); // returns 0
```

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>n</th>
<th>the filename to parse</th>
</tr>
</thead>
</table>

Returns

- non zero if file exists and is a directory, zero otherwise

### 33.15.3.8 fl_filename_list()

```c
int fl_filename_list (  
    const char * d,  
    dirent *** list,  
    Fl_File_Sort_F * sort )
```

Portable and const-correct wrapper for the `scandir()` function.

For each file in that directory a "dirent" structure is created. The only portable thing about a dirent is that `dirent.d_name` is the nul-terminated file name. A pointers array to these dirent's is created and a pointer to the array is
33.15 File names and URI utility functions

returned in list. The number of entries is given as a return value. If there is an error reading the directory a number less than zero is returned, and errno has the reason; errno does not work under Windows.

Include:
#include <FL/filename.H>

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>d</th>
<th>the name of the directory to list. It does not matter if it has a trailing slash.</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>list</td>
<td>table containing the resulting directory listing</td>
</tr>
</tbody>
</table>

#### Sorting Functors:

- fl_alphasort: The files are sorted in ascending alphabetical order; upper and lowercase letters are compared according to their ASCII ordering uppercase before lowercase.
- fl_casealphasort: The files are sorted in ascending alphabetical order; upper and lowercase letters are compared equally case is not significant.
- fl_casenumeralsort: The files are sorted in ascending "alphanumeric" order, where an attempt is made to put unpadded numbers in consecutive order; upper and lowercase letters are compared equally case is not significant.
- fl_numericsort: The files are sorted in ascending "alphanumeric" order, where an attempt is made to put unpadded numbers in consecutive order; upper and lowercase letters are compared according to their ASCII ordering - uppercase before lowercase.

### Returns

the number of entries if no error, a negative value otherwise.

**Todo** should support returning OS error messages

33.15.3.9 fl_filename_match()

```c
int fl_filename_match (const char * s, const char * p )
```

Checks if a string `s` matches a pattern `p`. The following syntax is used for the pattern:

- `*` matches any sequence of 0 or more characters.
- `?` matches any single character.
- `[set]` matches any character in the set. Set can contain any single characters, or a-z to represent a range. To match `]` or `-` they must be the first characters. To match `^` or `!` they must not be the first characters.
- `[^set]` or `[!set]` matches any character not in the set.
- `{X|Y|Z}` or `{X,Y,Z}` matches any one of the subexpressions literally.
- `\x` quotes the character `x` so it has no special meaning.
- `x` all other characters are matched "exactly" on a case-insensitive basis.

**Notes:**

- `s` and `p` are matched on a char/byte basis, not as UCS codepoints or UTF-8 sequences.
- `[set]` ranges must run from low to high, i.e. `[a-z]` and not `[z-a]`
- `[set]` comparison is case-sensitive, i.e. `[a-z]` won't match "A".
• \x only applies to the fl_filename_match special characters * ? { [ 

• \x needs a double \ or the compiler will complain about non-standard escape sequences.

Include:

```
#include <FL/filename.H>
```

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>s</th>
<th>the string to check for a match</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>p</td>
<td>the string pattern</td>
</tr>
</tbody>
</table>

Returns

non zero if the string matches the pattern

33.15.3.10 fl_filename_name()

```
const char * fl_filename_name ( 
    const char * filename )
```

Gets the file name from a path.

Similar to basename(3), exceptions shown below.

```
#include <FL/filename.H>
```

```
const char * out; 
out = fl_filename_name("/usr/lib"); // out="lib"  
out = fl_filename_name("/usr/");  // out=""    (basename(3) returns "usr" instead)  
out = fl_filename_name("/usr"); // out="usr" 
out = fl_filename_name("/"); // out=""    (basename(3) returns "/" instead) 
out = fl_filename_name(".."); // out=".." 
out = fl_filename_name(".."); // out=".." 
```

Returns

a pointer to the char after the last slash, or to filename if there is none.

33.15.3.11 fl_filename_relative() [1/2]

```
int fl_filename_relative ( 
    char * to,  
    int tolen, 
    const char * from )
```

Makes a filename relative to the current working directory.

Return the from path made relative to the working directory, similar to C++17 std::filesystem::path::lexically_relative. This function can also be called with a fourth argument for a user supplied base directory path.

These conversions are purely lexical. They do not check that the paths exist, do not follow symlinks, and do not access the filesystem at all.

Path arguments must be absolute (start at the root directory) and must not contain . or .. segments, or double separators. A single trailing separator is ok.

On Windows, path arguments must start with a drive name, e.g. c:\. Windows network paths and other special paths starting with a double separator are not supported (\cloud\drive\path, \?\, etc.). Separators can be \ and / and will be preserved. Newly created separators are always the forward slash /.

On Windows and macOS, the path segment tests are case insensitive.

If the path cannot be generated, from path is copied into the to buffer and 0 is returned.

```
#include <FL/filename.H>
```

```
fl_chdir("/var/tmp/somedir"); // set cwd to /var/tmp/somedir 
```

```
fl_filename_relative(out, sizeof(out), "/var/tmp/somedir/foo.txt"); // out="foo.txt", return=1 
fl_filename_relative(out, sizeof(out), "/var/tmp/foo.txt"); // out="../foo.txt", return=1 
```
File names and URI utility functions

33.15 File names and URI utility functions

#include "fl_filesystem.h"

#include "fl_filesystem.h"

#include "fl_filesystem.h"

int fl_filename_relative ( char *to, int tolen, const char *from, const char *base )

Makes a filename relative to any other directory.

Parameters

\begin{tabular}{|c|c|}
  \hline
  out & to \\
  \hline
  in & tolen \\
  \hline
  in & from \\
  \hline
  in & base \\
  \hline
\end{tabular}

Returns

0 if no change, non zero otherwise

See also

fl_filename_relative(char *to, int tolen, const char *from, const char *base)

33.15.3.13 fl_filename_setext()

char * fl_filename_setext ( char *buf, int buflen, const char *ext )

Replaces the extension in buf of max.

size buflen with the extension in ext.

If there's no '.' in buf, ext is appended.

If ext is NULL, behaves as if it were an empty string ("").

Generated by Doxygen
Example
#include <FL/filename.H>
[.] char buf[FL_PATH_MAX] = "./path/myfile.cxx"
fl_filename_setext(buf, sizeof(buf), "_txt"); // buf[] becomes "/path/myfile.txt"

Returns
buf itself for calling convenience.

3.15.3.14 fl_open_uri()

int fl_open_uri ( const char * uri, char * msg, int msglen )

Opens the specified Uniform Resource Identifier (URI).
Uses an operating-system dependent program or interface. For URIs using the "ftp", "http", or "https" schemes, the
system default web browser is used to open the URI, while "mailto" and "news" URIs are typically opened using the
system default mail reader and "file" URIs are opened using the file system navigator.
On success, the (optional) msg buffer is filled with the command that was run to open the URI; on Windows, this will
always be "open uri".
On failure, the msg buffer is filled with an English error message.

Note
Platform Specific Issues: Windows
With "file:" based URIs on Windows, you may encounter issues with anchors being ignored. Example: "file://c:/some/index.html#anchor" may open in the browser without the "#anchor" suffix. The behavior seems to vary across different Windows versions. Workaround: open a link to a separate html file that redirects to the
desired "file:" URI.

Example
#include <FL/filename.H>
[..] char errmsg[512];
if ( !fl_open_uri("http://example.com", errmsg, sizeof(errmsg)) ) {
    char warnmsg[768];
    sprintf(warnmsg, "Error: %s", errmsg);
    fl_alert(warnmsg);
}

Parameters

<table>
<thead>
<tr>
<th>uri</th>
<th>The URI to open</th>
</tr>
</thead>
<tbody>
<tr>
<td>msg</td>
<td>Optional buffer which contains the command or error message</td>
</tr>
<tr>
<td>msglen</td>
<td>Length of optional buffer</td>
</tr>
</tbody>
</table>

Returns
1 on success, 0 on failure
Chapter 34

Class Documentation

34.1 Fl_Grid::Cell Class Reference

Public Member Functions

- Fl_Grid_Align align () const
- void align (Fl_Grid_Align align)
- Cell (Fl_Widget *w, int row, int col)
- Cell (int row, int col)
- void Cell_ ()
- short col () const
- short colspan (short v) const
- void colspan (short v)
- void minimum_size (int *w, int *h) const
- void minimum_size (int w, int h)
- short row () const
- short rowspan (short v) const
- void rowspan (short v)
- Fl_Widget * widget () const

Friends

- class Fl_Grid

The documentation for this class was generated from the following file:

- Fl_Grid.H

34.2 Fl_Terminal::CharStyle Class Reference

Public Member Functions

- void attrib (uchar val)
- uchar attrib (void) const
- void bgcolor (Fl_Color val)
- void bgcolor (int r, int g, int b)
- Fl_Color bgcolor (void) const
- void bgcolor_uchar (uchar val)
- CharStyle (bool fontsize_defer)
- int charwidth (void) const
- void clr_charflag (uchar val)
- uchar colorbits_only (uchar inflags) const
- void defaultbgcolor (Fl_Color val)
• **FL_Color** defaultbgcolor (void) const
• void defaultfgcolor (**FL_Color** val)
• **FL_Color** defaultfgcolor (void) const
• void fgcolor (**FL_Color** val)
• void fgcolor (int r, int g, int b)
• **FL_Color** fgcolor (void) const
• void fgcolor_uchar (uchar val)
• int fontdescent (void) const
• void fontface (**FL_Font** val)
• **FL_Font** fontface (void) const
• int fontheight (void) const
• void fontsize (**FL_Fontsize** val)
• **FL_Fontsize** fontsize (void) const
• int onoff (bool flag, **Attrib** a)
• void set_charflag (uchar val)
• void sgr_blink (bool val)
• void sgr_bold (bool val)
• void sgr_dbl_under (bool val)
• void sgr_dim (bool val)
• void sgr_inverse (bool val)
• void sgr_italic (bool val)
• void sgr_reset (void)
• void sgr_strike (bool val)
• void sgr_underline (bool val)
• void update (void)
• void update_fake (void)

The documentation for this class was generated from the following files:

- **FI_Terminal.H**
- **FI_Terminal.cxx**

### 34.3 **FI_GIF_Image::GIF_FRAME::CPAL** Struct Reference

#### Public Attributes

- uchar **b**
- uchar **g**
- uchar **r**

The documentation for this struct was generated from the following file:

- **FI_GIF_Image.H**

### 34.4 **FI_Terminal::Cursor** Class Reference

#### Public Member Functions

- void bgcolor (**FL_Color** val)
- **FL_Color** bgcolor (void) const
- void col (int val)
- int col (void) const
- int down (void)
- void fgcolor (**FL_Color** val)
- **FL_Color** fgcolor (void) const
- void h (int val)
34.5 Fl_Preferences::Entry Struct Reference

- int h (void) const
- void home (void)
- bool is_rowcol (int drow, int dcol) const
- int left (void)
- int right (void)
- void row (int val)
- int row (void) const
- void scroll (int nrows)
- int up (void)

The documentation for this class was generated from the following files:

- Fl_Terminal.H
- Fl_Terminal.cxx

34.5 Fl_Preferences::Entry Struct Reference

Public Attributes

- char * name
- char * value

The documentation for this struct was generated from the following file:

- Fl_Preferences.H

34.6 Fl_Terminal::EscapeSeq Class Reference

Public Member Functions

- int defvalmax (int dval, int max) const
- void esc_mode (char val)
- char esc_mode (void) const
- bool is_csi (void) const
- int parse (char c)
- bool parse_in_progress (void) const
- void reset (void)
- void restore_cursor (int &row, int &col)
- void save_cursor (int row, int col)
- int total_vals (void) const
- int val (int i) const

Static Public Attributes

- static const int completed = 1
- static const int fail = -1
- static const int maxbuff = 80
- static const int maxvals = 20
- static const int success = 0

The documentation for this class was generated from the following files:

- Fl_Terminal.H
- Fl_Terminal.cxx
Fl Class Reference

The Fl is the FLTK global (static) class containing state information and global methods for the current application.
#include <Fl.H>

Public Types

- enum Fl_Option {
  OPTION_ARROW_FOCUS = 0, OPTION_VISIBLE_FOCUS, OPTION_DND_TEXT, OPTION_SHOW_TOOLTIPS,
  OPTION_FNFC_USES_GTK, OPTION_PRINTER_USES_GTK, OPTION_SHOW_SCALING, OPTION_FNFC_USES_ZENITY,
  OPTION_LAST
}
  Enumerator for global FLTK options.

Static Public Member Functions

- static int abi_check (const int val=FL_ABI_VERSION)
  Returns whether the runtime library ABI version is correct.
- static int abi_version ()
  Returns the compiled-in value of the FL_ABI_VERSION constant.
- static int add_awake_handler_ (Fl_Awake_Handler, void *)
  Adds an awake handler for use in awake().
- static void add_check (Fl_Timeout_Handler, void *=0)
  FLTK will call this callback just before it flushes the display and waits for events.
- static void add_clipboard_notify (Fl_Clipboard_Notify_Handler h, void *=0)
  FLTK will call the registered callback whenever there is a change to the selection buffer or the clipboard.
- static void add_fd (int fd, Fl_FD_Handler cb, void *=0)
  Adds file descriptor fd to listen to.
- static void add_fd (int fd, int when, Fl_FD_Handler cb, void *=0)
  Adds file descriptor fd to listen to.
- static void add_handler (Fl_Event_Handler h)
  Install a function to parse unrecognized events.
- static void add_idle (Fl_Idle_Handler cb, void *=0)
  Adds a callback function that is called every time by Fl::wait() and also makes it act as though the timeout is zero
  (this makes Fl::wait() return immediately, so if it is in a loop it is called repeatedly, and thus the idle function is called
  repeatedly).
- static void add_system_handler (Fl_System_Handler h, void *=data)
  Install a function to intercept system events.
- static void add_timeout (double t, Fl_Timeout_Handler cb, void *=data=0)
  Adds a one-shot timeout callback.
- static int api_version ()
  Returns the compiled-in value of the FL_API_VERSION constant.
- static int arg (int argc, char **argv, int &i)
  Parse a single switch from argv, starting at word i.
- static void args (int argc, char **argv)
  Parse all command line switches matching standard FLTK options only.
- static int args (int argc, char **argv, int &i, Fl_Args_Handler cb=0)
  Parse command line switches using the cb argument handler.
- static int args_to_utf8 (int argc, char **&argv)
  Convert Windows commandline arguments to UTF-8.
- static int awake (Fl_Awake_Handler cb, void *=message=0)
  See void awake(void* message=0).
• static void **awake** (void *message=0)
  Sends a message pointer to the main thread, causing any pending Fl::wait() call to terminate so that the main thread can retrieve the message and any pending redraws can be processed.

• static void **background** (uchar, uchar, uchar)
  Changes fl_color(FL_BACKGROUND_COLOR) to the given color, and changes the gray ramp from 32 to 56 to black to white.

• static void **background2** (uchar, uchar, uchar)
  Changes the alternative background color.

• static Fl_Widget * **belowmouse** ()
  Gets the widget that is below the mouse.

• static void **belowmouse** (Fl_Widget *)
  Sets the widget that is below the mouse.

• static int **box_border_radius_max** ()
  Get the maximum border radius of all "rounded" boxtypes in pixels.

• static void **box_border_radius_max** (int R)
  Set the maximum border radius of all "rounded" boxtypes in pixels.

• static Fl_Color **box_color** (Fl_Color)
  Gets the drawing color to be used for the background of a box.

• static int **box_dh** (Fl_Boxtype)
  Returns the height offset for the given boxtype.

• static int **box_dw** (Fl_Boxtype)
  Returns the width offset for the given boxtype.

• static int **box_dx** (Fl_Boxtype)
  Returns the X offset for the given boxtype.

• static int **box_dy** (Fl_Boxtype)
  Returns the Y offset for the given boxtype.

• static int **box_shadow_width** ()
  Get the box shadow width of all "shadow" boxtypes in pixels.

• static void **box_shadow_width** (int W)
  Set the box shadow width of all "shadow" boxtypes in pixels.

• static bool **cairo_autolink_context** ()
  Gets the current autolink mode for Cairo support.

• static void **cairo_autolink_context** (bool alink)
  When FLT_HAVE_CAIRO is defined and cairo_autolink_context() is true, any current window dc is linked to a current Cairo context.

• static cairo_t * **cairo_cc** ()
  Gets the current Cairo context linked with a fltk window.

• static void **cairo_cc** (cairo_t *c, bool own=false)
  Sets the current Cairo context to c.

• static void **cairo_flush** (cairo_t *c)
  Flush Cairo drawings on Cairo context c.

• static cairo_t * **cairo_make_current** (Fl_Window *w)
  Provides a Cairo context for window wi.

• static Fl_Callback_Reason **callback_reason** ()
  Give the reason for calling a callback.

• static int **check** ()
  Same as Fl::wait(0).

• static void **clear_widget_pointer** (Fl_Widget const *w)
  Clears a widget pointer in the watch list.

• static int **clipboard_contains** (const char *type)
  Returns non 0 if the clipboard contains data matching type.
• static int compose (int &del)
  Any text editing widget should call this for each FL_KEYBOARD event.
• static void compose_reset ()
  If the user moves the cursor, be sure to call Fli::compose_reset().
• static void copy (const char ∗stuff, int len, int destination=0, const char ∗type=Fl::clipboard_plain_text)
  Copies the data pointed to by stuff to the selection buffer (destination is 0), the clipboard (destination is 1), or both (destination is 2).
• static int damage ()
  If true then flush() will do something.
• static void damage (int d)
  If true then flush() will do something.
• static void default_atclose (Fl_Window ∗, void ∗)
  Default callback for window widgets.
• static void delete_widget (Fl_Widget ∗w)
  Schedules a widget for deletion at the next call to the event loop.
• static void disable_im ()
  Disables the system input methods facilities.
• static void display (const char ∗)
  Sets the X or Wayland display to use for all windows.
• static int dnd ()
  Initiate a Drag And Drop operation.
• static int dnd_text_ops ()
  Gets whether drag and drop text operations are supported.
• static void dnd_text_ops (int v)
  Sets whether drag and drop text operations are supported.
• static void do_widget_deletion ()
  Deletes widgets previously scheduled for deletion.
• static int draw_box_active ()
  Determines if the currently drawn box is active or inactive.
• static int draw_GL_text_with_textures ()
  returns whether whether OpenGL uses textures to draw all text.
• static void draw_GL_text_with_textures (int val)
  sets whether OpenGL uses textures to draw all text.
• static void enable_im ()
  Enables the system input methods facilities.
• static int event ()
  Returns the last event that was processed.
• static int event_alt ()
  Returns non-zero if the Alt key is pressed.
• static int event_button ()
  Gets which particular mouse button caused the current event.
• static int event_button1 ()
  Returns non-zero if mouse button 1 is currently held down.
• static int event_button2 ()
  Returns non-zero if button 2 is currently held down.
• static int event_button3 ()
  Returns non-zero if button 3 is currently held down.
• static int event_buttons ()
  Returns the mouse buttons state bits; if non-zero, then at least one button is pressed now.
• static int event_clicks ()
  Returns non zero if we had a double click event.
• static void event_clicks (int i)
  Manually sets the number returned by Fl::event_clicks().
• static void * event_clipboard ()
  Returns the type of the pasted data during an FL_PASTE event.
• static int event_command ()
  Returns non-zero if the FL_COMMAND key is pressed, either FL_CTRL or on OSX FL_META.
• static int event_ctrl ()
  Returns non-zero if the Control key is pressed.
• static Fl_Event_Dispatch event_dispatch ()
  Returns the current event dispatch function.
• static void event_dispatch (Fl_Event_Dispatch d)
  Sets a new event dispatch function.
• static int event_dx ()
  Returns the current horizontal mouse scrolling associated with the FL_MOUSEWHEEL event.
• static int event_dy ()
  Returns the current vertical mouse scrolling associated with the FL_MOUSEWHEEL event.
• static int event_inside (const Fl_Widget *)
  Returns whether or not the mouse event is inside a given child widget.
• static int event_inside (int, int, int, int)
  Returns whether or not the mouse event is inside the given rectangle.
• static int event_is_click ()
  Returns non-zero if the mouse has not moved far enough and not enough time has passed since the last FL_PUSH or FL_KEYBOARD event for it to be considered a "drag" rather than a "click".
• static void event_is_click (int i)
  Clears the value returned by Fl::event_is_click().
• static int event_key ()
  Gets which key on the keyboard was last pushed.
• static int event_key (int key)
  Returns true if the given key was held down (or pressed) during the last event.
• static int event_length ()
  Returns the length of the text in Fl::event_text().
• static int event_original_key ()
  Returns the keycode of the last key event, regardless of the NumLock state.
• static int event_shift ()
  Returns non-zero if the Shift key is pressed.
• static int event_state ()
  Returns the keyboard and mouse button states of the last event.
• static int event_state (int mask)
  Returns non-zero if any of the passed event state bits are turned on.
• static const char * event_text ()
  Returns the text associated with the current event, including FL_PASTE or FL_DND_RELEASE events.
• static int event_x ()
  Returns the mouse position of the event relative to the Fl_Window it was passed to.
• static int event_x_root ()
  Returns the mouse position on the screen of the event.
• static int event_y ()
  Returns the mouse position of the event relative to the Fl_Window it was passed to.
• static int event_y_root ()
  Returns the mouse position on the screen of the event.
• static Fl_Window * first_window ()
  Returns the first top-level window in the list of shown() windows.

• static void first_window (Fl_Window *)
  Sets the window that is returned by first_window().

• static void flush ()
  Causes all the windows that need it to be redrawn and graphics forced out through the pipes.

• static Fl_Widget * focus ()
  Gets the current Fl::focus() widget.

• static void focus (Fl_Widget *)
  Sets the widget that will receive FL_KEYBOARD events.

• static void foreground (uchar, uchar, uchar)
  Changes fl_color(FL_FOREGROUND_COLOR).

• static void free_color (Fl_Color i, int overlay=0)
  Frees the specified color from the colormap, if applicable.

• static int get_awake_handler_ (Fl_Awake_Handler &, void *&)
  Gets the last stored awake handler for use in awake().

• static Fl_Box_Draw_F * get_boxtype (Fl_Boxtype)
  Gets the current box drawing function for the specified box type.

• static unsigned get_color (Fl_Color i)
  Returns the RGB value(s) for the given FLTK color index.

• static void get_color (Fl_Color i, uchar &red, uchar &green, uchar &blue)
  Returns the RGB value(s) for the given FLTK color index.

• static void get_color (Fl_Color i, uchar &red, uchar &green, uchar &blue, uchar &alpha)
  Returns the RGBA value(s) for the given FLTK color index.

• static const char * get_font (Fl_Font)
  Gets the string for this face.

• static const char * get_font_name (Fl_Font, int *attributes=0)
  Get a human-readable string describing the family of this face.

• static int get_font_sizes (Fl_Font, int *sizep)
  Return an array of sizes in sizep.

• static int get_key (int key)
  Returns true if the given key is held down now.

• static void get_mouse (int &, int &)
  Return where the mouse is on the screen by doing a round-trip query to the server.

• static void get_system_colors ()
  Read the user preference colors from the system and use them to call Fl::foreground(), Fl::background(), and Fl::background2().

• static int gl_visual (int, int *alist=0)
  This does the same thing as Fl::visual(int) but also requires OpenGL drawing to work.

• static Fl_Window * grab ()
  Returns the window that currently receives all events.

• static void grab (Fl_Window &win)
  See grab(Fl_Window*)

• static void grab (Fl_Window *)
  Selects the window to grab.

• static int h ()
  Returns the height in pixels of the main screen work area.

• static int handle (int, Fl_Window *)
  Handle events from the window system.

• static int handle_ (int, Fl_Window *)
  Handle events from the window system.
• static int **has_check**(Fl_Timeout_Handler, void * = 0)
  
  Returns 1 if the check exists and has not been called yet, 0 otherwise.

• static int **has_idle**(Fl_Idle_Handler cb, void *data = 0)
  
  Returns true if the specified idle callback is currently installed.

• static int **has_timeout**(Fl_Timeout_Handler cb, void *data = 0)
  
  Returns true if the timeout exists and has not been called yet.

• static void **hide_all_windows**( )
  
  Hide all visible windows to make FLTK leave Fl::run().

• static int **is_scheme**(const char *name)
  
  Returns whether the current scheme is the given name.

• static void **keyboard_screen_scaling**(int value)
  
  Controls the possibility to scale all windows by ctrl/+/-/0/ or cmd/+/-/0/.

• static int **lock**( )
  
  The lock() method blocks the current thread until it can safely access FLTK widgets and data.

• static int **menu_linespacing**( )
  
  Gets the default line spacing used by menus.

• static void **menu_linespacing**(int H)
  
  Sets the default line spacing used by menus.

• static Fl_Window * **modal**( )
  
  Returns the top-most modal() window currently shown.

• static Fl_Window * **next_window**(const Fl_Window *)
  
  Returns the next top-level window in the list of shown() windows.

• static Fl_Timestamp **now**(double offset = 0)
  
  Set a time stamp at this point in time with optional signed offset in seconds.

• static bool **option**(Fl_Option opt)
  
  FLTK library options management.

• static void **option**(Fl_Option opt, bool val)
  
  Override an option while the application is running.

• static void **own_colormap**( )
  
  Makes FLTK use its own colormap.

• static void **paste**(Fl_Widget &receiver)
  
  Backward compatibility only.

• static void **paste**(Fl_Widget &receiver, int source, const char *type = Fl::clipboard_plain_text)
  
  Pastes the data from the selection buffer (source is 0) or the clipboard (source is 1) into receiver.

• static int **program_should_quit**( )
  
  Returns non-zero when a request for program termination was received and accepted.

• static void **program_should_quit**(int should_i)
  
  Indicate to the FLTK library whether a program termination request was received and accepted.

• static Fl_Widget * **pushed**( )
  
  Gets the widget that is being pushed.

• static void **pushed**(Fl_Widget *)
  
  Sets the widget that is being pushed.

• static Fl_Widget * **readqueue**( )
  
  Reads the default callback queue and returns the first widget.

• static int **ready**( )
  
  This is similar to Fl::check() except this does not call Fl::flush() or any callbacks, which is useful if your program is in a state where such callbacks are illegal.

• static void **redraw**( )
  
  Redraws all widgets.

• static void **release**( )
  
  Releases the current grabbed window, equals grab(0).
• static void **release_widget_pointer** (Fl_Widget **w)
  Releases a widget pointer from the watch list.

• static int **reload_scheme** ()
  Called internally when setting a new scheme according to scheme name.

• static void **remove_check** (Fl_Timeout_Handler, void **=0**)
  Removes a check callback.

• static void **remove_clipboard_notify** (Fl_Clipboard_Notify_Handler h)
  Stop calling the specified callback when there are changes to the selection buffer or the clipboard.

• static void **remove_fd** (int)
  Removes a file descriptor handler.

• static void **remove_fd** (int, int when)
  Removes a file descriptor handler.

• static void **remove_handler** (Fl_Event_Handler h)
  Removes a previously added event handler.

• static void **remove_idle** (Fl_Idle_Handler cb, void **=0**)
  Removes the specified idle callback, if it is installed.

• static void **remove_system_handler** (Fl_System_Handler h)
  Removes a previously added system event handler.

• static void **remove_timeout** (Fl_Timeout_Handler cb, void **=0**)
  Removes a timeout callback from the timer queue.

• static void **repeat_timeout** (double t, Fl_Timeout_Handler cb, void **=0**)
  Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.

• static int **run** ()
  Calls Fl::wait() repeatedly as long as any windows are displayed.

• static void **run_checks** ()

• static void **run_idle** ()

• static const char **scheme** ()
  See void scheme(const char **name**)

• static int **scheme** (const char **name**)
  Sets the current widget scheme.

• static int **screen_count** ()
  Gets the total count of available screens.

• static void **screen_dpi** (float &h, float &v, int n=0)
  Gets the screen resolution in dots-per-inch for the given screen.

• static Fl_Screen_Driver **screen_driver** ()
  Returns a pointer to the unique Fl_Screen_Driver object of the platform.

• static int **screen_num** (int x, int y)
  Gets the screen number of a screen that contains the specified screen position x, y.

• static int **screen_num** (int x, int y, int w, int h)
  Gets the screen number for the screen which intersects the most with the rectangle defined by x, y, w, h.

• static float **screen_scale** (int n)
  Current value of the GUI scaling factor for screen number n (n [0, Fl::screen_count()-1])

• static void **screen_scale** (int n, float factor)
  Sets the value of the GUI scaling factor for screen number n (n [0, Fl::screen_count()-1]).

• static int **screen_scaling_supported** ()
  See if scaling factors are supported by this platform.

• static void **screen_work_area** (int &X, int &Y, int &W, int &H)
  Gets the bounding box of the work area of the screen that contains the mouse pointer.

• static void **screen_work_area** (int &X, int &Y, int &W, int &H, int mx, int my)
  Gets the bounding box of the work area of a screen that contains the specified screen position mx, my.

• static void **screen_work_area** (int &X, int &Y, int &W, int &H, int n)
34.7 Fl Class Reference

- **Gets the bounding box of the work area of the given screen.**
  - static void **screen_xywh** (int &X, int &Y, int &W, int &H)
    - Gets the bounding box of a screen that contains the mouse pointer.
  - static void **screen_xywh** (int &X, int &Y, int &W, int &H, int mx, int my)
    - Gets the bounding box of a screen that contains the specified screen position \texttt{mx, my}.
  - static void **screen_xywh** (int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh)
    - Gets the screen bounding rect for the screen which intersects the most with the rectangle defined by \texttt{mx, my, mw, mh}.
  - static void **screen_xywh** (int &X, int &Y, int &W, int &H, int n)
    - Gets the screen bounding rect for the given screen.
  - static int scrollbar_size ()
    - Gets the default scrollbar size used by \texttt{Fl_Browser_, Fl_Help_View, Fl_Scroll, and Fl_Text_Display} widgets.
  - static void scrollbar_size (int W)
    - Sets the default scrollbar size that is used by the \texttt{Fl_Browser_, Fl_Help_View, Fl_Scroll, and Fl_Text_Display} widgets.
  - static double seconds_between (Fl_Timestamp &back, Fl_Timestamp &further_back)
    - Return the time in seconds between two time stamps.
  - static double seconds_since (Fl_Timestamp &then)
    - Return the time in seconds between now and a previously taken time stamp.
  - static void selection (Fl_Widget &owner, const char ∗, int len)
    - Changes the current selection.
  - static Fl_Widget ∗ selection_owner ()
    - back-compatibility only: Gets the widget owning the current selection
  - static void selection_owner (Fl_Widget ∗)
    - Back-compatibility only: The single-argument call can be used to move the selection to another widget or to set the owner to NULL, without changing the actual text of the selection.
  - static int selection_to_clipboard ()
    - Returns the current selection_to_clipboard mode.
  - static void selection_to_clipboard (int mode)
    - Copies selections on X11 directly to the clipboard if enabled.
  - static void set_abort (Fl_Abort_Handler f)
    - For back compatibility, sets the void \texttt{Fl::fatal} handler callback.
  - static void set_atclose (Fl_Atclose_Handler f)
    - For back compatibility, sets the \texttt{Fl::atclose} handler callback.
  - static void set_box_color (Fl_Color)
    - Sets the drawing color for the box that is currently drawn.
  - static void set_boxtype (Fl_Boxtype, Fl_Box_Draw_F ∗, uchar, uchar, uchar, uchar)
    - Sets the function to call to draw a specific boxtype.
  - static void set_boxtype (Fl_Boxtype, Fl_Boxtype from)
    - Copies the from boxtype.
  - static void set_color (Fl_Color i, unsigned c)
    - Sets an entry in the fl_color index table.
  - static void set_color (Fl_Color, uchar, uchar, uchar)
    - Sets an entry in the fl_color index table.
  - static void set_color (Fl_Color, uchar, uchar, uchar, uchar)
    - Sets an entry in the fl_color index table.
  - static void set_font (Fl_Font, const char ∗)
    - Changes a face.
  - static void set_font (Fl_Font, Fl_Font)
    - Copies one face to another.
  - static Fl_Font set_fonts (const char ∗="")
    - \texttt{FLTK} will open the display, and add every fonts on the server to the face table.
  - static void set_idle (Fl_Old_Idle_Handler cb)
Sets an idle callback.

- static void **set_labeltype** (Fl_Labeltype, Fl_Label_Draw_F *, Fl_Label_Measure_F *)
  
  Sets the functions to call to draw and measure a specific labeltype.

- static void **set_labeltype** (Fl_Labeltype, Fl_Labeltype from)
  
  Sets the functions to call to draw and measure a specific labeltype.

- static int **system**(const char *command)
  
  Run a command line on the computer.

- static Fl_System_Driver * **system_driver** ()
  
  Returns a pointer to the unique Fl_System_Driver object of the platform.

- static int **testShortcut** (Fl_Shortcut)
  
  Tests the current event, which must be an FL_KEYBOARD or FL_SHORTCUT, against a shortcut value (described in Fl_Button).

- static double **version** ()
  
  Returns the compiled-in value of the FL_VERSION constant.

- static int **visible_focus** ()
  
  Gets or sets the visible keyboard focus on buttons and other non-text widgets.

- static int **visual**(int)
  
  Selects a visual so that your graphics are drawn correctly.

- static int **w** ()
  
  Returns the width in pixels of the main screen work area.

- static int **wait** ()
  
  Waits until "something happens" and then returns.

- static double **wait** (double time)
  
  Waits a maximum of time_to_wait seconds or until "something happens".

- static void **watch_widget_pointer** (Fl_Widget * &w)
  
  Adds a widget pointer to the widget watch list.

- static int **x** ()
  
  Returns the leftmost x coordinate of the main screen work area.

- static int **y** ()
  
  Returns the topmost y coordinate of the main screen work area.
Static Public Attributes

- static void (*)(Fl_Window *, void *)
  Back compatibility: default window callback handler.
- static char const *const clipboard_image = "image"
  Denotes image data.
- static char const *const clipboard_plain_text = "text/plain"
  Denotes plain textual data.
- static void (*)(const char *, ...) = Fl_System_Driver::error
  FLTK calls Fl::error() to output a normal error message.
- static void (*)(const char *, ...) = Fl_System_Driver::fatal
  FLTK calls Fl::fatal() to output a fatal error message.
- static const char *const help = helpmsg+13
  Usage string displayed if Fl::args() detects an invalid argument.
- static void (*)( idle )
  The currently executing idle callback function: DO NOT USE THIS DIRECTLY!
- static void (*)( warning )
  FLTK calls Fl::warning() to output a warning message.

Friends

- class Fl_System_Driver

34.7.1 Detailed Description

The Fl is the FLTK global (static) class containing state information and global methods for the current application.

34.7.2 Member Enumeration Documentation

34.7.2.1 Fl_Option

defined in Fl.h

**Enum Fl::Fl_Option**

Enumerator for global FLTK options.

These options can be set system wide, per user, or for the running application only.

See also:

- Fl::option(Fl_Option, bool)
- Fl::option(Fl_Option)

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTION_ARROW_FOCUS</td>
<td>When switched on, moving the text cursor beyond the start or end of a text</td>
</tr>
<tr>
<td></td>
<td>in a text widget will change focus to the next text widget. (This is</td>
</tr>
<tr>
<td></td>
<td>considered 'old' behavior)</td>
</tr>
<tr>
<td></td>
<td>When switched off (default), the cursor will stop at the end of the text.</td>
</tr>
<tr>
<td></td>
<td>Pressing Tab or Ctrl-Tab will advance the keyboard focus.</td>
</tr>
<tr>
<td></td>
<td>See also: Fl::Input_::tab_nav()</td>
</tr>
<tr>
<td>OPTION_VISIBLE_FOCUS</td>
<td>If visible focus is switched on (default), FLTK will draw a dotted rectangle</td>
</tr>
<tr>
<td></td>
<td>inside the widget that will receive the next keystroke. If switched off, no</td>
</tr>
<tr>
<td></td>
<td>such indicator will be drawn and keyboard navigation is disabled.</td>
</tr>
<tr>
<td>OPTION_DND_TEXT</td>
<td>If text drag-and-drop is enabled (default), the user can select and drag</td>
</tr>
<tr>
<td></td>
<td>text from any text widget. If disabled, no dragging is possible, however</td>
</tr>
<tr>
<td></td>
<td>dropping text from other applications still works.</td>
</tr>
</tbody>
</table>

Generated by Doxygen
### Enumerator

<table>
<thead>
<tr>
<th>Option Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTION_SHOW_TOOLTIP</td>
<td>If tooltips are enabled (default), hovering the mouse over a widget with a tooltip text will open a little tooltip window until the mouse leaves the widget. If disabled, no tooltip is shown.</td>
</tr>
<tr>
<td>OPTION_FNFC_USES_GTK</td>
<td>When switched on (default), Fl_Native_Filechooser runs GTK file dialogs if the GTK library is available on the platform (linux/unix only). When switched off, GTK file dialogs aren't used even if the GTK library is available.</td>
</tr>
<tr>
<td>OPTION_PRINTER_USES_GTK</td>
<td>When switched on (default), Fl_Printer runs the GTK printer dialog if the GTK library is available on the platform (linux/unix only). When switched off, the GTK printer dialog isn't used even if the GTK library is available.</td>
</tr>
<tr>
<td>OPTION_SHOW_SCALING</td>
<td>When switched on (default), the library shows in a transient yellow window the zoom factor value. When switched off, no such window gets displayed.</td>
</tr>
<tr>
<td>OPTION_FNFC_USES_ZENITY</td>
<td>Meaningful for the Wayland/X11 platform only. When switched on (default), the library uses a Zenity-based file dialog. When switched off, the GTK file dialog is used instead.</td>
</tr>
<tr>
<td>OPTION_LAST</td>
<td>For internal use only.</td>
</tr>
</tbody>
</table>

### 34.7.3 Member Function Documentation

#### 34.7.3.1 abi_check()

```c
static int Fl::abi_check (
    const int val = FL_ABI_VERSION ) [inline], [static]
```

Returns whether the runtime library ABI version is correct. This enables you to check the ABI version of the linked FLTK library at runtime. Returns 1 (true) if the compiled ABI version (in the header files) and the linked library ABI version (used at runtime) are the same, 0 (false) otherwise. Argument `val` can be used to query a particular library ABI version. Use for instance 10303 to query if the runtime library is compatible with FLTK ABI version 1.3.3. This is rarely useful. The default `val` argument is FL_ABI_VERSION, which checks the version defined at configure time (i.e. in the header files at program compilation time) against the linked library version used at runtime. This is particularly useful if you linked with a shared object library, but it also concerns static linking.

See also

Fl::abi_version()

#### 34.7.3.2 abi_version()

```c
int Fl::abi_version ( ) [static]
```

Returns the compiled-in value of the FL_ABI_VERSION constant. This is useful for checking the version of a shared library.

#### 34.7.3.3 add_check()

```c
void Fl::add_check ( 
    Fl_Timeout_Handler cb,
    void * argp = 0 ) [static]
```

FLTK will call this callback just before it flushes the display and waits for events. This is different than an idle callback because it is only called once, then FLTK calls the system and tells it not to return until an event happens.
This can be used by code that wants to monitor the application's state, such as to keep a display up to date. The advantage of using a check callback is that it is called only when no events are pending. If events are coming in quickly, whole blocks of them will be processed before this is called once. This can save significant time and avoid the application falling behind the events.

Sample code:

```c
bool state_changed; // anything that changes the display turns this on
void callback(void*) {
    if (!state_changed) return;
    state_changed = false;
    do_expensive_calculation();
    widget->redraw();
}
main() {
    Fl::add_check(callback);
    Fl::run();
}
```

### 34.7.3.4 add_fd() [1/2]

```c
void Fl::add_fd {
    int fd,
    FL_FD_Handler cb,
    void * d = 0 ) [static]
```

Adds file descriptor fd to listen to.

See Fl::add_fd(int fd, int when, Fl_FD_Handler cb, void* = 0) for details

### 34.7.3.5 add_fd() [2/2]

```c
void Fl::add_fd {
    int fd,
    int when,
    FL_FD_Handler cb,
    void * d = 0 ) [static]
```

Adds file descriptor fd to listen to.

When the fd becomes ready for reading Fl::wait() will call the callback and then return. The callback is passed the fd and the arbitrary void* argument.

This version takes a when bitfield, with the bits FL_READ, FL_WRITE, and FL_EXCEPT defined, to indicate when the callback should be done.

There can only be one callback of each type for a file descriptor. Fl::remove_fd() gets rid of all the callbacks for a given file descriptor.

Under UNIX/Linux/macOS any file descriptor can be monitored (files, devices, pipes, sockets, etc.). Due to limitations in Microsoft Windows, Windows applications can only monitor sockets.

Under macOS, Fl::add_fd() opens the display if that's not been done before.

### 34.7.3.6 add_idle()

```c
void Fl::add_idle {
    FL_Idle_Handler cb,
    void * data = 0 ) [static]
```

Adds a callback function that is called every time by Fl::wait() and also makes it act as though the timeout is zero (this makes Fl::wait() return immediately, so if it is in a loop it is called repeatedly, and thus the idle function is called repeatedly).

The idle function can be used to get background processing done.

You can have multiple idle callbacks. To remove an idle callback use Fl::remove_idle().

Fl::wait() and Fl::check() call idle callbacks, but Fl::ready() does not.

The idle callback can call any FLTK functions, including Fl::wait(), Fl::check(), and Fl::ready(). FLTK will not recursively call the idle callback.

### 34.7.3.7 add_timeout()

```c
void Fl::add_timeout {
    double time,
```
Fl_Timeout_Handler cb,
void * data = 0 ) [static]

Adds a one-shot timeout callback.
The callback function cb will be called by Fl::wait() at time seconds after this function is called. The callback function must have the signature Fl_Timeout_Handler. The optional data argument is passed to the callback (default: NULL).
The timer is removed from the timer queue before the callback function is called. It is safe to reschedule the timeout inside the callback function.
You can have multiple timeout callbacks, even the same timeout callback with different timeout values and/or different data values. They are all considered different timer objects.
To remove a timeout while it is active (pending) use Fl::remove_timeout().
If you need more accurate, repeated timeouts, use Fl::repeat_timeout() to reschedule the subsequent timeouts.
Please see Fl::repeat_timeout() for an example.
Since version 1.4, a timeout can be started from a child thread under the condition that the call to Fl::add_timeout is wrapped in Fl::lock() and Fl::unlock().

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>time</th>
<th>delta time in seconds until the timer expires</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>cb</td>
<td>callback function</td>
</tr>
<tr>
<td>in</td>
<td>data</td>
<td>optional user data (default: NULL)</td>
</tr>
</tbody>
</table>

See also

Fl_Timeout_Handler
Fl::repeat_timeout(double time, Fl_Timeout_Handler cb, void *data)
Fl::remove_timeout(Fl_Timeout_Handler cb, void *data)
Fl::has_timeout(Fl_Timeout_Handler cb, void *data)

34.7.3.8 api_version()

int Fl::api_version ( ) [static]

Returns the compiled-in value of the FL_API_VERSION constant.
This is useful for checking the version of a shared library.

34.7.3.9 arg()

int Fl::arg {
    int argc,
    char ** argv,
    int & i ) [static]

Parse a single switch from argv, starting at word i.
Returns the number of words eaten (1 or 2, or 0 if it is not recognized) and adds the same value to i.
This is the default argument handler used internally by Fl::args(...), but you can use this function if you prefer to step through the standard FLTK switches yourself.
All standard FLTK switches except -bg2 may be abbreviated to just one letter and case is ignored:

- -bg color or -background color
  Sets the background color using Fl::background().
- -bg2 color or -background2 color
  Sets the secondary background color using Fl::background2().
- -display host:n.n
  Sets the X display to use; this option is silently ignored under Windows and MacOS.
- **-dnd and -nodnd**
  Enables or disables drag and drop text operations using `Fl::dnd_text_ops()`.

- **-fg color or -foreground color**
  Sets the foreground color using `Fl::foreground()`.

- **-geometry WxH+X+Y**
  Sets the initial window position and size according to the standard X geometry string.

- **-iconic**
  Iconifies the window using `Fl_Window::iconize()`.

- **-kbd and -nokbd**
  Enables or disables visible keyboard focus for non-text widgets using `Fl::visible_focus()`.

- **-name string**
  Sets the window class using `Fl_Window::xclass()`.

- **-scheme string**
  Sets the widget scheme using `Fl::scheme()`.

- **-title string**
  Sets the window title using `Fl_Window::label()`.

- **-tooltips and -notooltips**
  Enables or disables tooltips using `Fl_Tooltip::enable()`.

If your program requires other switches in addition to the standard FLTK options, you will need to pass your own argument handler to `Fl::args(int,char**,int&,Fl_Args_Handler)` explicitly.

### 34.7.3.10 args() [1/2]

```cpp
void Fl::args (  
    int argc,  
    char ** argv )  [static]
```

Parse all command line switches matching standard FLTK options only.

It parses all the switches, and if any are not recognized it calls `Fl::abort(Fl::help)`, i.e. unlike the long form, an unrecognized switch generates an error message and causes the program to exit.

### 34.7.3.11 args() [2/2]

```cpp
int Fl::args (  
    int argc,  
    char ** argv,  
    int & i,  
    Fl_Args_Handler cb = 0 )  [static]
```

Parse command line switches using the `cb` argument handler.

Returns 0 on error, or the number of words processed.

FLTK provides this as an *entirely optional* command line switch parser. You don't have to call it if you don't want to.

Everything it can do can be done with other calls to FLTK.

To use the switch parser, call `Fl::args(...)` near the start of your program. This does *not* open the display, instead switches that need the display open are stashed into static variables. Then you *must* display your first window by calling `window->show(argc,argv)`, which will do anything stored in the static variables.

Providing an argument handler callback `cb` lets you define your own switches. It is called with the same `argc` and `argv`, and with `i` set to the index of the switch to be processed. The `cb` handler should return zero if the switch is unrecognized, and not change `i`. It should return non-zero to indicate the number of words processed if the switch is recognized, i.e. 1 for just the switch, and more than 1 for the switch plus associated parameters. `i` should be incremented by the same amount.

The `cb` handler is called *before* any other tests, so you can also *override any standard FLTK switch* (this is why FLTK can use very short switches instead of the long ones all other toolkits force you to use). See `Fl::arg()` for descriptions of the standard switches.

On return `i` is set to the index of the first non-switch. This is either:
• The first word that does not start with ` `-`
• The word ` `-` (used by many programs to name stdin as a file)
• The first unrecognized switch (return value is 0).
  • \texttt{argc}

The return value is 0 unless an unrecognized switch is found, in which case it is zero. If your program takes no arguments other than switches you should produce an error if the return value is less than \texttt{argc}.

A usage string is displayed if \texttt{Fl::args()} detects an invalid argument on the command-line. You can change the message by setting the \texttt{Fl::help} pointer.

A very simple command line parser can be found in \texttt{examples/howto-parse-args.cxx}

The simpler \texttt{Fl::args(int argc, char **argv)} form is useful if your program does not have command line switches of its own.

### 34.7.3.12 \texttt{args_to_utf8()}

\begin{verbatim}
int Fl::args_to_utf8 (int argc, char **&argv) [static]
\end{verbatim}

Convert Windows commandline arguments to UTF-8.

\textbf{Note}

This function does nothing on other (non-Windows) platforms, hence you may call it on all platforms or only on Windows by using platform specific code like `#ifdef _WIN32` etc. - it's your choice. Calling it on other platforms returns quickly w/o wasting much CPU time.

This function \textbf{must be called on Windows platforms} in \texttt{main()} before the array \texttt{argv} is used if your program uses any commandline argument strings (these should be UTF-8 encoded). This applies also to standard FLTK commandline arguments like `-name` (class name) and `-title` (window title in the title bar).

Unfortunately Windows \textbf{neither} provides commandline arguments in UTF-8 encoding nor as Windows "Wide Character" strings in the standard \texttt{main()} and/or the Windows specific \texttt{WinMain()} function.

On Windows platforms (no matter which build system) this function calls a Windows specific function to retrieve commandline arguments as Windows "Wide Character" strings, converts these strings to an internally allocated buffer (or multiple buffers) and returns the result in \texttt{argv}. For implementation details please refer to the source code; however these details may be changed in the future.

Note that \texttt{argv} is provided by reference so it can be overwritten.

In the recommended simple form the function overwrites the variable \texttt{argv} and allocates a new array of strings pointed to by \texttt{argv}. You may use this form on all platforms and it is as simple as adding one line to old programs to make them work with international (UTF-8) commandline arguments.

\begin{verbatim}
int main(int argc, char **argv) {
  Fl::args_to_utf8(argc, argv); // add this line
  // ... use argc and argv, e.g. for commandline parsing
  window->show(argc, argv);
  return Fl::run();
}
\end{verbatim}

For an example see 'examples/howto-parse-args.cxx' in the FLTK sources.

If you want to retain the original \texttt{argc} and \texttt{argv} variables the following slightly longer and more complicated code works as well on all platforms.

\begin{verbatim}
int main(int argc, char **argv) {
  char **argvn = argv; // must copy argv to work on all platforms
  int argcn = Fl::args_to_utf8(argc, argvn);
  // ... use argcn and argvn, e.g. for commandline parsing
  window->show(argcn, argvn);
  return Fl::run();
}
\end{verbatim}

\textbf{Parameters}

\begin{itemize}
  \item \textbf{in} \texttt{argc} \textit{used only on non-Windows platforms}
  \item \textbf{out} \texttt{argv} \textit{modified only on Windows platforms}
\end{itemize}
Returns

argument count (always the same as argc)

Since

1.4.0

### 34.7.3.13 background()  

```cpp
void Fl::background (  
    uchar r,  
    uchar g,  
    uchar b ) [static]
```

Changes `fl_color(FL_BACKGROUND_COLOR)` to the given color, and changes the gray ramp from 32 to 56 to black to white. These are the colors used as backgrounds by almost all widgets and used to draw the edges of all the boxtypes.

### 34.7.3.14 background2()  

```cpp
void Fl::background2 (  
    uchar r,  
    uchar g,  
    uchar b ) [static]
```

Changes the alternative background color. This color is used as a background by `Fl_Input` and other text widgets. This call may change `fl_color(FL_FOREGROUND_COLOR)` if it does not provide sufficient contrast to `FL_BACKGROUND2_COLOR`.

### 34.7.3.15 box_border_radius_max() [1/2]  

```cpp
static int Fl::box_border_radius_max ( ) [inline], [static]
```

Get the maximum border radius of all "rounded" boxtypes in pixels.

Since

1.4.0

### 34.7.3.16 box_border_radius_max() [2/2]  

```cpp
static void Fl::box_border_radius_max (  
    int R ) [inline], [static]
```

Set the maximum border radius of all "rounded" boxtypes in pixels. Must be at least 5, default = 15.

Note

This does not apply to the "round" boxtypes which have really round sides (i.e. composed of half circles) as opposed to "rounded" boxtypes that have only rounded corners with a straight border between corners.

The box border radius of "rounded" boxtypes is typically calculated as about 2/5 of the box height or width, whichever is smaller. The upper limit can be set by this method for all "rounded" boxtypes.

Since

1.4.0
34.7.3.17  box_color()

std::optional<Fl_Color> Fl::box_color (Fl_Color c) [static]

Gets the drawing color to be used for the background of a box.
This method is only useful inside box drawing code. It returns the color to be used, either \texttt{fl_inactive(c)} if the widget is \texttt{!active()} or \texttt{c} otherwise.

34.7.3.18  box_dh()

\texttt{int Fl::box_dh (Fl_Boxtype t) [static]}

Returns the height offset for the given boxtype.

See also

box_dy().

34.7.3.19  box_dw()

\texttt{int Fl::box_dw (Fl_Boxtype t) [static]}

Returns the width offset for the given boxtype.

See also

box_dy().

34.7.3.20  box_dx()

\texttt{int Fl::box_dx (Fl_Boxtype t) [static]}

Returns the X offset for the given boxtype.

See also

box_dy().

34.7.3.21  box_dy()

\texttt{int Fl::box_dy (Fl_Boxtype t) [static]}

Returns the Y offset for the given boxtype.
These functions return the offset values necessary for a given boxtype, useful for computing the area inside a box's borders, to prevent overdrawning the borders.
For instance, in the case of a boxtype like FL_DOWN_BOX where the border width might be 2 pixels all around, the above functions would return 2, 2, 4, and 4 for box_dx, box_dy, box_dw, and box_dh respectively.

An example to compute the area inside a widget's box():
\begin{verbatim}
int X = yourwidget->x() + Fl::box_dx(yourwidget->box());
int Y = yourwidget->y() + Fl::box_dy(yourwidget->box());
int W = yourwidget->w() - Fl::box_dw(yourwidget->box());
int H = yourwidget->h() - Fl::box_dh(yourwidget->box());
\end{verbatim}

These functions are mainly useful in the draw() code for deriving custom widgets, where one wants to avoid drawing over the widget's own border box().
34.7.3.22 box_shadow_width() [1/2]
static int Fl::box_shadow_width ( ) [inline], [static]
Get the box shadow width of all "shadow" boxtypes in pixels.
Since
1.4.0

34.7.3.23 box_shadow_width() [2/2]
static void Fl::box_shadow_width ( int W ) [inline], [static]
Set the box shadow width of all "shadow" boxtypes in pixels.
Must be at least 1, default = 3. There is no upper limit.
Since
1.4.0

34.7.3.24 check()

int Fl::check ( ) [static]
Same as Fl::wait(0).
Calling this during a big calculation will keep the screen up to date and the interface responsive:
while (!calculation_done()) {
    calculate();
    Fl::check();
    if (user_hit_abort_button()) break;
}
This returns non-zero if any windows are displayed, and 0 if no windows are displayed (this is likely to change in future versions of FLTK).

34.7.3.25 display()

void Fl::display ( const char * d ) [static]
Sets the X or Wayland display to use for all windows.
This sets the environment variable $DISPLAY or $WAYLAND_DISPLAY to the passed string, so this only works before you show() the first window or otherwise open the display.
This does nothing on other platforms.

34.7.3.26 dnd_text_ops() [1/2]
static int Fl::dnd_text_ops ( ) [inline], [static]
Gets whether drag and drop text operations are supported.
This returns whether selected text can be dragged from text fields or dragged within a text field as a cut/paste shortcut.

34.7.3.27 dnd_text_ops() [2/2]
static void Fl::dnd_text_ops ( int v ) [inline], [static]
Sets whether drag and drop text operations are supported.
This specifically affects whether selected text can be dragged from text fields or dragged within a text field as a cut/paste shortcut.
34.7.3.28  draw_box_active()

int Fl::draw_box_active ( ) [static]
Determines if the currently drawn box is active or inactive.
If inactive, the box color should be changed to the inactive color.

See also

Fl::box_color(Fl_Color c)

34.7.3.29  draw_GL_text_with_textures() [1/2]

static int Fl::draw_GL_text_with_textures ( ) [inline], [static]
returns whether whether OpenGL uses textures to draw all text.
Default is yes.

See also

draw_GL_text_with_textures(int val)

Version

1.4.0

34.7.3.30  draw_GL_text_with_textures() [2/2]

static void Fl::draw_GL_text_with_textures ( int val ) [inline], [static]
sets whether OpenGL uses textures to draw all text.
By default, FLTK draws OpenGL text using textures, if the necessary hardware support is available. Call Fl::<
::draw_GL_text_with_textures(0) once in your program before the first call to gl_font() to have FLTK
draw instead OpenGL text using a legacy, platform-dependent procedure. It's recommended not to deactivate
textures under the MacOS platform because the MacOS legacy procedure is extremely rudimentary.

Parameters

| val | use 0 to prevent FLTK from drawing GL text with textures |

See also

gl_texture_pile_height(int max)

Version

1.4.0

34.7.3.31  flush()

void Fl::flush ( ) [static]
Causes all the windows that need it to be redrawn and graphics forced out through the pipes.
This is what wait() does before looking for events.
Note: in multi-threaded applications you should only call Fl::flush() from the main thread. If a child thread needs to
trigger a redraw event, it should instead call Fl::awake() to get the main thread to process the event queue.
34.7.3.32 get_system_colors()

```cpp
void Fl::get_system_colors ( ) [static]
```

Read the user preference colors from the system and use them to call `Fl::foreground()`, `Fl::background()`, and `Fl::background2()`.

This is done by `Fl_Window::show(argc,argv)` before applying the `-fg` and `-bg` switches.

On X this reads some common values from the Xdefaults database. KDE users can set these values by running the "krdb" program, and newer versions of KDE set this automatically if you check the "apply style to other X programs" switch in their control panel.

34.7.3.33 gl_visual()

```cpp
static int Fl::gl_visual ( int ,
                           int ∗alist = 0 ) [static]
```

This does the same thing as `Fl::visual(int)` but also requires OpenGL drawing to work.

This must be done if you want to draw in normal windows with OpenGL with `gl_start()` and `gl_end()`. It may be useful to call this so your X windows use the same visual as an `Fl_Gl_Window`, which on some servers will reduce colormap flashing.

See `Fl_Gl_Window` for a list of additional values for the argument.

34.7.3.34 has_timeout()

```cpp
int Fl::has_timeout ( Fl_Timeout_Handler cb,
                     void ∗data = 0 ) [static]
```

Returns true if the timeout exists and has not been called yet.

Both arguments `cb` and `data` must match with at least one timer in the queue of active timers to return true (1).

Note

It is a known inconsistency that `Fl::has_timeout()` does not use the `data` argument as a wildcard (match all) if it is zero (NULL) which `Fl::remove_timeout()` does. This is so for backwards compatibility with FLTK 1.3.x. Therefore using 0 (zero, NULL) as the timeout `data` value is discouraged unless you're sure that you don't need to use `Fl::has_timeout(callback, (void ∗)0);` or `Fl::remove_timeout(callback, (void ∗)0);`.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cb</th>
<th>Timer callback</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>data</td>
<td>User data</td>
</tr>
</tbody>
</table>

Returns

whether the timer was found in the queue

Return values

<table>
<thead>
<tr>
<th>0</th>
<th>not found</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>found</td>
</tr>
</tbody>
</table>

34.7.3.35 hide_all_windows()

```cpp
void Fl::hide_all_windows ( ) [static]
```

Hide all visible windows to make FLTK leave `Fl::run()`.

Generated by Doxygen
Fl::run() will run as long as there are visible windows. Call Fl::hide_all_windows() to hide (close) all currently shown (visible) windows, effectively terminating the Fl::run() loop.

See also

Fl::run()

Since

1.4.0

34.7.3.36 is_scheme()

static int Fl::is_scheme (const char * name) [inline], [static]

Returns whether the current scheme is the given name.
This is a fast inline convenience function to support scheme-specific code in widgets, e.g. in their draw() methods, if required.
Use a valid scheme name, not NULL (although NULL is allowed, this is not a useful argument - see below).
If Fl::scheme() has not been set or has been set to the default scheme ("none" or "base"), then this will always return 0 regardless of the argument, because Fl::scheme() is NULL in this case.

Note

The stored scheme name is always lowercase, and this method will do a case-sensitive compare, so you must provide a lowercase string to return the correct value. This is intentional for performance reasons.

Example:

```c
if (Fl::is_scheme("gtk+")) { your_code_here(); }
```

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>name</th>
<th>lowercase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>string of requested scheme name.</td>
</tr>
</tbody>
</table>

Returns

1 if the given scheme is active, 0 otherwise.

See also

Fl::scheme(const char *name)

34.7.3.37 menu_linespacing() [1/2]

int Fl::menu_linespacing ( ) [static]

Gets the default line spacing used by menus.

Returns

The default line spacing, in pixels.

34.7.3.38 menu_linespacing() [2/2]

void Fl::menu_linespacing ( int H ) [static]

Sets the default line spacing used by menus.
Default is 4.
### 34.7.3.39 now()

**FL_Timestamp Fl::now (double offset = 0) [static]**

Set a time stamp at this point in time with optional signed offset in seconds. The time stamp is an opaque type and does not represent the time of day or date in the calendar. It is used with `Fl::seconds_between()` and `Fl::seconds_since()` to measure elapsed time.

```c
Fl_Timestamp start = Fl::now();
// do something
double s = Fl::seconds_since(start);
printf("That operation took %g seconds\n", s);
```

Depending on the system the resolution may be milliseconds or microseconds. Under certain conditions (particularly on Windows) the value in member `sec` may wrap around and does not represent a real time (maybe runtime of the system). Function `seconds_since()` below uses this to subtract two timestamps which is always a correct delta time with milliseconds or microseconds resolution.

**Parameters**

- **offset** optional signed offset in seconds added to the current time

**Returns**

this moment in time offset by `offset` as an opaque time stamp

**Todo** `Fl::system_driver()::gttime()` was implemented for the Forms library and has a limited resolution (on Windows: milliseconds). On POSIX platforms it uses `gettimeofday()` with microsecond resolution. A new function could use a better resolution on Windows with its multimedia timers which requires a new dependency: `winmm.lib` (dll). This could be a future improvement, maybe set as a build option or generally (requires Win95 or 98?).

**See also**

- `Fl::seconds_since(Fl_Timestamp& then)`
- `Fl::seconds_between(Fl_Timestamp& back, Fl_Timestamp& further_back)`
- `Fl::ticks_since(Fl_Timestamp& then)`
- `Fl::ticks_between(Fl_Timestamp& back, Fl_Timestamp& further_back)`

### 34.7.3.40 option() [1/2]

```c
bool Fl::option (Fl_Option opt) [static]
```

FLTK library options management.

This function needs to be documented in more detail. It can be used for more optional settings, such as using a native file chooser instead of the FLTK one wherever possible, disabling tooltips, disabling visible focus, disabling FLTK file chooser preview, etc.

There should be a command line option interface.

There should be an application that manages options system wide, per user, and per application.

**Example:**

```c
if ( Fl::option(Fl::OPTION_ARROW_FOCUS) )
{
  ..on..
}
else
{
  ..off..
}
```
As of FLTK 1.3.0, options can be managed within fluid, using the menu Edit/Global FLTK Settings.

Parameters

<table>
<thead>
<tr>
<th>opt</th>
<th>which option</th>
</tr>
</thead>
</table>

Returns

true or false

See also

denum Fl::Fl_Option
Fl::option(Fl_Option, bool)

Since

FLTK 1.3.0

34.7.3.41 option() [2/2]

void Fl::option (  
    Fl_Option opt,  
    bool val ) [static]

Override an option while the application is running.  
This function does not change any system or user settings.
Example:

Fl::option(Fl::OPTION_ARROW_FOCUS, true); // on
Fl::option(Fl::OPTION_ARROW_FOCUS, false); // off

Parameters

<table>
<thead>
<tr>
<th>opt</th>
<th>which option</th>
</tr>
</thead>
<tbody>
<tr>
<td>val</td>
<td>set to true or false</td>
</tr>
</tbody>
</table>

See also

denum Fl::Fl_Option
bool Fl::option(Fl_Option)

34.7.3.42 own_colormap()

void Fl::own_colormap ( ) [static]

Makes FLTK use its own colormap.
This may make FLTK display better and will reduce conflicts with other programs that want lots of colors. However the colors may flash as you move the cursor between windows. This does nothing if the current visual is not colormapped.

34.7.3.43 program_should_quit() [1/2]

static int Fl::program_should_quit ( ) [inline], [static]

Returns non-zero when a request for program termination was received and accepted.
On the MacOS platform, the "Quit xxx" item of the application menu is such a request, that is considered accepted when all windows are closed. On other platforms, this function returns 0 until Fl::program_should_quit(1) is called.

Version
1.4.0

34.7.3.44 program_should_quit() [2/2]

static void Fl::program_should_quit (  
    int should_i  ) [inline], [static]

Indicate to the FLTK library whether a program termination request was received and accepted. A program may set this to 1, for example, while performing a platform-independent command asking the program to cleanly terminate, similarly to the "Quit xxx" item of the application menu under MacOS.

Version
1.4.0

34.7.3.45 readqueue()

Fl_Widget * Fl::readqueue ( ) [static]

Reads the default callback queue and returns the first widget.
All Fl_Widgets that don't have a callback defined use the default callback static Fl_Widget::default_callback() that puts a pointer to the widget in a queue. This method reads the oldest widget out of this queue.
The queue (FIFO) is limited (currently 20 items). If the queue overflows, the oldest entry (Fl_Widget *) is discarded.
Relying on the default callback and reading the callback queue with Fl::readqueue() is not recommended. If you need a callback, you should set one with Fl_Widget::callback(Fl_Callback *, void *) or one of its variants.

See also
Fl_Widget::callback()
Fl_Widget::callback(Fl_Callback *, void *)
Fl_Widget::default_callback()

34.7.3.46 ready()

int Fl::ready ( ) [static]

This is similar to Fl::check() except this does not call Fl::flush() or any callbacks, which is useful if your program is in a state where such callbacks are illegal.
This returns true if Fl::check() would do anything (it will continue to return true until you call Fl::check() or Fl::wait()).

while (!calculation_done()) {
    calculate();
    if (Fl::ready()) {  
        do_expensive_cleanup();
        Fl::check();
        if (user_hit_abort_button()) break;
    }
}

34.7.3.47 release()

static void Fl::release ( ) [inline], [static]

Releases the current grabbed window, equals grab(0).

Deprecated Use Fl::grab(0) instead.
34.7.3.48 reload_scheme()

```c
int Fl::reload_scheme ( ) [static]
```

Called internally when setting a new scheme according to scheme name.
Loads or reloads the current scheme selection.

Returns

Always 1 (this may change in the future)

See void Fl::scheme(const char *name)

34.7.3.49 remove_check()

```c
void Fl::remove_check ( Fl_Timeout_Handler cb, void * argp = 0 ) [static]
```

Removes a check callback.

It is harmless to remove a check callback that no longer exists.

34.7.3.50 remove_timeout()

```c
void Fl::remove_timeout ( Fl_Timeout_Handler cb, void * data = 0 ) [static]
```

Removes a timeout callback from the timer queue.

This method removes all matching timeouts, not just the first one. This may change in the future.

If the data argument is NULL (the default!) only the callback cb must match, i.e. all timer entries with this callback are removed.

It is harmless to remove a timeout callback that no longer exists.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cb</th>
<th>Timer callback to be removed (must match)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>data</td>
<td>Wildcard if NULL (default), must match otherwise</td>
</tr>
</tbody>
</table>

34.7.3.51 repeat_timeout()

```c
void Fl::repeat_timeout ( double time, Fl_Timeout_Handler cb, void * data = 0 ) [static]
```

Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.

You should call this method only inside a timeout callback of the same or a logically related timer from whose expiration time the new timeout shall be scheduled. Otherwise the timing accuracy can't be improved and the exact behavior is undefined.

If you call this outside a timeout callback the behavior is the same as Fl::add_timeout().

Example: The following code will print "TICK" each second on stdout with a fair degree of accuracy:

```c
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <stdio.h>

void callback(void *) {
    printf("TICK\n");
    Fl::repeat_timeout(1.0, callback); // retrigger timeout
}
```
```c
int main() {
    Fl_Window win(100, 100);
    win.show();
    Fl::add_timeout(1.0, callback); // set up first timeout
    return Fl::run();
}
```

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>time</th>
<th>delta time in seconds until the timer expires</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>cb</td>
<td>callback function</td>
</tr>
<tr>
<td>in</td>
<td>data</td>
<td>optional user data (default: NULL)</td>
</tr>
</tbody>
</table>

### 34.7.3.52 run()

```c
int Fl::run () [static]
Calls Fl::wait() repeatedly as long as any windows are displayed.
When all the windows are closed it returns zero (supposedly it would return non-zero on any errors, but FLTK calls
exit directly for these). A normal program will end main() with return Fl::run();.
```

**Note**

Fl::run() and Fl::wait() (but not Fl::wait(double)) both return when all FLTK windows are closed. Therefore, a
MacOS FLTK application possessing Fl_Sys_Menu_Bar items able to create new windows and expected to
keep running without any open window cannot use these two functions. One solution is to run the event loop
as follows:
```
while (!Fl::program_should_quit()) Fl::wait(1e20);
```

### 34.7.3.53 scheme()

```c
int Fl::scheme (const char * s ) [static]
Sets the current widget scheme.
NULL will use the scheme defined in the FLTK_SCHEME environment variable or the scheme resource under X11.
Otherwise, any of the following schemes can be used:

- "none" - This is the default look-n-feel which resembles old Windows (95/98/Me/NT/2000) and old GTK/KDE
- "base" - This is an alias for "none"
- "plastic" - This scheme is inspired by the Aqua user interface on macOS
- "gtk+" - This scheme is inspired by the Red Hat Bluecurve theme
- "gleam" - This scheme is inspired by the Clearlooks Glossy scheme. (Colin Jones and Edmanuel Torres).
- "oxy" - This is a subset of Dmitrij K's oxy scheme (STR 2675, 3477)
```

If the given scheme name is unknown, the default scheme will be used.
Setting the scheme (name) is case insensitive, but the stored scheme name will always be lowercase and
Fl::scheme() will return this lowercase name or NULL if no scheme or the default scheme ("none" or "base") was set.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>s</th>
<th>Scheme name of NULL</th>
</tr>
</thead>
</table>
Returns

Current scheme name or NULL

Return values

| NULL | if the scheme has not been set or is the default scheme |

See also

Fl::is_scheme()

34.7.3.54 scrollbar_size() [1/2]

int Fl::scrollbar_size () [static]

Gets the default scrollbar size used by Fl_Browser_, Fl_Help_View, Fl_Scroll, and Fl_Text_Display widgets.

Returns

The default size for widget scrollbars, in pixels.

34.7.3.55 scrollbar_size() [2/2]

void Fl::scrollbar_size ( int W ) [static]

Sets the default scrollbar size that is used by the Fl_Browser_, Fl_Help_View, Fl_Scroll, and Fl_Text_Display widgets.

Parameters

| in | W | The new default size for widget scrollbars, in pixels |

34.7.3.56 seconds_between()

double Fl::seconds_between ( Fl_Timestamp & back, Fl_Timestamp & further_back ) [static]

Return the time in seconds between two time stamps.

Parameters

| in | back | a previously taken time stamp |
| in | further_back | an even earlier time stamp |

Returns

elapsed seconds and fractions of a second

See also

Fl::seconds_since(Fl_Timestamp& then)
Fl::now()
34.7.3.57  seconds_since()

```cpp
double Fl::seconds_since ( Fl_Timestamp & then ) [static]
```

Return the time in seconds between now and a previously taken time stamp.

**Parameters**

- `in then` a previously taken time stamp

**Returns**

elapsed seconds and fractions of a second

**See also**

- `Fl::seconds_between(Fl_Timestamp& back, Fl_Timestamp& further_back)`
- `Fl::now()`
- `Fl::distant_past()`

34.7.3.58  set_box_color()

```cpp
void Fl::set_box_color ( Fl_Color c ) [static]
```

Sets the drawing color for the box that is currently drawn.

This method sets the current drawing color `fl_color()` depending on the widget's state to either `c` or `fl_inactive(c)`. It should be used whenever a box background is drawn in the box (type) drawing code instead of calling `fl_color(Fl_Color bg)` with the background color `bg`, usually `Fl_Widget::color()`.

This method is only useful inside box drawing code. Whenever a box is drawn with one of the standard box drawing methods, a static variable is set depending on the widget's current state - if the widget is `!active_r()` then the internal variable is false (0), otherwise it is true (1). This is faster than calling `Fl_Widget::active_r()` because the state is cached.

**See also**

- `Fl::draw_box_active()`
- `Fl::box_color(Fl_Color)`

34.7.3.59  set_idle()

```cpp
static void Fl::set_idle ( Fl_Old_Idle_Handler cb ) [inline], [static]
```

Sets an idle callback.

**Deprecated** This method is obsolete - use the `add_idle()` method instead.

34.7.3.60  ticks_between()

```cpp
long Fl::ticks_between ( Fl_Timestamp & back,
                       Fl_Timestamp & further_back ) [static]
```

Return the time in ticks (60Hz) between two time stamps.
Parameters

<table>
<thead>
<tr>
<th>back</th>
<th>a previously taken time stamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>further_back</td>
<td>an even earlier time stamp</td>
</tr>
</tbody>
</table>

Returns

elapsed ticks in 60th of a second

See also

Fl::ticks_since(Fl_Timestamp& then)
Fl::now()

34.7.3.61 ticks_since()

long Fl::ticks_since ( Fl_Timestamp & then ) [static]
Return the time in ticks (60Hz) between now and a previously taken time stamp.
Ticks are a convenient way to time animations 'per frame'. Even though modern computers use all kinds of screen refresh rates, 60Hz is a very good base for animation that is typically shown in user interface graphics.

Parameters

| then       | a previously taken time stamp |

Returns

elapsed ticks in 60th of a second

See also

Fl::ticks_between(Fl_Timestamp& back, Fl_Timestamp& further_back)
Fl::now()

34.7.3.62 use_high_res_GL() [1/2]

static int Fl::use_high_res_GL ( ) [inline], [static]
returns whether GL windows should be drawn at high resolution on Apple computers with retina displays.
Default is no.
Version
1.3.4

34.7.3.63 use_high_res_GL() [2/2]

static void Fl::use_high_res_GL ( int val ) [inline], [static]
sets whether GL windows should be drawn at high resolution on Apple computers with retina displays
Version
1.3.4
34.7.3.64  version()

double Fl::version ( ) [static]
Returns the compiled-in value of the FL_VERSION constant.
This is useful for checking the version of a shared library.

**Deprecated** Use int Fl::api_version() instead.

34.7.3.65  visible_focus() [1/2]

static int Fl::visible_focus ( ) [inline], [static]
Gets or sets the visible keyboard focus on buttons and other non-text widgets.
The default mode is to enable keyboard focus for all widgets.

34.7.3.66  visible_focus() [2/2]

static void Fl::visible_focus ( 
    int v ) [inline], [static]
Gets or sets the visible keyboard focus on buttons and other non-text widgets.
The default mode is to enable keyboard focus for all widgets.

34.7.3.67  visual()

int Fl::visual ( 
    int flags ) [static]
Selects a visual so that your graphics are drawn correctly.
This is only allowed before you call show() on any windows. This does nothing if the default visual satisfies the
capabilities, or if no visual satisfies the capabilities, or on systems that don’t have such brain-dead notions.
Only the following combinations do anything useful:

- Fl::visual(FL_RGB)
  Full/true color (if there are several depths FLTK chooses the largest). Do this if you use fl_draw_image for
  much better (non-dithered) output.

- Fl::visual(FL_RGB8)
  Full color with at least 24 bits of color. FL_RGB will always pick this if available, but if not it will happily return
  a less-than-24 bit deep visual. This call fails if 24 bits are not available.

This returns true if the system has the capabilities by default or FLTK succeeded in turning them on. Your program
will still work even if this returns false (it just won’t look as good).

34.7.3.68  wait() [1/2]

int Fl::wait ( ) [static]
Waits until “something happens” and then returns.
Call this repeatedly to “run” your program. You can also check what happened each time after this returns, which is
quite useful for managing program state.
What this really does is call all idle callbacks, all elapsed timeouts, call Fl::flush() to get the screen to update, and
then wait some time (zero if there are idle callbacks, the shortest of all pending timeouts, or infinity), for any events
from the user or any Fl::add_fd() callbacks. It then handles the events and calls the callbacks and then returns.

Returns
non-zero if there are any visible windows - this may change in future versions of FLTK.
34.7.3.69 wait() [2/2]

double Fl::wait (  
    double time_to_wait ) [static]
Waits a maximum of time_to_wait seconds or until "something happens".  
See Fl::wait() for the description of operations performed when "something happens".

Returns
Always 1 on Windows. Otherwise, it is positive if an event or fd happens before the time elapsed. It is zero if 
nothing happens. It is negative if an error occurs (this will happen on X11 if a signal happens).

34.7.4 Member Data Documentation

34.7.4.1 help

const char *const Fl::help = helpmsg+13 [static]
Usage string displayed if Fl::args() detects an invalid argument. 
This may be changed to point to customized text at run-time.

34.7.4.2 idle

void(* Fl::idle)() [static]
The currently executing idle callback function: DO NOT USE THIS DIRECTLY!  
This is now used as part of a higher level system allowing multiple idle callback functions to be called.

See also
    add_idle(), remove_idle()

The documentation for this class was generated from the following files:

- Fl.H
- Fl.cxx
- Fl_abort.cxx
- Fl_add_idle.cxx
- Fl_arg.cxx
- fl_boxtype.cxx
- Fl_Cairo.cxx
- fl_color.cxx
- Fl_compose.cxx
- Fl_display.cxx
- Fl_get_system_colors.cxx
- Fl_grab.cxx
- fl_labeltype.cxx
- Fl_lock.cxx
- Fl_own_colormap.cxx
- fl_set_font.cxx
- flShortcut.cxx
- Fl_Timeout.cxx
- Fl_visual.cxx
- Fl_Widget.cxx
- Fl_Window.cxx
- screen_xywh.cxx
34.8 Fl_Adjuster Class Reference

The Fl_Adjuster widget was stolen from Prisms, and has proven to be very useful for values that need a large dynamic range.

#include <Fl_Adjuster.H>

Inheritance diagram for Fl_Adjuster:

![Inheritance Diagram](image)

### Public Member Functions

- **Fl_Adjuster (int X, int Y, int W, int H, const char *l="")**
  
  Creates a new Fl_Adjuster widget using the given position, size, and label string.

- **int soft () const**
  
  If "soft" is turned on, the user is allowed to drag the value outside the range.

- **void soft (int s)**
  
  If "soft" is turned on, the user is allowed to drag the value outside the range.

### Protected Member Functions

- **void draw () FL_OVERRIDE**
  
  Draws the widget.

- **int handle (int) FL_OVERRIDE**
  
  Handles the specified event.

- **void value_damage () FL_OVERRIDE**
  
  Asks for partial redraw.

### Additional Inherited Members

#### 34.8.1 Detailed Description

The Fl_Adjuster widget was stolen from Prisms, and has proven to be very useful for values that need a large dynamic range.

![Fl_Adjuster](image)

**Figure 34.1 Fl_Adjuster**

When you press a button and drag to the right the value increases. When you drag to the left it decreases. The largest button adjusts by 100 * step(), the next by 10 * step() and that smallest button by step(). Clicking on the buttons increments by 10 times the amount dragging by a pixel does. Shift + click decrements by 10 times the amount.
34.8.2 Constructor & Destructor Documentation

34.8.2.1 Fl_Adjuster()

Fl_Adjuster::Fl_Adjuster (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ l = 0 )

Creates a new Fl_Adjuster widget using the given position, size, and label string.  
It looks best if one of the dimensions is 3 times the other.  
Inherited destructor destroys the Valuator.

34.8.3 Member Function Documentation

34.8.3.1 draw()

void Fl_Adjuster::draw ( ) [protected], [virtual]

Draws the widget.  
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as 
soon as possible, call redraw() instead.  
Override this function to draw your own widgets.  
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:
Fl_Widget ∗ s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar  
s->draw(); // calls Fl_Scrollbar::draw()  
Implements Fl_Widget.

34.8.3.2 handle()

int Fl_Adjuster::handle (  
    int event ) [protected], [virtual]

Handles the specified event.  
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.  
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.  
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-
circuit events that you don't handle. In this last case you should return the callee retval.  
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.  
This requires knowledge of the details of the inherited class.  
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses)  
in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In  
such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by  
returning 1 even if you didn't do anything with it.

Parameters

| in  | event | the kind of event received |

Return values

| 0   | if the event was not used or understood |
| 1   | if the event was used and can be deleted |
See also

`Fl_Event`

Reimplemented from `Fl_Widget`.

### 34.8.3.3 `soft()` [1/2]

```cpp
int Fl_Adjuster::soft ( ) const [inline]
```

If “soft” is turned on, the user is allowed to drag the value outside the range.
If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.
Default is one.

### 34.8.3.4 `soft()` [2/2]

```cpp
void Fl_Adjuster::soft ( int s ) [inline]
```

If “soft” is turned on, the user is allowed to drag the value outside the range.
If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.
Default is one.

### 34.8.3.5 `value_damage()`

```cpp
void Fl_Adjuster::value_damage ( ) [protected], [virtual]
```

Asks for partial redraw.
Reimplemented from `Fl_Valuator`.
The documentation for this class was generated from the following files:

- `Fl_Adjuster.H`
- `Fl_Adjuster.cxx`

### 34.9 `Fl_Anim_GIF_Image` Class Reference

The `Fl_Anim_GIF_Image` class supports loading, caching, and drawing of animated Compuserve GIF\textsuperscript{SM} images.

Inheritance diagram for `Fl_Anim_GIF_Image`:

```
Fl_Image
   |
   V
Fl_Pixmap
   |
   V
Fl_GIF_Image
   |
   V
Fl_Anim_GIF_Image
```

**Public Types**

- `enum Flags {
  DONT_START = 1 , DONT_RESIZE_CANVAS = 2 , DONT_SET_AS_IMAGE = 4 , OPTIMIZE_MEMORY = 8 ,
  LOG_FLAG = 64 , DEBUG_FLAG = 128
}

When opening an `Fl_Anim_GIF_Image` there are some options that can be passed in a `flags` value.
Public Member Functions

- **FL_Widget * canvas () const**
  
  Gets the current widget, that is used to display the frame images.

- **void canvas (FL_Widget *canvas, unsigned short flags=0)**
  
  Link the image back to a widget for automated animation.

- **int canvas_h () const**
  
  Return the height of the animation canvas.

- **int canvas_w () const**
  
  Return the width of the animation canvas.

- **void color_average (FL_Color c, float i) FL_OVERRIDE**
  
  Applies a color average to all frames.

- **FL_Image * copy () const**

- **FL_Image * copy (int W, int H) const FL_OVERRIDE**
  
  Copy and resize the animation frames.

- **int debug () const**

- **void delay (int frame, double delay)**
  
  Set the delay of frame [0-frames () -1] in seconds.

- **double delay (int frame_) const**
  
  Return the delay of frame [0-frames () -1] in seconds.

- **void desaturate () FL_OVERRIDE**

  Desaturate to all frames of the animation.

- **void draw (int x, int y, int w, int h, int cx=0, int cy=0) FL_OVERRIDE**

  Draw the current frame of the animation.

- **FL_Anim_GIF_Image ()**

  Create an empty animated GIF image shell.

- **FL_Anim_GIF_Image (const char *filename, FL_Widget *canvas=0, unsigned short flags=0)**

  Load an animated GIF image from a file.

- **FL_Anim_GIF_Image (const char *imagename, const unsigned char *data, const size_t length, FL_Widget *canvas=0, unsigned short flags=0)**

  Load an animated GIF image from memory.

- **int frame () const**

  Return the current frame.

- **void frame (int frame)**

  Set the current frame.

- **int frame_h (int frame) const**

  Return the frame dimensions of a frame.

- **bool frame_uncache () const**

  Return the active frame_uncache() setting.

- **void frame_uncache (bool uncache)**

  Use frame_uncache() to set or forbid frame image uncaching.

- **int frame_w (int frame) const**

  Return the frame dimensions of a frame.

- **int frame_x (int frame) const**

  Return the frame position of a frame.

- **int frame_y (int frame) const**

  Return the frame position of a frame.

- **int frames () const**

  Get the number of frames in the animation.

- **FL_Image * image () const**

  Return the current frame image.
• Fl_image * image (int frame) const
  Return the image of the given frame index.

• bool is_animated () const
  Check if this is a valid animation with more than one frame.

• bool load (const char *name, const unsigned char *imgdata=NULL, size_t imglength=0)
  Load an animation from a file or from a memory block.

• const char * name () const
  Return the name of the played file as specified in the constructor.

• bool next ()
  Show the next frame if the animation is stopped.

• bool playing () const
  Return if the animation is currently running or stopped.

• Fl_Anim_GIF_Image & resize (double scale)
  Resizes the image to the specified size, replacing the current image.

• Fl_Anim_GIF_Image & resize (int w, int h)
  Resizes the image to the specified size, replacing the current image.

• double speed () const
  Get the animation speed factor.

• void speed (double speed)
  Set the animation speed factor.

• bool start ()
  The start() method (re-)starts the playing of the frames.

• bool stop ()
  The stop() method stops the playing of the frames.

• void uncache () FL_OVERRIDE
  Uncache all cached image data now.

• bool valid () const
  Check if animation is valid.

• ~Fl_Anim_GIF_Image () FL_OVERRIDE
  Release the image and all cached data.

Static Public Member Functions

• static int frame_count (const char *name, const unsigned char *imgdata=NULL, size_t imglength=0)
  Get the number of frames in a GIF file or in a GIF compressed data block.

Static Public Attributes

• static bool loop = true
  The loop flag can be used to (dis-)allow loop count.

• static double min_delay = 0.
  The min_delay value can be used to set a minimum value for the frame delay for playback.

Protected Member Functions

• void clear_frames ()
• bool next_frame ()
• void on_extension_data (Fl_GIF_Image::GIF_FRAME &f) FL_OVERRIDE
• void on_frame_data (Fl_GIF_Image::GIF_FRAME &f) FL_OVERRIDE
• void scale_frame ()
• void set_frame ()
• void set_frame (int frame)
Static Protected Member Functions

- static void cb_animate (void *d)

Additional Inherited Members

34.9.1 Detailed Description

The Fl_Anim_GIF_Image class supports loading, caching, and drawing of animated Compuserve GIF images. The class loads all images contained in the file and animates them by cycling through them as defined by the delay times in the image file. The user must supply an FLTK widget as "container" in order to see the animation by specifying it in the constructor or later using the canvas() method.

34.9.2 Member Enumeration Documentation

34.9.2.1 Flags

enum Fl_Anim_GIF_Image::Flags

When opening an Fl_Anim_GIF_Image there are some options that can be passed in a flags value.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DONT_START</td>
<td>This flag indicates to the loader that it should not start the animation immediately after successful load, which is the default. It can be started later using the start() method.</td>
</tr>
<tr>
<td>DONT_RESIZE_CANVAS</td>
<td>This flag indicates to the loader that it should not resize the canvas widget of the animation to the dimensions of the animation, which is the default. Needed for special use cases.</td>
</tr>
<tr>
<td>DONT_SET_AS_IMAGE</td>
<td>This flag indicates to the loader that it should not set the animation as image() member of the canvas widget, which is the default. Needed for special use cases.</td>
</tr>
<tr>
<td>OPTIMIZE_MEMORY</td>
<td>Often frames change just a small area of the animation canvas. This flag indicates to the loader to try using less memory by storing frame data not as canvas-sized images but use the sizes defined in the GIF file. The drawbacks are higher cpu usage during playback and maybe minor artifacts when resized.</td>
</tr>
<tr>
<td>LOG_FLAG</td>
<td>This flag can be used to print informations about the decoding process to the console.</td>
</tr>
<tr>
<td>DEBUG_FLAG</td>
<td>This flag can be used to print even more informations about the decoding process to the console.</td>
</tr>
</tbody>
</table>

34.9.3 Constructor & Destructor Documentation

34.9.3.1 Fl_Anim_GIF_Image() [1/2]

Fl_Anim_GIF_Image::Fl_Anim_GIF_Image (const char * filename, Fl_Widget * canvas = 0, unsigned short flags = 0 )

Load an animated GIF image from a file.

This constructor creates an animated image from a GIF-formatted file. Optionally it applies the canvas() method after successful load. If DONT_START is not specified in the flags parameter it calls start() after successful load.
34.9 Fl_Anim_GIF_Image Class Reference

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>filename</th>
<th>path and name of GIF file in the file system</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>canvas</td>
<td>a widget that will show and animate the GIF, or NULL</td>
</tr>
<tr>
<td>in</td>
<td>flags</td>
<td>see Flags for details, or 0</td>
</tr>
</tbody>
</table>

Note

The GIF image must be decoupled from the canvas by calling `myGif->canvas(NULL)`; before deleting the canvas.

### 34.9.3.2 Fl_Anim_GIF_Image() [2/2]

```cpp
Fl_Anim_GIF_Image::Fl_Anim_GIF_Image (const char * imagename,
                                      const unsigned char * data,
                                      const size_t length,
                                      Fl_Widget * canvas = 0,
                                      unsigned short flags = 0)
```

Load an animated GIF image from memory. This constructor creates an animated image from a GIF-formatted block in memory. Optionally it applies the `canvas()` method after successful load. If `DONT_START` is not specified in the `flags` parameter it calls `start()` after successful load.

`imagename` can be `NULL`. If a name is given, the image is added to the list of shared images and will be available by that name.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>imagename</th>
<th>a name given to this image or NULL</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>data</td>
<td>pointer to the start of the GIF image in memory</td>
</tr>
<tr>
<td>in</td>
<td>length</td>
<td>length of the GIF image in memory</td>
</tr>
<tr>
<td>in</td>
<td>canvas</td>
<td>a widget that will show and animate the GIF, or NULL</td>
</tr>
<tr>
<td>in</td>
<td>flags</td>
<td>see Flags for details, or 0</td>
</tr>
</tbody>
</table>

Note

The GIF image must be decoupled from the canvas by calling `myGif->canvas(NULL)`; before deleting the canvas.

### 34.9.3.3 ~Fl_Anim_GIF_Image()

```cpp
Fl_Anim_GIF_Image::~Fl_Anim_GIF_Image ( )
```

Release the image and all cached data. Also removes the animation timer.

### 34.9.4 Member Function Documentation

#### 34.9.4.1 canvas() [1/2]

```cpp
Fl_Widget * Fl_Anim_GIF_Image::canvas ( ) const
```

Gets the current widget, that is used to display the frame images.
Returns

a pointer to a widget

34.9.4.2  canvas() [2/2]

void Fl_Anim_GIF_Image::canvas ( 
    Fl_Widget * canvas, 
    unsigned short flags = 0 )

Link the image back to a widget for automated animation. This method sets current widget, that is used to display the frame images. The flags parameter specifies whether the canvas widget is resized to the animation dimensions and/or its image() method will be used to set the current frame image during animation.

Parameters

| in  | canvas | a pointer to the widget that will show the animation |
| in  | flags  | see Flags                                                |

Note

The GIF image must be decoupled from the canvas by calling myGif->canvas(NULL); before deleting the canvas.

34.9.4.3  canvas_h()

int Fl_Anim_GIF_Image::canvas_h ( ) const

Return the height of the animation canvas.

Returns

the width in pixel units

34.9.4.4  canvas_w()

int Fl_Anim_GIF_Image::canvas_w ( ) const

Return the width of the animation canvas.

Returns

the width in pixel units

34.9.4.5  color_average()

void Fl_Anim_GIF_Image::color_average ( 
    Fl_Color c, 
    float i ) [virtual]

Applies a color average to all frames. The color_average() method averages the colors in the image with the provided FLTK color value.

Parameters

| in  | c   | blend color |
| in  | i   | a value between 0.0 and 1.0 where 0 results in the blend color, and 1 returns the original image |
Reimplemented from Fl_Image.

### 34.9.4.6 copy()

```cpp
Fl_Image * Fl_Anim_GIF_Image::copy (  
    int W,  
    int H ) const [virtual]
```

Copy and resize the animation frames.
The virtual `copy()` method makes a copy of the animated image and resizes all of its frame images to \( W \times H \) using the current resize method.

#### Parameters

- **in** `W,H` new size in FLTK pixel units

#### Returns

the resized copy of the animation

Reimplemented from Fl_Image.

### 34.9.4.7 delay() [1/2]

```cpp
void Fl_Anim_GIF_Image::delay (  
    int frame,  
    double delay )
```

Set the delay of frame \([0-\text{frames}() -1]\) in seconds.

#### Parameters

- **in** `frame` index into frame list
- **in** `delay` to next frame in seconds

### 34.9.4.8 delay() [2/2]

```cpp
double Fl_Anim_GIF_Image::delay (  
    int frame ) const
```

Return the delay of frame \([0-\text{Frames}() -1]\) in seconds.

#### Parameters

- **in** `frame` index into frame list

#### Returns

delay to next frame in seconds

### 34.9.4.9 desaturate()

```cpp
void Fl_Anim_GIF_Image::desaturate ( ) [virtual]
```

Desaturate to all frames of the animation.
Reimplemented from Fl_Image.

Generated by Doxygen
34.9.4.10 draw()

```c
void Fl_Anim_GIF_Image::draw (  
    int x,  
    int y,  
    int w,  
    int h,  
    int cx = 0,  
    int cy = 0 ) [virtual]
```

Draw the current frame of the animation.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>x, y, w, h</th>
<th>target rectangle</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>cx, cy</td>
<td>source offset</td>
</tr>
</tbody>
</table>

Reimplemented from Fl_Image.

34.9.4.11 frame() [1/2]

```c
int Fl_Anim_GIF_Image::frame ( ) const
```

Return the current frame.

Returns

the current frame index in the range for 0 to frames()-1.
-1 if the image has no frames.

34.9.4.12 frame() [2/2]

```c
void Fl_Anim_GIF_Image::frame (  
    int frame  
)
```

Set the current frame.

Parameters

| in  | frame | index into list of frames |

34.9.4.13 frame_count()

```c
int Fl_Anim_GIF_Image::frame_count (  
    const char * name,  
    const unsigned char * imgdata = NULL,  
    size_t imglength = 0 ) [static]
```

Get the number of frames in a GIF file or in a GIF compressed data block.

The static frame_count() method is just a convenience method for getting the number of images (frames) stored in a GIF file.

As this count is not readily available in the GIF header, the whole GIF file has be parsed (which is done here by using a temporary Fl_Anim_GIF_Image object for simplicity). So this call may be slow with large files.

If imgdata is NULL, the image will be read from the file. Otherwise, it will be read from memory.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>name</th>
<th>path and name of GIF file in the file system, ignored when reading from memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>imgdata</td>
<td>pointer to the start of the GIF image in memory, or NULL to read from a file</td>
</tr>
</tbody>
</table>
Parameters

| in | imglength | length of the GIF image in memory, or 0 |

Returns

the number of frames in the animation

### 34.9.4.14 frame_h()

```cpp
int Fl_Anim_GIF_Image::frame_h (int frame) const
```

Return the frame dimensions of a frame.
Usefull only if loaded with ‘optimize_mem’ and the animation also has size optimized frames.

Parameters

| in | frame | index into frame list |

Returns

height in FLTK pixle units

### 34.9.4.15 frame_uncache() [1/2]

```cpp
bool Fl_Anim_GIF_Image::frame_uncache () const
```

Return the active frame_uncache() setting.

Returns

true if caching is disabled

### 34.9.4.16 frame_uncache() [2/2]

```cpp
void Fl_Anim_GIF_Image::frame_uncache (bool uncache)
```

Use frame_uncache() to set or forbid frame image uncaching.
If frame uncaching is set, frame images are not offscreen cached for re-use and will be re-created every time they are displayed. This saves a lot of memory on the expense of cpu usage and should be carefully considered. Per default frame caching will be done.

Parameters

| in | uncache | true to disable caching |

### 34.9.4.17 frame_w()

```cpp
int Fl_Anim_GIF_Image::frame_w (int frame) const
```

Return the frame dimensions of a frame.
Usefull only if loaded with ‘optimize_mem’ and the animation also has size optimized frames.
Parameters

| in  | frame | index into frame list |

Returns

width in FLTK pixel units

### 34.9.4.18 frame_x()

```cpp
int Fl_Anim_GIF_Image::frame_x ( int frame ) const
```

Return the frame position of a frame. Usefull only if loaded with 'optimize_mem' and the animation also has size optimized frames.

Parameters

| in  | frame | index into frame list |

Returns

x position in FLTK pixel units

### 34.9.4.19 frame_y()

```cpp
int Fl_Anim_GIF_Image::frame_y ( int frame ) const
```

Return the frame position of a frame. Usefull only if loaded with 'optimize_mem' and the animation also has size optimized frames.

Parameters

| in  | frame | index into frame list |

Returns

y position in FLTK pixel units

### 34.9.4.20 frames()

```cpp
int Fl_Anim_GIF_Image::frames ( ) const
```

Get the number of frames in the animation.

Returns

the number of frames

### 34.9.4.21 image() [1/2]

```cpp
Fl_Image * Fl_Anim_GIF_Image::image ( ) const
```

Return the current frame image.
34.9 Fl_Anim_GIF_Image Class Reference

Returns

a pointer to the image or NULL if this is not an animation.

34.9.4.22  image() [2/2]

Fl_Image * Fl_Anim_GIF_Image::image ( int frame_ ) const
Return the image of the given frame index.

Parameters

| in   | frame_ | index into list of frames |

Returns

image data or NULL if the frame number is not valid.

34.9.4.23  is_animated()

bool Fl_Anim_GIF_Image::is_animated ( ) const
Check if this is a valid animation with more than one frame.
The is_animated() method is just a convenience method for testing the valid flag and the frame count being greater 1.

Returns

true if the animation is valid and has multiple frames.

34.9.4.24  load()

bool Fl_Anim_GIF_Image::load ( const char * name, const unsigned char * imgdata = NULL, size_t imglength = 0 )
Load an animation from a file or from a memory block.
The load() method is either used from the constructor to load the image from the given file, or to re-load an existing animation from another file.

Parameters

| in   | name            | path and name of GIF file in the file system, or the image name when reading from memory |
| in   | imgdata         | pointer to the start of the GIF image in memory, or NULL to read from a file |
| in   | imglength       | length of the GIF image in memory, or 0 |

Returns

true if the animation loaded correctly

34.9.4.25  name()

const char * Fl_Anim_GIF_Image::name ( ) const

Generated by Doxygen
Return the name of the played file as specified in the constructor. If read from a memory block, this returns the name of the animation.

Returns

pointer to a C string

34.9.4.26  next()

bool Fl_Anim_GIF_Image::next ( )
Show the next frame if the animation is stopped.

Returns

true if the animation has frames

34.9.4.27  on_extension_data()

void Fl_Anim_GIF_Image::on_extension_data ( 
    Fl_GIF_Image::GIF_FRAME & f ) [protected], [virtual]
Reimplemented from Fl_GIF_Image.

34.9.4.28  on_frame_data()

void Fl_Anim_GIF_Image::on_frame_data ( 
    Fl_GIF_Image::GIF_FRAME & f ) [protected], [virtual]
Reimplemented from Fl_GIF_Image.

34.9.4.29  playing()

bool Fl_Anim_GIF_Image::playing ( ) const [inline]
Return if the animation is currently running or stopped.

Returns

true if the animation is running

34.9.4.30  resize [1/2]

Fl_Anim_GIF_Image & Fl_Anim_GIF_Image::resize ( 
    double scale 
)  
Resizes the image to the specified size, replacing the current image. If DONT_RESIZE_CANVAS is not set, the canvas widget will also be resized.

Parameters

| in | scale | rescale factor in relation to current size |

34.9.4.31  resize [2/2]

Fl_Anim_GIF_Image & Fl_Anim_GIF_Image::resize ( 
    int w,

34.9 Fl_Anim_GIF_Image Class Reference

```cpp
int h )
Resizes the image to the specified size, replacing the current image.
If DONT_RESIZE_CANVAS is not set, the canvas widget will also be resized.

Parameters

| in | w, h | new size of the animation frames |
```

34.9.4.32 speed() [1/2]

double Fl_Anim_GIF_Image::speed ( ) const
Get the animation speed factor.

Returns

the current speed factor

34.9.4.33 speed() [2/2]

void Fl_Anim_GIF_Image::speed ( double speed )
Set the animation speed factor.
The speed() method changes the playing speed to speed x original speed. E.g. to play at half speed call it with 0.5, for double speed with 2.

Parameters

| in | speed | floating point speed factor |
```

34.9.4.34 start()

bool Fl_Anim_GIF_Image::start ( )
The start() method (re-)starts the playing of the frames.

Returns

true if the animation has frames

34.9.4.35 stop()

bool Fl_Anim_GIF_Image::stop ( )
The stop() method stops the playing of the frames.

Returns

true if the animation has frames

34.9.4.36 uncache()

void Fl_Anim_GIF_Image::uncache ( ) [virtual]
Uncache all cached image data now.
Re-implemented from Fl_Pixmap.
Reimplemented from Fl_Image.

---

Generated by Doxygen
34.9.4.37 valid()

bool Fl_Anim_GIF_Image::valid ( ) const
Check if animation is valid.

Returns
true if the class has successfully loaded and the image has at least one frame.

34.9.5 Member Data Documentation

34.9.5.1 loop

bool Fl_Anim_GIF_Image::loop = true [static]
The loop flag can be used to (dis-)allow loop count.
If set (which is the default), the animation will be stopped after the number of repeats specified in the GIF file
(typically this count is set to 'forever' anyway). If cleared the animation will always be 'forever', regardless of what is
specified in the GIF file.

34.9.5.2 min_delay

double Fl_Anim_GIF_Image::min_delay = 0. [static]
The min_delay value can be used to set a minimum value for the frame delay for playback.
This is to prevent CPU hogs caused by images with very low delay rates. This is a global value for all
Fl_Anim_GIF_Image objects.
The documentation for this class was generated from the following files:

• Fl_Anim_GIF_Image.H
• Fl_Anim_GIF_Image.cxx

34.10 Fl_Bitmap Class Reference

The Fl_Bitmap class supports caching and drawing of mono-color (bitmap) images.
#include <Fl_Bitmap.H>
Inheritance diagram for Fl_Bitmap:

```
Fl_Bitmap
    |        
Fl_Image
    |        
Fl_Bitmap
    |        
Fl_XBM_Image
```

Public Member Functions

• int cache_h ()
• int cache_w ()
• Fl_Image * copy () const
• Fl_Image * copy (int W, int H) const FL_OVERRIDE
    Creates a resized copy of the image.
• void draw (int X, int Y)
• void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE
    Draws the image to the current drawing surface with a bounding box.
• Fl_Bitmap (const char +bits, int bits_length, int W, int H)
The constructors create a new bitmap from the specified bitmap data.

- **Fl_Bitmap** (const char ∗bits, int W, int H)
  - The constructors create a new bitmap from the specified bitmap data.
- **Fl_Bitmap** (const uchar ∗bits, int W, int H)
  - The constructors create a new bitmap from the specified bitmap data.
- **Fl_Bitmap** (const uchar ∗bits, int bits_length, int W, int H)
  - The constructors create a new bitmap from the specified bitmap data.

- **void label (Fl_Menu_Item *m) FL_OVERRIDE**
  - This method is an obsolete way to set the image attribute of a menu item.
- **void label (Fl_Widget *w) FL_OVERRIDE**
  - This method is an obsolete way to set the image attribute of a widget or menu item.
- **void uncache () FL_OVERRIDE**
  - If the image has been cached for display, delete the cache data.
- **virtual ∼Fl_Bitmap ()**
  - The destructor frees all memory and server resources that are used by the bitmap.

**Public Attributes**

- **int alloc_array**
  - Non-zero if array points to bitmap data allocated internally.
- **const uchar ∗array**
  - Pointer to raw bitmap data

**Friends**

- **class Fl_Graphics_Driver**

**Additional Inherited Members**

34.10.1 Detailed Description

The **Fl_Bitmap** class supports caching and drawing of mono-color (bitmap) images. Images are drawn using the current color.

34.10.2 Constructor & Destructor Documentation

34.10.2.1 **Fl_Bitmap()** [1/4]

**Fl_Bitmap::Fl_Bitmap (**
  - const uchar ∗bits,
  - int W,
  - int H ) [inline]

The constructors create a new bitmap from the specified bitmap data.

See also

- **Fl_Bitmap(const uchar ∗bits, int bits_length, int W, int H)**
34.10.2.2 Fl_Bitmap() [2/4]

Fl_Bitmap::Fl_Bitmap (const char * bits, int W, int H) [inline]

The constructors create a new bitmap from the specified bitmap data.

See also

Fl_Bitmap(const char *bits, int bits_length, int W, int H)

34.10.2.3 Fl_Bitmap() [3/4]

Fl_Bitmap::Fl_Bitmap (const uchar * bits, int bits_length, int W, int H)

The constructors create a new bitmap from the specified bitmap data.
If the provided array is too small to contain all the image data, the constructor will not generate the bitmap to avoid illegal memory read access and instead set data to NULL and ld to ERR_MEMORY_ACCESS.

Parameters

<table>
<thead>
<tr>
<th>bits</th>
<th>bitmap data, one pixel per bit, rows are rounded to the next byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>bits_length</td>
<td>length of the bits array in bytes</td>
</tr>
<tr>
<td>W</td>
<td>image width in pixels</td>
</tr>
<tr>
<td>H</td>
<td>image height in pixels</td>
</tr>
</tbody>
</table>

See also

Fl_Bitmap(const char *bits, int bits_length, int W, int H), Fl_Bitmap(const uchar *bits, int W, int H)

34.10.2.4 Fl_Bitmap() [4/4]

Fl_Bitmap::Fl_Bitmap (const char * bits, int bits_length, int W, int H)

The constructors create a new bitmap from the specified bitmap data.
If the provided array is too small to contain all the image data, the constructor will not generate the bitmap to avoid illegal memory read access and instead set data to NULL and ld to ERR_MEMORY_ACCESS.

Parameters

<table>
<thead>
<tr>
<th>bits</th>
<th>bitmap data, one pixel per bit, rows are rounded to the next byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>bits_length</td>
<td>length of the bits array in bytes</td>
</tr>
<tr>
<td>W</td>
<td>image width in pixels</td>
</tr>
<tr>
<td>H</td>
<td>image height in pixels</td>
</tr>
</tbody>
</table>
See also

\texttt{Fl\_Bitmap(const\s*uchar\s*\ast\s*bits,\s*int\s*bits\_length,\s*int\s*W,\s*int\s*H),\s*Fl\_Bitmap(const\s*char\s*\ast\s*bits,\s*int\s*W,\s*int\s*H)}

## 34.10.3 Member Function Documentation

### 34.10.3.1 copy()

\texttt{Fl\_Image\s*\ast\s*Fl\_Bitmap::copy\s*(\s*int\s*W,\s*int\s*H\s*)\s*const\[virtual\]}

Creates a resized copy of the image.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use \texttt{Fl\_Image::release()} for all types of images (i.e. all subclasses of \texttt{Fl\_Image}) instead of \texttt{operator delete} for \texttt{Fl\_Image}'s and \texttt{Fl\_Image::release()} for \texttt{Fl\_Shared\_Image}'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by \texttt{Fl\_Image::RGB\_scaling()}.

For the new image the following equations are true:

- \( \text{w}() = \text{data\_w}() = W \)
- \( \text{h}() = \text{data\_h}() = H \)

Parameters

| in | \( W,H \) | Requested width and height of the new image |

Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of \texttt{Fl\_RGB\_Image}, \texttt{Fl\_SVG\_Image}, \texttt{Fl\_Pixmap}, \texttt{Fl\_Bitmap}, \texttt{Fl\_Tiled\_Image}, \texttt{Fl\_Anim\_GIF\_Image} and \texttt{Fl\_Shared\_Image}. Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an \texttt{Fl\_GIF\_Image} is an object of class \texttt{Fl\_Pixmap}.

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from \texttt{Fl\_Image} or any subclass your overridden methods of '\texttt{Fl\_Image::copy()} const' and '\texttt{Fl\_Image::copy(int, int) const}' must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from \texttt{Fl\_Image}.

### 34.10.3.2 draw()

\texttt{void Fl\_Bitmap::draw\s*(\s*int\s*X,\s*int\s*Y,\s*int\s*W,\s*int\s*H,\s*int\s*cx\s*=\s*0,\s*int\s*cy\s*=\s*0\s*)\s*[virtual]}\n
Draws the image to the current drawing surface with a bounding box.

Arguments \( X, Y, W, H \) specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the \( cx \) and \( cy \) arguments.

In other words: \texttt{fl\_push\_clip(X,Y,W,H)} is applied, the image is drawn with its upper-left corner at \( X-cx,Y-cy \) and its own width and height, \texttt{fl\_pop\_clip()} is applied.

Reimplemented from \texttt{Fl\_Image}.
34.10.3.3 label() [1/2]

```cpp
void Fl_Bitmap::label ( Fl_Menu_Item * m ) [virtual]
```

This method is an obsolete way to set the image attribute of a menu item.

**Deprecated** Please use Fl_Menu_Item::image() instead.

Reimplemented from Fl_Image.

34.10.3.4 label() [2/2]

```cpp
void Fl_Bitmap::label ( Fl_Widget * widget ) [virtual]
```

This method is an obsolete way to set the image attribute of a widget or menu item.

**Deprecated** Please use Fl_Widget::image() or Fl_Widget::deimage() instead.

Reimplemented from Fl_Image.

34.10.3.5 uncache()

```cpp
void Fl_Bitmap::uncache ( ) [virtual]
```

If the image has been cached for display, delete the cache data.

This allows you to change the data used for the image and then redraw it without recreating an image object.

Reimplemented from Fl_Image.

The documentation for this class was generated from the following files:

- Fl_Bitmap.H
- Fl_Bitmap.cxx

## 34.11 Fl_BMP_Image Class Reference

The Fl_BMP_Image class supports loading, caching, and drawing of Windows Bitmap (BMP) image files.

```cpp
#include <Fl_BMP_Image.H>
```

Inheritance diagram for Fl_BMP_Image:

```
Fl_BMP_Image
|     |
|     |
Fl_RGB_Image
|     |
|     |
Fl_BMP_Image
|     |
|     |
Fl_ICO_Image
```

### Public Member Functions

- **Fl_BMP_Image** (const char *filename)
  
  This constructor loads the named BMP image from the given BMP filename.

- **Fl_BMP_Image** (const char *imagename, const unsigned char *data, const long length=-1)
  
  This constructor loads a BMP image from memory.

### Protected Member Functions

- void **load_bmp** (class Fl_Image_Reader &rdr, int ico_height=0, int ico_width=0)
Additional Inherited Members

34.11.1 Detailed Description

The Fl_BMP_Image class supports loading, caching, and drawing of Windows Bitmap (BMP) image files.

34.11.2 Constructor & Destructor Documentation

34.11.2.1 Fl_BMP_Image() [1/2]

Fl_BMP_Image::Fl_BMP_Image (const char * filename)

This constructor loads the named BMP image from the given BMP filename. The destructor frees all memory and server resources that are used by the image. Use Fl_Image::fail() to check if Fl_BMP_Image failed to load. fail() returns ERR_FILE_ACCESS if the file could not be opened or read, ERR_FORMAT if the BMP format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason.

Parameters

| in     | filename | a full path and name pointing to a BMP file. |

See also

Fl_BMP_Image::Fl_BMP_Image(const char* imagename, const unsigned char *data, const long length = -1);

34.11.2.2 Fl_BMP_Image() [2/2]

Fl_BMP_Image::Fl_BMP_Image (const char * imagename, const unsigned char * data, const long length = -1)

This constructor loads a BMP image from memory. Construct an image from a block of memory inside the application. Fluid offers "binary data" chunks as a great way to add image data into the C++ source code. imagename can be NULL. If a name is given, the image is added to the list of shared images and will be available by that name. The destructor frees all memory and server resources that are used by the image. The (new and optional) third parameter length should be used so buffer overruns (i.e. truncated images) can be checked. See note below.

If length is not used

- it defaults to -1 (unlimited size)
- buffer overruns will not be checked.

Note

The optional parameter length is available since FLTK 1.4.0. Not using it is deprecated and old code should be modified to use it. This parameter will likely become mandatory in a future FLTK version.

Use Fl_Image::fail() to check if Fl_BMP_Image failed to load. fail() returns ERR_FILE_ACCESS if the image could not be read from memory, ERR_FORMAT if the BMP format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason.

Parameters

| in     | imagename | A name given to this image or NULL |
| in     | data      | Pointer to the start of the BMP image in memory. |
|        | length    | Length of the BMP image in memory. |
See also

\begin{verbatim}
   Fl_BMP_Image::Fl_BMP_Image(const char *filename)
   Fl_Shared_Image
\end{verbatim}

The documentation for this class was generated from the following files:

- Fl_BMP_Image.H
- Fl_BMP_Image.cxx

### 34.12 Fl_Box Class Reference

This widget simply draws its box, and possibly its label.

```cpp
#include <Fl_Box.H>
```

Inheritance diagram for Fl_Box:

```
Fl_Widget
  ↓
Fl_Box
```

#### Public Member Functions

- `Fl_Box (Fl_Boxtype b, int X, int Y, int W, int H, const char *l)`
  
  See `Fl_Box::Fl_Box(int x, int y, int w, int h, const char * = 0)`

- `Fl_Box (int X, int Y, int W, int H, const char *l = 0)`
- `int handle (int) FL_OVERRIDE`

  Handles the specified event.

#### Protected Member Functions

- `void draw () FL_OVERRIDE`

  Draws the widget.

#### Additional Inherited Members

### 34.12.1 Detailed Description

This widget simply draws its box, and possibly its label.

Putting it before some other widgets and making it big enough to surround them will let you draw a frame around them.

### 34.12.2 Constructor & Destructor Documentation

#### 34.12.2.1 Fl_Box()

```cpp
Fl_Box::Fl_Box (  
   int X,  
   int Y,  
   int W,  
   int H,  
   const char * l = 0 )
```

Generated by Doxygen
• The first constructor sets box() to FL_NO_BOX, which means it is invisible. However such widgets are useful as placeholders or Fl_Group::resizable() values. To change the box to something visible, use box(n).

• The second form of the constructor sets the box to the specified box type.

The destructor removes the box.

### 34.12.3 Member Function Documentation

#### 34.12.3.1 draw()

```cpp
void Fl_Box::draw () [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.

#### 34.12.3.2 handle()

```cpp
int Fl_Box::handle ( int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

**Parameters**

- **in event** the kind of event received

**Return values**

- **0** if the event was not used or understood
- **1** if the event was used and can be deleted

See also

- Fl_Event

Reimplemented from Fl_Widget.

The documentation for this class was generated from the following files:

- Fl_Box.H
- Fl_Box.cxx
34.13  Fl_Browser Class Reference

The Fl_Browser widget displays a scrolling list of text lines, and manages all the storage for the text.

#include <Fl_Browser.H>

Inheritance diagram for Fl_Browser:

```
Fl_Widget
|   |
|   |
Fl_Group
|   |
|   |
Fl_Browser
|   |
|   |
Fl_Browser_ Fl_Group Fl_Widget Fl_File_Browser Fl_Hold_Browser Fl_Multi_Browser Fl_Select_Browser
```

Public Types

- enum Fl_Line_Position { TOP, BOTTOM, MIDDLE }

  For internal use only?

Public Member Functions

- void add (const char *newtext, void *d=0)

  Adds a new line to the end of the browser.

- void bottomline (int line)

  Scrolls the browser so the bottom item in the browser is showing the specified line.

- void clear ()

  Removes all the lines in the browser.

- char column_char () const

  Gets the current column separator character.

- void column_char (char c)

  Sets the column separator to c.

- const int * column_widths () const

  Gets the current column width array.

- void column_widths (const int *arr)

  Sets the current array to arr.

- void * data (int line) const

  Returns the user data() for specified line.

- void data (int line, void *d)

  Sets the user data for specified line to d.

- void display (int line, int val=1)

  For back compatibility.

- int displayed (int line) const

  Returns non-zero if line has been scrolled to a position where it is being displayed.

- Fl_Browser (int X, int Y, int W, int H, const char *L=0)

  The constructor makes an empty browser.

- char format_char () const

  Gets the current format code prefix character, which by default is '@'.

- void format_char (char c)
Sets the current format code prefix character to \texttt{c}.

- **void hide () FL_OVERRIDE**
  
  Hides the entire \texttt{Fl_Browser} widget – opposite of show().

- **void hide (int line)**
  
  Makes line invisible, preventing selection by the user.

- **\texttt{Fl_Image \ast icon (int line) const}**
  
  Returns the icon currently defined for line.

- **void icon (int line, \texttt{Fl_Image \ast icon})**
  
  Set the image icon for line to the value icon.

- **void insert (int line, const char \ast newtext, void \ast d=0)**
  
  Insert a new entry whose label is \texttt{newtext} above given line, optional data \texttt{d}.

- **void lineposition (int line, \texttt{Fl_Line_Position pos})**
  
  Updates the browser so that line is shown at position pos.

- **int load (const char \ast filename)**
  
  Clears the browser and reads the file, adding each line from the file to the browser.

- **void make_visible (int line)**
  
  Make the item at the specified line visible().

- **void middleline (int line)**
  
  Scrolls the browser so the middle item in the browser is showing the specified line.

- **void move (int to, int from)**
  
  Line from is removed and reinserted at to.

- **void remove (int line)**
  
  Remove entry for given line number, making the browser one line shorter.

- **void remove_icon (int line)**
  
  Removes the icon for line.

- **void replace (int a, const char \ast b)**
  
  For back compatibility only.

- **int select (int line, int val=1)**
  
  Sets the selection state of the item at line to the value val.

- **int selected (int line) const**
  
  Returns 1 if specified line is selected, 0 if not.

- **void show () FL_OVERRIDE**
  
  Shows the entire \texttt{Fl_Browser} widget – opposite of hide().

- **void show (int line)**
  
  Makes line visible, and available for selection by user.

- **int size () const**
  
  Returns how many lines are in the browser.

- **void size (int W, int H)**
  
  Swaps two browser lines \texttt{a} and \texttt{b}.

- **const char \ast text (int line) const**
  
  Returns the label text for the specified line.

- **void text (int line, const char \ast newtext)**
  
  Sets the text for the specified line to newtext.

- **\texttt{Fl_Fontsize textsize () const}**
  
  Gets the default text size (in pixels) for the lines in the browser.

- **void textsize (\texttt{Fl_Fontsize newSize})**
  
  Sets the default text size (in pixels) for the lines in the browser to newSize.

- **int topline () const**
  
  Returns the line that is currently visible at the top of the browser.

- **void topline (int line)**
Scrolls the browser so the top item in the browser is showing the specified line.

- **int value () const**
  Returns the line number of the currently selected line, or 0 if none selected.

- **void value (int line)**
  Sets the browser's value(), which selects the specified line.

- **int visible (int line) const**
  Returns non-zero if the specified line is visible, 0 if hidden.

- **~Fl_Browser ()**
  The destructor deletes all list items and destroys the browser.

**Protected Member Functions**

- **FL_BLINE * _remove (int line)**
  Removes the item at the specified line.

- **FL_BLINE * find_line (int line) const**
  Returns the item for specified line.

- **int full_height () const FL_OVERRIDE**
  The height of the entire list of all visible() items in pixels.

- **int incr_height () const FL_OVERRIDE**
  The default 'average' item height (including inter-item spacing) in pixels.

- **void insert (int line, FL_BLINE * item)**
  Insert specified item above line.

- **void * item_at (int line) const FL_OVERRIDE**
  Return the item at specified line.

- **void item_draw (void * item, int X, int Y, int W, int H) const FL_OVERRIDE**
  Draws item at the position specified by XYWH.

- **void * item_first () const FL_OVERRIDE**
  Returns the very first item in the list.

- **int item_height (void * item) const FL_OVERRIDE**
  Returns height of item in pixels.

- **void * item_last () const FL_OVERRIDE**
  Returns the very last item in the list.

- **void * item_next (void * item) const FL_OVERRIDE**
  Returns the next item after item.

- **void * item_prev (void * item) const FL_OVERRIDE**
  Returns the previous item before item.

- **void item_select (void * item, int val) FL_OVERRIDE**
  Change the selection state of item to the value val.

- **int item_selected (void * item) const FL_OVERRIDE**
  See if item is selected.

- **void item_swap (void *a, void *b) FL_OVERRIDE**
  Swap the items a and b.

- **const char * item_text (void *item) const FL_OVERRIDE**
  Returns the label text for item.

- **int item_width (void *item) const FL_OVERRIDE**
  Returns width of item in pixels.

- **int lineno (void *item) const**
  Returns line number corresponding to item, or zero if not found.

- **void swap (FL_BLINE *a, FL_BLINE *b)**
  Swap the two items a and b.
**Additional Inherited Members**

### 34.13.1 Detailed Description

The `Fl_Browser` widget displays a scrolling list of text lines, and manages all the storage for the text. This is not a text editor or spreadsheet! But it is useful for showing a vertical list of named objects to the user.

![Figure 34.2 Fl_Hold_Browser](image1)

![Figure 34.3 Fl_Multi_Browser](image2)

Each line in the browser is identified by number. *The numbers start at one* (this is so that zero can be reserved for "no line" in the selective browsers). *Unless otherwise noted, the methods do not check to see if the passed line number is in range and legal. It must always be greater than zero and <= size().*

Each line contains a null-terminated string of text and a void * data pointer. The text string is displayed, the void * pointer can be used by the callbacks to reference the object the text describes.

The base class does nothing when the user clicks on it. The subclasses `Fl_Select_Browser`, `Fl_Hold_Browser`, and `Fl_Multi_Browser` react to user clicks to select lines in the browser and do callbacks.

The base class `Fl_Browser` provides the scrolling and selection mechanisms of this and all the subclasses, but the dimensions and appearance of each item are determined by the subclass. You can use `Fl_Browser` to display information other than text, or text that is dynamically produced from your own data structures. If you find that loading the browser is a lot of work or is inefficient, you may want to make a subclass of `Fl_Browser`.

Some common coding patterns used for working with `Fl_Browser`:

```c++
// How to loop through all the items in the browser
for ( int t=1; t<browser->size(); t++ ) { // index 1 based!
    printf("item %d, label='%s'\n", t, browser->text(t));
}
```

Note: If you are subclassing `Fl_Browser`, it's more efficient to use the protected methods `item_first()` and `item_next()`, since `Fl_Browser` internally uses linked lists to manage the browser's items. For more info, see `find_item(int)`.

### 34.13.2 Constructor & Destructor Documentation

#### 34.13.2.1 Fl_Browser()

`Fl_Browser::Fl_Browser` {
    int _X,
    int _Y,
    int _W,
    int _H,
    const char * _L = 0
}

The constructor makes an empty browser.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>X, Y, W, H</th>
<th>position and size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>_L</td>
<td>label string, may be NULL.</td>
</tr>
</tbody>
</table>
34.13.3 Member Function Documentation

34.13.3.1 _remove()

```cpp
FL_BLINE * Fl_Browser::_remove (int line) [protected]
```

Removes the item at the specified `line`. Caveat: See efficiency note in `find_line()`. You must call `redraw()` to make any changes visible.

Parameters

| In | `line` | The line number to be removed. (1 based) Must be in range!
|

Returns

Pointer to browser item that was removed (and is no longer valid).

See also

`add(), insert(), remove(), swap(int,int), clear()`

34.13.3.2 add()

```cpp
void Fl_Browser::add (const char * newtext, void * d = 0)
```

Adds a new line to the end of the browser.
The text string `newtext` may contain format characters; see `format_char()` for details. `newtext` is copied using the `strdup()` function, and can be NULL to make a blank line.
The optional void* argument `d` will be the `data()` for the new item.

Parameters

| In | `newtext` | The label text used for the added item

See also

`add(), insert(), remove(), swap(int,int), clear()`

34.13.3.3 bottomline()

```cpp
void Fl_Browser::bottomline (int line) [inline]
```

Scrolls the browser so the bottom item in the browser is showing the specified `line`.

Parameters

| In | `line` | The line to be displayed at the bottom. |
34.13 Fl_Browser Class Reference

See also

topline(), middleline(), bottomline(), displayed(), lineposition()

34.13.3.4 clear()

void Fl_Browser::clear ()
Removes all the lines in the browser.

See also

add(), insert(), remove(), swap(int,int), clear()

34.13.3.5 column_char() [1/2]

char Fl_Browser::column_char ( ) const [inline]
Gets the current column separator character.
The default is 't' (tab).

See also

column_char(), column_widths()

34.13.3.6 column_char() [2/2]

void Fl_Browser::column_char ( char c ) [inline]
Sets the column separator to c.
This will only have an effect if you also set column_widths(). The default is 't' (tab).

See also

column_char(), column_widths()

34.13.3.7 column_widths() [1/2]

const int * Fl_Browser::column_widths ( ) const [inline]
Gets the current column width array.
This array is zero-terminated and specifies the widths in pixels of each column. The text is split at each
column_char() and each part is formatted into it's own column. After the last column any remaining text is for-
matted into the space between the last column and the right edge of the browser, even if the text contains instances
of column_char() . The default value is a one-element array of just a zero, which means there are no columns.
Example:

```
FL_Browser *b = new FL_Browser(..);
static int widths[] = { 50, 50, 50, 50, 30, 30, 30, 30, 30, 30, 0 }; // widths for each column
b->column_widths(widths); // assign array to widget
b->column_char('t'); // use tab as the column character
b->add("root\t2888\t0.0\t0.0\t1352\ttty3\ttAug15\t0:00\t/sbin/mingetty tty3*1;
b->add("root\t13115\t0.0\t0.0\t1352\t tty2\ttAug30\t0:00\t/sbin/mingetty tty2*1;
[..]
```
See also

column_char(), column_widths()
34.13.3.8  column_widths() [2/2]

void Fl_Browser::column_widths (const int * arr) [inline]

Sets the current array to arr.
Make sure the last entry is zero.

See also

column_char(), column_widths()

34.13.3.9  data() [1/2]

void * Fl_Browser::data (int line) const

Returns the user data() for specified line.
Return value can be NULL if line is out of range or no user data() was defined. The parameter line is 1 based
(1 will be the first item in the list).

Parameters

| in  | line | The line number of the item whose data() is returned. (1 based) |

Returns

The user data pointer (can be NULL)

34.13.3.10 data() [2/2]

void Fl_Browser::data (int line, void * d)

Sets the user data for specified line to d.
Does nothing if line is out of range.

Parameters

| in  | line | The line of the item whose data() is to be changed. (1 based) |

| in  | d    | The new data to be assigned to the item. (can be NULL) |

34.13.3.11 display()

void Fl_Browser::display (int line, int val = 1)

For back compatibility.
This calls show(line) if val is true, and hide(line) otherwise. If val is not specified, the default is 1 (makes the line visible).

See also

show(int), hide(int), display(), visible(), make_visible()
34.13.3.12 displayed()

int Fl_Browser::displayed (  
    int line ) const  [inline]

Returns non-zero if line has been scrolled to a position where it is being displayed.  
Checks to see if the item's vertical position is within the top and bottom edges of the display window.  
This does NOT take into account the hide()/show() status of the widget or item.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>line</th>
<th>The line to be checked</th>
</tr>
</thead>
</table>

Returns

1 if visible, 0 if not visible.

See also

toline(), middleline(), bottomline(), displayed(), lineposition()

34.13.3.13 find_line()

FL_BLINE * Fl_Browser::find_line (  
    int line ) const  [protected]

Returns the item for specified line.  
Note: This call is slow. It's fine for e.g. responding to user clicks, but slow if called often, such as in a  
tight sorting loop. Finding an item 'by line' involves a linear lookup on the internal linked list. The  
performance hit can be significant if the browser's contents is large, and the method is called often (e.g.  
during a sort). If you're writing a subclass, use the protected methods item_first(), item_next(), etc. to  
access the internal linked list more efficiently.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>line</th>
<th>The line number of the item to return. (1 based)</th>
</tr>
</thead>
</table>

Return values

<table>
<thead>
<tr>
<th>item</th>
<th>that was found.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NULL</td>
<td>if line is out of range.</td>
</tr>
</tbody>
</table>

See also

item_at(), find_line(), lineno()

34.13.3.14 format_char() [1/2]

char Fl_Browser::format_char ( ) const  [inline]

Gets the current format code prefix character, which by default is '@'.  
A string of formatting codes at the start of each column are stripped off and used to modify how the rest of the line  
is printed:

- '@.' Print rest of line, don't look for more '@' signs
- '@@' Doubling the format character prints the format character once, followed by the rest of line
- '@l' Use a LARGE (24 point) font
• '@m' Use a medium large (18 point) font
• '@s' Use a small (11 point) font
• '@b' Use a bold font (adds FL_BOLD to font)
• '@i' Use an italic font (adds FL_ITALIC to font)
• '@f' or '@t' Use a fixed-pitch font (sets font to FL_COURIER)
• '@c' Center the line horizontally
• '@r' Right-justify the text
• '@N' Use fl_inactive_color() to draw the text
• '@B0', '@B1', ... '@B255' Fill the background with fl_color(n)
• '@C0', '@C1', ... '@C255' Use fl_color(n) to draw the text
• '@F0', '@F1', ... Use fl_font(n) to draw the text
• '@S1', '@S2', ... Use point size n to draw the text
• '@u' or '@_' Underline the text.
• '@-' draw an engraved line through the middle.

Notice that the '@.' command can be used to reliably terminate the parsing. To print a random string in a random color, use sprintf("@C%d@.%s", color, string) and it will work even if the string starts with a digit or has the format character in it.

34.13.3.15 format_char() [2/2]

void Fl_Browser::format_char (char c) [inline]
Sets the current format code prefix character to c.
The default prefix is '@'. Set the prefix to 0 to disable formatting.

See also

format_char() for list of '@' codes

34.13.3.16 full_height()

int Fl_Browser::full_height () const [protected], [virtual]
The height of the entire list of all visible() items in pixels.
This returns the accumulated height of all the items in the browser that are not hidden with hide(), including items scrolled off screen.

Returns

The accumulated size of all the visible items in pixels.

See also

item_height(), item_width(),
incr_height(), full_height()

Reimplemented from Fl_Browser_.

Generated by Doxygen
34.13.3.17 hide() [1/2]

void Fl_Browser::hide ( ) [inline], [virtual]
Hides the entire Fl_Browser widget – opposite of show().
Reimplemented from Fl_Widget.

34.13.3.18 hide() [2/2]

void Fl_Browser::hide ( int line )
Makes line invisible, preventing selection by the user.
The line can still be selected under program control. This changes the full_height() if the state was changed. When a line is made invisible, lines below it are moved up in the display. redraw() is called automatically if a change occurred.

Parameters

| in | line | The line to be hidden. (1 based) |

See also

show(int), hide(int), display(), visible(), make_visible()

34.13.3.19 icon() [1/2]

Fl_Image * Fl_Browser::icon ( int line ) const
Returns the icon currently defined for line.
If no icon is defined, NULL is returned.

Parameters

| in | line | The line whose icon is returned. |

Returns

The icon defined, or NULL if none.

34.13.3.20 icon() [2/2]

void Fl_Browser::icon ( int line,
                        Fl_Image * icon )
Set the image icon for line to the value icon.
Caller is responsible for keeping the icon allocated. The line is automatically redrawn.

Parameters

| in  | line | The line to be modified. If out of range, nothing is done. |
| in  | icon | The image icon to be assigned to the line. If NULL, any previous icon is removed. |
### 34.13.3.21 incr_height()

```cpp
int Fl_Browser::incr_height ( ) const [protected], [virtual]
The default 'average' item height (including inter-item spacing) in pixels.
This currently returns `textsize() + 2`.  

Returns

The value in pixels.

See also

- `item_height()`, `item_width()`,
- `incr_height()`, `full_height()`

Reimplemented from `Fl_Browser_`.
```

### 34.13.3.22 insert() [1/2]

```cpp
void Fl_Browser::insert (  
    int line,  
    const char ∗ newtext,  
    void ∗ d = 0 )
```

Insert a new entry whose label is `newtext` above given `line`, optional data `d`.  
Text may contain format characters; see `format_char()` for details.  
`newtext` is copied using the `strdup()` function, and can be NULL to make a blank line.  
The optional void ∗ argument `d` will be the `data()` of the new item.

Parameters

| in | `line` | Line position for insert. (1 based)  
|    |        | If `line > size()`, the entry will be added at the end.  
| in | `newtext` | The label text for the new line.  
| in | `d` | Optional pointer to user data to be associated with the new line.  

### 34.13.3.23 insert() [2/2]

```cpp
void Fl_Browser::insert (  
    int line,  
    FL_BLINE ∗ item ) [protected]
```

Insert specified `item` above `line`.  
If `line > size()` then the line is added to the end.  
Caveat: See efficiency note in `find_line()`.

Parameters

| in | `line` | The new line will be inserted above this line (1 based).  
| in | `item` | The item to be added.  

### 34.13.3.24 item_at()

```cpp
void ∗ Fl_Browser::item_at (  
    int line ) const [inline], [protected], [virtual]
```

Return the item at specified `line`.  

---

Generated by Doxygen
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>line</td>
<td>The line of the item to return. (1 based)</td>
</tr>
</tbody>
</table>

Returns

The item, or NULL if line out of range.

See also

item_at(), find_line(), lineno()

Reimplemented from Fl_Browser_.

### 34.13.3.25 item_draw()

```c
void Fl_Browser::item_draw ( void *item, int X, int Y, int W, int H ) const [protected], [virtual]
```

Draws item at the position specified by X Y W H. The W and H values are used for clipping. Should only be called within the context of an FLTK draw().

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>item</td>
<td>The item to be drawn</td>
</tr>
<tr>
<td>X, Y, W, H</td>
<td>position and size.</td>
</tr>
</tbody>
</table>

Implements Fl_Browser_.

### 34.13.3.26 item_first()

```c
void *Fl_Browser::item_first ( ) const [protected], [virtual]
```

Returns the very first item in the list.

Example of use:

```c
// Walk the browser from beginning to end
for ( void *i=item_first(); i; i=item_next(i) ) {
    printf("item label='\"%s\"', item_text(i));
}
```

Returns

The first item, or NULL if list is empty.

See also

item_first(), item_last(), item_next(), item_prev()

Implements Fl_Browser_.

### 34.13.3.27 item_height()

```c
int Fl_Browser::item_height ( void *item ) const [protected], [virtual]
```

Returns height of item in pixels. This takes into account embedded @ codes within the text() label.
Parameters

| in | item | The item whose height is returned. |

Returns

The height of the item in pixels.

See also

item_height(), item_width(),
increment_height(), full_height()

Implements Fl_Browser_.

### 34.13.3.28 item_last()

```cpp
void * Fl_Browser::item_last ( ) const [protected], [virtual]
```

Returns the very last item in the list.

Example of use:

```cpp
// Walk the browser in reverse, from end to start
for ( void *i=item_last(); i; i=item_prev(i) ) {
  printf("item label="s"\n", item_text(i));
}
```

Returns

The last item, or NULL if list is empty.

See also

item_first(), item_last(), item_next(), item_prev()

Reimplemented from Fl_Browser_.

### 34.13.3.29 item_next()

```cpp
void * Fl_Browser::item_next (item)
```

Returns the next item after `item`.

Parameters

| in | item | The 'current' item |

Returns

The next item after `item`, or NULL if there are none after this one.

See also

item_first(), item_last(), item_next(), item_prev()

Implements Fl_Browser_.

### 34.13.3.30 item_prev()

```cpp
void * Fl_Browser::item_prev (item)
```

Parameters

| in | item | The item whose height is returned. |

Returns

The next item after `item`, or NULL if there are none after this one.
Returns the previous item before item.
Parameters

| in  | item | The 'current' item |

Returns

The previous item before `item`, or NULL if there are none before this one.

See also

`item_first()`, `item_last()`, `item_next()`, `item_prev()`

Implements `Fl_Browser_`.

### 34.13.3.31 item_select()

```cpp
void Fl_Browser::item_select (
    void * item,
    int val ) [protected], [virtual]
```

Change the selection state of `item` to the value `val`.

Parameters

| in  | item | The item to be changed. |
| in  | val  | The new selection state: 1 selects, 0 de-selects. |

See also

`select()`, `selected()`, `value()`, `item_select()`, `item_selected()`

Reimplemented from `Fl_Browser_`.

### 34.13.3.32 item_selected()

```cpp
int Fl_Browser::item_selected ( 
    void * item ) const [protected], [virtual]
```

See if `item` is selected.

Parameters

| in  | item | The item whose selection state is to be checked. |

Returns

1 if selected, 0 if not.

See also

`select()`, `selected()`, `value()`, `item_select()`, `item_selected()`

Reimplemented from `Fl_Browser_`.

### 34.13.3.33 item_swap()

```cpp
void Fl_Browser::item_swap ( 
    void * a,
    void * b ) [inline], [protected], [virtual]
```
Swap the items a and b. You must call `redraw()` to make any changes visible.

Parameters

| in | a, b | the items to be swapped. |

See also

- `swap(int,int)`, `item_swap()`

Reimplemented from `Fl_Browser_`.

### 34.13.3.34 item_text()

```cpp
class Fl_Browser::item_text {
  void *item) const [protected], [virtual]

Returns the label text for item.

Parameters

| in | item | The item whose label text is returned. |

Returns

The item's text string. (Can be NULL)

Reimplemented from `Fl_Browser_`.

### 34.13.3.35 item_width()

```cpp
int Fl_Browser::item_width {
  void *item) const [protected], [virtual]

Returns width of item in pixels. This takes into account embedded @ codes within the label.

Parameters

| in | item | The item whose width is returned. |

Returns

The width of the item in pixels.

See also

- `item_height()`, `item_width()`,
- `incr_height()`, `full_height()`

Implements `Fl_Browser_`.

### 34.13.3.36 lineno()

```cpp
int Fl_Browser::lineno {
  void *item) const [protected]

Returns line number corresponding to item, or zero if not found.

Caveat: See efficiency note in `find_line()`.
Parameters

| in | item | The item to be found |

Returns

The line number of the item, or 0 if not found.

See also

item_at(), find_line(), lineno()

34.13.37 lineposition()

void Fl_Browser::lineposition (  
    int line,  
    Fl_Line_Position pos  )

Updates the browser so that line is shown at position pos.

Parameters

| in | line | line number. (1 based) |
| in | pos  | position. |

See also

topline(), middleline(), bottomline()

34.13.38 load()

int Fl_Browser::load (  
    const char * filename  )

Clears the browser and reads the file, adding each line from the file to the browser.  
If the filename is NULL or a zero-length string then this just clears the browser.  
This returns zero if there was any error in opening or reading the file, in which case errno is set to the system error.  The data() of each line is set to NULL.

Parameters

| in | filename | The filename to load |

Returns

1 if OK, 0 on error (errno has reason)

See also

add()

34.13.39 make_visible()

void Fl_Browser::make_visible (  
    int line  ) [inline]
Make the item at the specified line visible(). Functionally similar to show(int line). If line is out of range, redisplay top or bottom of list as appropriate.

**Parameters**

| in | line | The line to be made visible. |

**See also**

show(int), hide(int), display(), visible(), make_visible()

### 34.13.3.40 middleline()

```cpp
void Fl_Browser::middleline (int line) [inline]
```

Scrolls the browser so the middle item in the browser is showing the specified line.

**Parameters**

| in | line | The line to be displayed in the middle. |

**See also**

topl ine(), middleline(), bottomline(), displayed(), lineposition()

### 34.13.3.41 move()

```cpp
void Fl_Browser::move (int to, int from)
```

Line from is removed and reinserted at to. 
**Note:** to is calculated after line from gets removed.

**Parameters**

| in | to | Destination line number (calculated after line from is removed) |
| in | from | Line number of item to be moved |

### 34.13.3.42 remove()

```cpp
void Fl_Browser::remove (int line)
```

Remove entry for given line number, making the browser one line shorter. You must call redraw() to make any changes visible.

**Parameters**

| in | line | Line to be removed. (1 based) |
| | | If line is out of range, no action is taken. |
See also

- `add()`, `insert()`, `remove()`, `swap(int,int)`, `clear()`

### 34.13.3.43 remove_icon()

```cpp
void Fl_Browser::remove_icon {
    int line
}
```

Removes the icon for `line`.
It's ok to remove an icon if none has been defined.

**Parameters**

| in  | `line`  | The line whose icon is to be removed. |

### 34.13.3.44 select()

```cpp
int Fl_Browser::select {
    int line,
    int val = 1
}
```

Sets the selection state of the item at `line` to the value `val`.
If `val` is not specified, the default is 1 (selects the item).

**Parameters**

| in  | `line`  | The line number of the item to be changed. (1 based) |
| in  | `val`   | The new selection state (1=select, 0=de-select). |

**Returns**

1 if the state changed, 0 if not.

See also

- `select()`, `selected()`, `value()`, `item_select()`, `item_selected()`

### 34.13.3.45 selected()

```cpp
int Fl_Browser::selected {
    int line
    const
}
```

Returns 1 if specified `line` is selected, 0 if not.

**Parameters**

| in  | `line`  | The line being checked (1 based) |

**Returns**

1 if item selected, 0 if not.

See also

- `select()`, `selected()`, `value()`, `item_select()`, `item_selected()"
### 34.13.3.46 show() [1/2]

```c++
void Fl_Browser::show ( ) [inline], [virtual]
```

Shows the entire Fl_Browser widget – opposite of hide().
Reimplemented from Fl_Widget.

### 34.13.3.47 show() [2/2]

```c++
void Fl_Browser::show (
    int line
)
```

Makes line visible, and available for selection by user.
Opposite of hide(int). This changes the full_height() if the state was changed. redraw() is called automatically if a change occurred.

**Parameters**

| in  | line | The line to be shown. (1 based) |

**See also**

show(int), hide(int), display(), visible(), make_visible()

### 34.13.3.48 size()

```c++
int Fl_Browser::size ( ) const [inline]
```

Returns how many lines are in the browser.
The last line number is equal to this. Returns 0 if browser is empty.

### 34.13.3.49 swap() [1/2]

```c++
void Fl_Browser::swap (  
    FL_BLINE * a,  
    FL_BLINE * b ) [protected]
```

Swap the two items a and b.
Uses swapping() to ensure list updates correctly.

**Parameters**

| in  | a, b | The two items to be swapped. |

**See also**

swap(int,int), item_swap()

### 34.13.3.50 swap() [2/2]

```c++
void Fl_Browser::swap (  
    int a,  
    int b )
```

Swaps two browser lines a and b.
You must call redraw() to make any changes visible.

**Parameters**

| in  | a, b | The two lines to be swapped. (both 1 based) |
See also

\texttt{swap(int,int), item\_swap()}

### 34.13.3.51 text() [1/2]

\begin{verbatim}
const char * Fl_Browser::text ( int line ) const
\end{verbatim}

Returns the label text for the specified line. Return value can be NULL if line is out of range or unset. The parameter line is 1 based.

**Parameters**

| in | line | The line number of the item whose text is returned. (1 based) |

**Returns**

The text string (can be NULL)

### 34.13.3.52 text() [2/2]

\begin{verbatim}
void Fl_Browser::text ( int line, const char * newtext )
\end{verbatim}

Sets the text for the specified line to newtext. Text may contain format characters; see format\_char() for details. newtext is copied using the strdup() function, and can be NULL to make a blank line. Does nothing if line is out of range.

**Parameters**

| in | line | The line of the item whose text will be changed. (1 based) |

| in | newtext | The new string to be assigned to the item. |

### 34.13.3.53 textsize()

\begin{verbatim}
void Fl_Browser::textsize ( Fl_Fontsize newSize )
\end{verbatim}

Sets the default text size (in pixels) for the lines in the browser to newSize. This method recalculates all item heights and caches the total height internally for optimization of later item changes. This can be slow if there are many items in the browser. It returns immediately (w/o recalculation) if newSize equals the current textsize(). You may need to call redraw() to see the effect and to have the scrollbar positions recalculated. You should set the text size before populating the browser with items unless you really need to change the size later.

### 34.13.3.54 topline() [1/2]

\begin{verbatim}
int Fl_Browser::topline ( ) const
\end{verbatim}

Returns the line that is currently visible at the top of the browser. If there is no vertical scrollbar then this will always return 1.
34.13 Fl_Browser Class Reference

Returns
The lineno() of the top() of the browser.

34.13.3.55 topline [2/2]

void Fl_Browser::topline ( 
    int line ) [inline]
Scrolls the browser so the top item in the browser is showing the specified line.

Parameters

| in  | line  | The line to be displayed at the top. |

See also
topline(), middleline(), bottomline(), displayed(), lineposition()

34.13.3.56 value [1/2]

int Fl_Browser::value ( ) const
Returns the line number of the currently selected line, or 0 if none selected.

Returns
The line number of current selection, or 0 if none selected.

See also
select(), selected(), value(), item_select(), item_selected()

34.13.3.57 value [2/2]

void Fl_Browser::value ( 
    int line ) [inline]
Sets the browser’s value(), which selects the specified line. This is the same as calling select(line).

See also
select(), selected(), value(), item_select(), item_selected()

34.13.3.58 visible()

int Fl_Browser::visible ( 
    int line ) const
Returns non-zero if the specified line is visible, 0 if hidden. Use show(int), hide(int), or make_visible(int) to change an item’s visible state.

Parameters

| in  | line  | The line in the browser to be tested. (1 based) |

Generated by Doxygen
See also

show(int), hide(int), display(), visible(), make_visible()

The documentation for this class was generated from the following files:

- Fl_Browser.H
- Fl_Browser.cxx
- Fl_Browser_load.cxx

## 34.14 Fl_Browser_ Class Reference

This is the base class for browsers.

```c
#include <Fl_Browser_.H>
```

Inheritance diagram for Fl_Browser_:

```
Fl_Widget
   |
   v
Fl_Group
   |
   v
Fl_Browser
   |
Fl_Browser_:
   |
Fl_Browser
   |
Fl_Browser
   |
Fl_Browser
   |
Fl_Browser
   |
Fl_Browser
```

### Public Types

- enum {
  
  HORIZONTAL = 1, VERTICAL = 2, BOTH = 3, ALWAYS_ON = 4,
  HORIZONTAL_ALWAYS = 5, VERTICAL_ALWAYS = 6, BOTH_ALWAYS = 7
}

Values for `has_scrollbar()`.

### Public Member Functions

- int deselect (int docallbacks=0)

  Deselects all items in the list and returns 1 if the state changed or 0 if it did not.

- void display (void *item)

  Displays the item, scrolling the list as necessary.

- int handle (int event) FL_OVERRIDE

  Handles the event within the normal widget bounding box.

- uchar has_scrollbar () const

  Returns the current scrollbar mode, see Fl_Browser_::has_scrollbar(uchar)

- void has_scrollbar (uchar mode)

  Sets whether the widget should have scrollbars or not (default Fl_Browser_::BOTH).

- int hposition () const

  Gets the horizontal scroll position of the list as a pixel position pos.

- void hposition (int)

  Sets the horizontal scroll position of the list to pixel position pos.

- int linespacing () const

  Returns the height of additional spacing between browser lines.

- void linespacing (int pixels)
Add some space between browser lines.

- **int position()** const
- **void position(int pos)**
- **void position(int x, int y)**
- **void resize(int X, int Y, int W, int H) FL_OVERRIDE**
  Repositions and/or resizes the browser.
- **void scrollbar_left()**
  Moves the vertical scrollbar to the lefthand side of the list.
- **void scrollbar_right()**
  Moves the vertical scrollbar to the righthand side of the list.
- **int scrollbar_size()** const
  *Gets the current size of the scrollbars' troughs, in pixels.*
- **void scrollbar_size(int newSize)**
  Sets the pixel size of the scrollbars' troughs to **newSize**, in pixels.
- **int scrollbar_width()** const
  Returns the global value FL::scrollbar_size().
- **void scrollbar_width(int width)**
  Sets the global FL::scrollbar_size(), and forces this instance of the widget to use it.
- **int select(void *item, int val=1, int docallbacks=0)**
  Sets the selection state of *item* to *val*, and returns 1 if the state changed or 0 if it did not.
- **int select_only(void *item, int docallbacks=0)**
  Selects *item* and returns 1 if the state changed or 0 if it did not.
- **void sort(int flags=0)**
  Sorts the items in the browser based on **flags**.
- **FL_Color textcolor()** const
  *Gets the default text color for the lines in the browser.*
- **void textcolor(FL_Color col)**
  Sets the default text color for the lines in the browser to **col**.
- **FL_Font textfont()** const
  *Gets the default text font for the lines in the browser.*
- **void textfont(FL_Font font)**
  Sets the default text font for the lines in the browser to **font**.
- **FL_Fontsize textsize()** const
  *Gets the default text size (in pixels) for the lines in the browser.*
- **void textsize(FL_Fontsize newSize)**
  Sets the default text size (in pixels) for the lines in the browser to **newSize**.
- **int vposition()** const
  *Gets the vertical scroll position of the list as a pixel position pos.*
- **void vposition(int pos)**
  Sets the vertical scroll position of the list to pixel position **pos**.

**Public Attributes**

- **FL_Scrollbar hscrollbar**
  Horizontal scrollbar.
- **FL_Scrollbar scrollbar**
  Vertical scrollbar.
Protected Member Functions

- void bbox (int &X, int &Y, int &W, int &H) const
  
  Returns the bounding box for the interior of the list's display window, inside the scrollbars.

- void deleting (void *item)
  
  This method should be used when item is being deleted from the list.

- int displayed (void *item) const
  
  Returns non-zero if item has been scrolled to a position where it is being displayed.

- void draw () FL_OVERRIDE
  
  Draws the list within the normal widget bounding box.

- void *find_item (int ypos)
  
  This method returns the item under mouse y position ypos.

- Fl_Browser_ (int X, int Y, int W, int H, const char *L=0)
  
  The constructor makes an empty browser.

- virtual int full_height () const
  
  This method may be provided by the subclass to indicate the full height of the item list, in pixels.

- virtual int full_width () const
  
  This method may be provided by the subclass to indicate the full width of the item list, in pixels.

- virtual int incr_height () const
  
  This method may be provided to return the average height of all items to be used for scrolling.

- void inserting (void *a, void *b)
  
  This method should be used when an item is in the process of being inserted into the list.

- virtual void *item_at (int index) const
  
  This method must be provided by the subclass to return the item for the specified index.

- virtual void *item_draw (void *item, int X, int Y, int W, int H) const =0
  
  This method must be provided by the subclass to draw the item in the area indicated by X, Y, W, H.

- virtual void *item_first () const =0
  
  This method must be provided by the subclass to return the first item in the list.

- virtual void *item_last () const
  
  This method must be provided by the subclass to return the last item in the list.

- virtual void *item_next (void *item) const =0
  
  This method must be provided by the subclass to return the item in the list after item.

- virtual void *item_prev (void *item) const =0
  
  This method must be provided by the subclass to return the item in the list before item.

- virtual void *item_quick_height (void *item) const
  
  This method may be provided by the subclass to return the height of the item, in pixels.

- virtual void *item_select (void *item, int val=1)
  
  This method must be implemented by the subclass if it supports multiple selections; sets the selection state to val for the item.

- virtual int item_selected (void *item) const
  
  This method must be implemented by the subclass if it supports multiple selections; returns the selection state for the item.

- virtual void *item_swap (void *a, void *b)
  
  This optional method should be provided by the subclass to efficiently swap browser items a and b, such as for sorting.

- virtual const char *item_text (void *item) const
  
  This optional method returns a string (label) that may be used for sorting.

- virtual int item_width (void *item) const =0
  
  This method must be provided by the subclass to return the width of the item in pixels.

- int leftedge () const
This method returns the X position of the left edge of the list area after adjusting for the scrollbar and border, if any.

- void new_list ()
  This method should be called when the list data is completely replaced or cleared.

- void redraw_line (void *item)
  This method should be called when the contents of item has changed, but not its height.

- void redraw_lines ()
  This method will cause the entire list to be redrawn.

- void replacing (void *a, void *b)
  This method should be used when item a is being replaced by item b.

- void *selection () const
  Returns the item currently selected, or NULL if there is no selection.

- void swapping (void *a, void *b)
  This method should be used when two items a and b are being swapped.

- void *top () const
  Returns the item that appears at the top of the list.

Additional Inherited Members

34.14.1 Detailed Description

This is the base class for browsers. To be useful it must be subclassed and several virtual functions defined. The Forms-compatible browser and the file chooser's browser are subclassed off of this.

This has been designed so that the subclass has complete control over the storage of the data, although because next() and prev() functions are used to index, it works best as a linked list or as a large block of characters in which the line breaks must be searched for.

A great deal of work has been done so that the "height" of a data object does not need to be determined until it is drawn. This is useful if actually figuring out the size of an object requires accessing image data or doing stat() on a file or doing some other slow operation.

Callbacks are called when the value changes with FL_REASON_CHANGED. If FL_WHEN_RELEASE is set, callbacks are called when the mouse button is released with FL_REASON_CHANGED or FL_REASON←RESELECTED if the selection did not change. If FL_WHEN_ENTER_KEY is set, callbacks are also called when key presses or double clicks change the selection.

Keyboard navigation of browser items

The keyboard navigation of browser items is only possible if visible_focus() is enabled. If disabled, the widget rejects keyboard focus; Tab and Shift-Tab focus navigation will skip the widget.

In 'Select' and 'Normal' mode, the widget rejects keyboard focus; no navigation keys are supported (other than scrollbar positioning).

In 'Hold' mode, the widget accepts keyboard focus, and Up/Down arrow keys can navigate the selected item.

In 'Multi' mode, the widget accepts keyboard focus, and Up/Down arrow keys navigate the focus box; Space toggles the current item's selection, Enter selects only the current item (deselects all others). If Shift (or Ctrl) is combined with Up/Down arrow keys, the current item's selection state is extended to the next item. In this way one can extend a selection or de-selection.

34.14.2 Member Enumeration Documentation

34.14.2.1 anonymous enum

Values for has_scrollbar().
Anonymous enum bit flags for has_scrollbar().

- bit 0: horizontal
• bit 1: vertical
• bit 2: 'always' (to be combined with bits 0 and 1)
• bit 3-31: reserved for future use

**Enumerator**

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORIZONTAL</td>
<td>Only show horizontal scrollbar.</td>
</tr>
<tr>
<td>VERTICAL</td>
<td>Only show vertical scrollbar.</td>
</tr>
<tr>
<td>BOTH</td>
<td>Show both scrollbars. (default)</td>
</tr>
<tr>
<td>ALWAYS_ON</td>
<td>Specified scrollbar(s) should 'always' be shown (to be used with HORIZONTAL/VERTICAL)</td>
</tr>
<tr>
<td>HORIZONTAL_ALWAYS</td>
<td>Horizontal scrollbar always on.</td>
</tr>
<tr>
<td>VERTICAL_ALWAYS</td>
<td>Vertical scrollbar always on.</td>
</tr>
<tr>
<td>BOTH_ALWAYS</td>
<td>Both scrollbars always on.</td>
</tr>
</tbody>
</table>

### 34.14.3 Constructor & Destructor Documentation

#### 34.14.3.1 Fl_Browser()

```cpp
Fl_Browser_::Fl_Browser_ (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char ∗ L = 0 ) [protected]
```

The constructor makes an empty browser.

**Parameters**

- **in X,Y,W,H** position and size.
- **in L** The label string, may be NULL

### 34.14.4 Member Function Documentation

#### 34.14.4.1 bbox()

```cpp
void Fl_Browser_::bbox (  
  int & X,  
  int & Y,  
  int & W,  
  int & H ) const [protected]
```

Returns the bounding box for the interior of the list's display window, inside the scrollbars.

**Parameters**

- **out X,Y,W,H** The returned bounding box.
  *(The original contents of these parameters are overwritten)*
### 34.14.4.2 deleting()

```cpp
void Fl_Browser_::deleting ( void * item ) [protected]
```

This method should be used when `item` is being deleted from the list. It allows the Fl_Browser to discard any cached data it has on the item. This method does not actually delete the item, but handles the follow up bookkeeping after the item has just been deleted.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>item</td>
<td>The item being deleted.</td>
</tr>
</tbody>
</table>

### 34.14.4.3 deselect()

```cpp
int Fl_Browser_::deselect ( int docallbacks = 0 )
```

Deselects all items in the list and returns 1 if the state changed or 0 if it did not. If the optional `docallbacks` parameter is non-zero, deselect tries to call the callback function for the widget.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallbacks</td>
<td>If non-zero, invokes widget callback if item changed. If 0, doesn't do callback (default).</td>
</tr>
</tbody>
</table>

### 34.14.4.4 display()

```cpp
void Fl_Browser_::display ( void * item )
```

Displays the `item`, scrolling the list as necessary.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>item</td>
<td>The item to be displayed.</td>
</tr>
</tbody>
</table>

See also

- `display()`, `displayed()`

### 34.14.4.5 displayed()

```cpp
int Fl_Browser_::displayed ( void * item ) const [protected]
```

Returns non-zero if `item` has been scrolled to a position where it is being displayed. Checks to see if the item's vertical position is within the top and bottom edges of the display window. This does NOT take into account the hide()/show() status of the widget or item.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>item</td>
<td>The item to check</td>
</tr>
</tbody>
</table>
Returns

1 if visible, 0 if not visible.

See also

display(), displayed()

### 34.14.4.6 draw()

```cpp
void Fl_Browser_::draw ( ) [protected], [virtual]
```

Draws the list within the normal widget bounding box.
Implements Fl_Widget.

### 34.14.4.7 find_item()

```cpp
void * Fl_Browser_::find_item ( int ypos ) [protected]
```

This method returns the item under mouse y position `ypos`. NULL is returned if no item is displayed at that position.

**Parameters**

| in | ypos | The y position (eg. Fl::event_y()) to find an item under. |

**Returns**

The item, or NULL if not found

### 34.14.4.8 full_height()

```cpp
int Fl_Browser_::full_height ( ) const [protected], [virtual]
```

This method may be provided by the subclass to indicate the full height of the item list, in pixels.
The default implementation computes the full height from the item heights. Includes the items that are scrolled off screen.

**Returns**

The height of the entire list, in pixels.

Reimplemented in Fl_Browser.

### 34.14.4.9 full_width()

```cpp
int Fl_Browser_::full_width ( ) const [protected], [virtual]
```

This method may be provided by the subclass to indicate the full width of the item list, in pixels.
The default implementation computes the full width from the item widths.

**Returns**

The maximum width of all the items, in pixels.
34.14.4.10 handle()

```cpp
int Fl_Browser_::handle ( int event ) [virtual]
```

Handles the event within the normal widget bounding box.

**Parameters**

- **event** The event to process.

**Returns**

- 1 if event was processed, 0 if not.

Reimplemented from Fl_Widget.
Reimplemented in Fl_Check_Browser.

34.14.4.11 has_scrollbar()

```cpp
void Fl_Browser_::has_scrollbar ( uchar mode ) [inline]
```

Sets whether the widget should have scrollbars or not (default Fl_Browser_::BOTH).
By default you can scroll in both directions, and the scrollbars disappear if the data will fit in the widget.
`has_scrollbar()` changes this based on the value of `mode`:

- 0 - No scrollbars.
- Fl_Browser_::HORIZONTAL - Only a horizontal scrollbar.
- Fl_Browser_::VERTICAL - Only a vertical scrollbar.
- Fl_Browser_::BOTH - The default is both scrollbars.
- Fl_Browser_::HORIZONTAL_ALWAYS - Horizontal scrollbar always on, vertical always off.
- Fl_Browser_::VERTICAL_ALWAYS - Vertical scrollbar always on, horizontal always off.
- Fl_Browser_::BOTH_ALWAYS - Both always on.

34.14.4.12 hposition() [1/2]

```cpp
int Fl_Browser_::hposition ( ) const [inline]
```

Gets the horizontal scroll position of the list as a pixel position `pos`.
The position returned is how many pixels of the list are scrolled off the left edge of the screen. Example: A position of '18' indicates the left 18 pixels of the list are scrolled off the left edge of the screen.

See also

- position(), hposition()

34.14.4.13 hposition() [2/2]

```cpp
void Fl_Browser_::hposition ( int pos )
```

Sets the horizontal scroll position of the list to pixel position `pos`.
The position is how many pixels of the list are scrolled off the left edge of the screen. Example: A position of '18' scrolls the left 18 pixels of the list off the left edge of the screen.
Parameters

| in  | pos   | The horizontal position (in pixels) to scroll the browser to. |

See also

vposition(), hposition()

34.14.4.14 incr_height()

```cpp
text Fl_Browser_::incr_height ( ) const [protected], [virtual]
```
This method may be provided to return the average height of all items to be used for scrolling.
The default implementation uses the height of the first item.

Returns

The average height of items, in pixels.

Reimplemented in Fl_Browser.

34.14.4.15 inserting()

```cpp
void Fl_Browser_::inserting ( void * a, void * b ) [protected]
```
This method should be used when an item is in the process of being inserted into the list.
It allows the Fl_Browser_ to update its cache data as needed, scheduling a redraw for the affected lines. This
method does not actually insert items, but handles the follow up bookkeeping after items have been inserted.

Parameters

| in  | a  | The starting item position |
| in  | b  | The new item being inserted |

34.14.4.16 item_at()

```cpp
virtual void * Fl_Browser_::item_at ( int index ) const [inline], [protected], [virtual]
```
This method must be provided by the subclass to return the item for the specified index.

Parameters

| in  | index | The index of the item to be returned |

Returns

The item at the specified index.

Reimplemented in Fl_Check_Browser, and Fl_Browser.

34.14.4.17 item_draw()

```cpp
virtual void Fl_Browser_::item_draw ( void * item, 
```
int X,
int Y,
int W,
int H ) const  [protected],  [pure virtual]

This method must be provided by the subclass to draw the item in the area indicated by X, Y, W, H. Implemented in Fl_Check_Browser, and Fl_Browser.

### 34.14.4.18 item_first()

virtual void * Fl_Browser_::item_first ( ) const  [protected],  [pure virtual]

This method must be provided by the subclass to return the first item in the list.

See also

item_first(), item_next(), item_last(), item_prev()

Implemented in Fl_Browser, and Fl_Check_Browser.

### 34.14.4.19 item_height()

virtual int Fl_Browser_::item_height ( void * item ) const  [protected],  [pure virtual]

This method must be provided by the subclass to return the height of item in pixels. Allow for two additional pixels for the list selection box.

Parameters

| in  | item | The item whose height is returned. |

Returns

The height of the specified item in pixels.

See also

item_height(), item_width(), item_quick_height()

Implemented in Fl_Check_Browser, and Fl_Browser.

### 34.14.4.20 item_last()

virtual void * Fl_Browser_::item_last ( ) const  [inline],  [protected],  [virtual]

This method must be provided by the subclass to return the last item in the list.

See also

item_first(), item_next(), item_last(), item_prev()

Reimplemented in Fl_Browser.

### 34.14.4.21 item_next()

virtual void * Fl_Browser_::item_next ( void * item ) const  [protected],  [pure virtual]

This method must be provided by the subclass to return the item in the list after item.

See also

item_first(), item_next(), item_last(), item_prev()

Implemented in Fl_Check_Browser, and Fl_Browser.
34.14.4.22  item_prev()

virtual void * Fl_Browser_::item_prev (  
    void * item ) const [protected], [pure virtual]  
This method must be provided by the subclass to return the item in the list before item.

See also  
    item_first(), item_next(), item_last(), item_prev()

Implemented in Fl_Check_Browser, and Fl_Browser.

34.14.4.23  item_quick_height()

int Fl_Browser_::item_quick_height (  
    void * item ) const [protected], [virtual]  
This method may be provided by the subclass to return the height of the item, in pixels.  
Allow for two additional pixels for the list selection box. This method differs from item_height in that it is only called for selection and scrolling operations. The default implementation calls item_height.

Parameters

| in  | item | The item whose height to return. |

Returns

The height, in pixels.

34.14.4.24  item_select()

void Fl_Browser_::item_select (  
    void * item,  
    int val = 1 ) [protected], [virtual]  
This method must be implemented by the subclass if it supports multiple selections; sets the selection state to val for the item.

Sets the selection state for item, where optional val is 1 (select, the default) or 0 (de-select).

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The item to be selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>val</td>
<td>The optional selection state; 1=select, 0=de-select. The default is to select the item (1).</td>
</tr>
</tbody>
</table>

Reimplemented in Fl_Check_Browser, and Fl_Browser.

34.14.4.25  item_selected()

int Fl_Browser_::item_selected (  
    void * item ) const [protected], [virtual]  
This method must be implemented by the subclass if it supports multiple selections; returns the selection state for item.

The method should return 1 if item is selected, or 0 otherwise.

Parameters

| in  | item | The item to test. |
34.14 Fl_Browser_ Class Reference

Reimplemented in Fl_Check_Browser, and Fl_Browser.

34.14.4.26 item_swap()

```
virtual void Fl_Browser_::item_swap (  
    void * a,  
    void * b ) [inline], [protected], [virtual]
```

This optional method should be provided by the subclass to efficiently swap browser items a and b, such as for sorting.

Parameters

```
in   a,b  The two items to be swapped.
```

Reimplemented in Fl_Browser, and Fl_Check_Browser.

34.14.4.27 item_text()

```
virtual const char * Fl_Browser_::item_text (  
    void * item ) const [inline], [protected], [virtual]
```

This optional method returns a string (label) that may be used for sorting.

Parameters

```
in   item  The item whose label text is returned.
```

Returns

The item's text label. (Can be NULL if blank)

Reimplemented in Fl_Browser, and Fl_Check_Browser.

34.14.4.28 item_width()

```
virtual int Fl_Browser_::item_width (  
    void * item ) const [protected], [pure virtual]
```

This method must be provided by the subclass to return the width of the item in pixels. Allow for two additional pixels for the list selection box.

Parameters

```
in   item  The item whose width is returned.
```

Returns

The width of the item in pixels.

Implemented in Fl_Check_Browser, and Fl_Browser.

34.14.4.29 leftedge()

```
int Fl_Browser_::leftedge ( ) const [protected]
```

This method returns the X position of the left edge of the list area after adjusting for the scrollbar and border, if any.
Returns

The X position of the left edge of the list, in pixels.

See also

Fl_Browser_::bbox()

34.14.4.30  linespacing() [1/2]

int Fl_Browser_::linespacing ( ) const [inline]
Return the height of additional spacing between browser lines.
Returns
  spacing height in pixel units.

34.14.4.31  linespacing() [2/2]

void Fl_Browser_::linespacing ( int pixels ) [inline]
Add some space between browser lines.
Parameters

| in    | pixels | number of additional pixels between lines. |

34.14.4.32  new_list()

void Fl_Browser_::new_list ( ) [protected]
This method should be called when the list data is completely replaced or cleared.
It informs the Fl_Browser_ widget that any cached information it has concerning the items is invalid. This method
does not clear the list, it just handles the follow up bookkeeping after the list has been cleared.

34.14.4.33  position() [1/2]

int Fl_Browser_::position ( ) const [inline]

Deprecated  "in 1.4.0 - use vposition() instead"

34.14.4.34  position() [2/2]

void Fl_Browser_::position ( int pos ) [inline]

Deprecated  "in 1.4.0 - use vposition(pos) instead"
34.14.4.35 redraw_line()

```cpp
void Fl_Browser_::redraw_line ( void * item ) [protected]
```

This method should be called when the contents of `item` has changed, but not its height.
Parameters

| in | item       | The item that needs to be redrawn. |

See also

redraw_lines(), redraw_line()

34.14.4.36 redraw_lines()

```c
void Fl_Browser_::redraw_lines ( ) [inline], [protected]
```

This method will cause the entire list to be redrawn.

See also

redraw_lines(), redraw_line()

34.14.4.37 replacing()

```c
void Fl_Browser_::replacing (  
    void * a,  
    void * b ) [protected]
```

This method should be used when item a is being replaced by item b. It allows the Fl_Browser_ to update its cache data as needed, schedules a redraw for the item being changed, and tries to maintain the selection. This method does not actually replace the item, but handles the follow up bookkeeping after the item has just been replaced.

Parameters

| in | a   | Item being replaced |
| in | b   | Item to replace 'a' |

34.14.4.38 resize()

```c
void Fl_Browser_::resize (  
    int X,  
    int Y,  
    int W,  
    int H ) [virtual]
```

Repositions and/or resizes the browser.

Parameters

| in | X,Y,W,H | The new position and size for the browser, in pixels. |

Reimplemented from Fl_Widget.

34.14.4.39 scrollbar_left()

```c
void Fl_Browser_::scrollbar_left ( ) [inline]
```

Moves the vertical scrollbar to the lefthand side of the list. For back compatibility.
34.14.4.40 scrollbar_right()

void Fl_Browser_::scrollbar_right ( ) [inline]
Moves the vertical scrollbar to the righthand side of the list.
For back compatibility.

34.14.4.41 scrollbar_size() [1/2]

int Fl_Browser_::scrollbar_size ( ) const [inline]
Gets the current size of the scrollbars' troughs, in pixels.
If this value is zero (default), this widget will use the Fl::scrollbar_size() value as the scrollbar's width.

Returns

Scrollbar size in pixels, or 0 if the global Fl::scrollbar_size() is being used.

See also

Fl::scrollbar_size(int)

34.14.4.42 scrollbar_size() [2/2]

void Fl_Browser_::scrollbar_size ( int newSize ) [inline]
Sets the pixel size of the scrollbars' troughs to newSize, in pixels.
Normally you should not need this method, and should use Fl::scrollbar_size(int) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.
Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.
Setting newSize to the special value of 0 causes the widget to track the global Fl::scrollbar_size(), which is the default.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>newSize</th>
<th>Sets the scrollbar size in pixels.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>If 0 (default), scrollbar size tracks the global Fl::scrollbar_size()</td>
</tr>
</tbody>
</table>

See also

Fl::scrollbar_size()

34.14.4.43 scrollbar_width() [1/2]

int Fl_Browser_::scrollbar_width ( ) const [inline]
Returns the global value Fl::scrollbar_size().

Deprecated Use scrollbar_size() instead.

Todo This method should eventually be removed in 1.4+

34.14.4.44 scrollbar_width() [2/2]

void Fl_Browser_::scrollbar_width ( int width ) [inline]
Sets the global Fl::scrollbar_size(), and forces this instance of the widget to use it.
Deprecation
Use `scrollbar_size()` instead.

Todo
This method should eventually be removed in 1.4+

### 34.14.4.45 select()

```c
int Fl_Browser_::select (void * item, int val = 1, int docallbacks = 0 )
```

Sets the selection state of `item` to `val`, and returns 1 if the state changed or 0 if it did not.
If `docallbacks` is non-zero, select tries to call the callback function for the widget.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>item</code></td>
<td>The item whose selection state is to be changed</td>
</tr>
<tr>
<td><code>val</code></td>
<td>The new selection state (1=select, 0=de-select)</td>
</tr>
<tr>
<td><code>docallbacks</code></td>
<td>If non-zero, invokes widget callback if item changed.</td>
</tr>
<tr>
<td></td>
<td>If 0, doesn't do callback (default).</td>
</tr>
</tbody>
</table>

**Returns**

1 if state was changed, 0 if not.

### 34.14.4.46 select_only()

```c
int Fl_Browser_::select_only ( void * item, int docallbacks = 0 )
```

Selects `item` and returns 1 if the state changed or 0 if it did not.
Any other items in the list are deselected.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>item</code></td>
<td>The item to select.</td>
</tr>
<tr>
<td><code>docallbacks</code></td>
<td>If non-zero, invokes widget callback if item changed.</td>
</tr>
<tr>
<td></td>
<td>If 0, doesn't do callback (default).</td>
</tr>
</tbody>
</table>

### 34.14.4.47 selection()

```c
void * Fl_Browser_::selection () const [inline], [protected]
```

Returns the item currently selected, or `NULL` if there is no selection.
For multiple selection browsers this call returns the currently focused item, even if it is not selected.
To find all selected items, call `Fl_Multi_Browser::selected()` for every item in question.

### 34.14.4.48 sort()

```c
void Fl_Browser_::sort ( int flags = 0 )
```

Sorts the items in the browser based on `flags`.
`item_swap(void*, void*)` and `item_text(void*)` must be implemented for this call.
### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>flags</th>
<th>FL_SORT_ASCENDING – sort in ascending order</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FL_SORT_DESCENDING – sort in descending order</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FL_SORT_CASEINSENSITIVE – add this to sort case-insensitively</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Values other than the above will cause undefined behavior</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other flags may appear in the future.</td>
<td></td>
</tr>
</tbody>
</table>

### 34.14.4.49 swapping()

```cpp
void Fl_Browser_::swapping ( 
  void * a, 
  void * b ) [protected]
```

This method should be used when two items `a` and `b` are being swapped. It allows the Fl_Browser_ to update its cache data as needed, schedules a redraw for the two items, and tries to maintain the current selection. This method does not actually swap items, but handles the follow up bookkeeping after items have been swapped.

**Parameters**

| in  | a,b | Items being swapped. |

### 34.14.4.50 textfont()

```cpp
Fl_Font Fl_Browser_::textfont ( ) const [inline]
```

Gets the default text font for the lines in the browser.

See also

- textfont(), textsize(), textcolor()

### 34.14.4.51 vposition() [1/2]

```cpp
int Fl_Browser_::vposition ( ) const [inline]
```

Gets the vertical scroll position of the list as a pixel position `pos`. The position returned is how many pixels of the list are scrolled off the top edge of the screen. Example: A position of '3' indicates the top 3 pixels of the list are scrolled off the top edge of the screen.

See also

- position(), hposition()

### 34.14.4.52 vposition() [2/2]

```cpp
void Fl_Browser_::vposition ( 
  int pos )
```

Sets the vertical scroll position of the list to pixel position `pos`. The position is how many pixels of the list are scrolled off the top edge of the screen. Example: A position of '3' scrolls the top three pixels of the list off the top edge of the screen.

**Parameters**

| in  | pos | The vertical position (in pixels) to scroll the browser to. |
See also
   vposition(), hposition()

34.14.5 Member Data Documentation

34.14.5.1 hscrollbar

Fl_Scrollbar Fl_Browser_::hscrollbar
Horizontal scrollbar.
Public, so that it can be accessed directly.

34.14.5.2 scrollbar

Fl_Scrollbar Fl_Browser_::scrollbar
Vertical scrollbar.
Public, so that it can be accessed directly.
Use scrollbar_left() or scrollbar_right() to change what side the vertical scrollbar is drawn on.
Use scrollbar.align(int) (see Fl_Widget::align(Fl_Align)) to change what side either of the
scrollbars is drawn on.
If the FL_ALIGN_LEFT bit is on, the vertical scrollbar is on the left. If the FL_ALIGN_TOP bit is on, the horizontal
scrollbar is on the top. Note that only the alignment flags in scrollbar are considered. The flags in hscrollbar however
are ignored.
The documentation for this class was generated from the following files:
   • Fl_Browser_.H
   • Fl_Browser_.cxx

34.15 Fl_Button Class Reference

Buttons generate callbacks when they are clicked by the user.

#include <Fl_Button.H>

Inheritance diagram for Fl_Button:

Public Member Functions

   • int clear ()
      
      Same as value(0).
   • uchar compact ()
      
      Return true if buttons are rendered as compact buttons.
   • void compact (uchar v)
      
      Decide if buttons should be rendered in compact mode.
   • Fl_Boxtype down_box () const
      
      Returns the current down box type, which is drawn when value() is non-zero.
   • void down_box (Fl_Boxtype b)
      
      Sets the down box type.
   • Fl_Color down_color () const
34.15 Fl_Button Class Reference

(for backwards compatibility)
- void down_color(unsigned c)
  (for backwards compatibility)
- Fl_Button(int X, int Y, int W, int H, const char *L=0)
  The constructor creates the button using the given position, size, and label.
- int handle(int) FL_OVERRIDE
  Handles the specified event.
- int set()
  Same as value(1).
- void setonly()
  Turns on this button and turns off all other radio buttons in the group (calling value(1) or set() does not do this).
- int shortcut() const
  Returns the current shortcut key for the button.
- void shortcut(const char *s)
  (for backwards compatibility)
- void shortcut(int s)
  Sets the shortcut key to s.
- char value() const
  Returns the current value of the button (0 or 1).
- int value(int v)
  Sets the current value of the button.

Protected Member Functions

- void draw() FL_OVERRIDE
  Draws the widget.
- void simulate_key_action()

Static Protected Member Functions

- static void key_release_timeout(void *)

Static Protected Attributes

- static Fl_Widget_Tracker *key_release_tracker = 0

Additional Inherited Members

34.15.1 Detailed Description

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for type(uchar) and when(uchar). Buttons can also generate callbacks in response to FL_SHORTCUT events. The button can either have an explicit shortcut(int s) value or a letter shortcut can be indicated in the label() with an ‘&’ character before it. For the label shortcut it does not matter if Alt is held down, but if you have an input field in the same window, the user will have to hold down the Alt key so that the input field does not eat the event first as an FL_KEYBOARD event.

See also

Fl_Widget::shortcut_label(int)

For an Fl_Button object, the type() call returns one of:

- FL_NORMAL_BUTTON (0): value() remains unchanged after button press.
- FL_TOGGLE_BUTTON: value() is inverted after button press.
• **FL_RADIO_BUTTON**: `value()` is set to 1 after button press, and all other buttons in the current group with `type() == FL_RADIO_BUTTON` are set to zero.

For an `Fl_Button` object, the following `when()` values are useful, the default being `FL_WHEN_RELEASE`:

• **0**: The callback is not done, instead `changed()` is turned on.

• **FL_WHEN_RELEASE**: The callback is done after the user successfully clicks the button, or when a shortcut is typed. The reason is `FL_REASON_RELEASED`.

• **FL_WHEN_CHANGED**: The callback is done each time the `value()` changes (when the user pushes and releases the button, and as the mouse is dragged around in and out of the button). The reason is set to `FL_REASON_CHANGED`.

• **FL_WHEN_NOT_CHANGED**: The callback is done when the mouse button is released, but the value did not change. The reason is set to `FL_REASON_SELECTED`.

### 34.15.2 Constructor & Destructor Documentation

#### 34.15.2.1 Fl_Button()

Fl_Button::Fl_Button (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0 )

The constructor creates the button using the given position, size, and label. The default box type is `box(FL_UP_BOX)`. You can control how the button is drawn when ON by setting `down_box()`. The default is `FL_NO_BOX (0)` which will select an appropriate box type using the normal (OFF) box type by using `fl_down(box())`. Derived classes may handle this differently. A button may request callbacks with `when()` `FL_WHEN_CHANGED, FL_WHEN_NOT_CHANGED,` and `FL_WHEN_RELEASE`, triggering the callback reasons `FL_REASON_CHANGED, FL_REASON_SELECTED,` and `FL_REASON_DESELECTED`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th><code>X,Y,W,H</code></th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>L</code></td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

### 34.15.3 Member Function Documentation

#### 34.15.3.1 clear()

`int Fl_Button::clear () [inline]`

Same as `value(0)`.

See also

`value(int v)`

#### 34.15.3.2 compact()[1/2]

`uchar Fl_Button::compact () [inline]`
Return true if buttons are rendered as compact buttons.

Returns
0 if compact mode is off, 1 if it is on

See also
compact(bool)

34.15.3.3 compact() [2/2]

void Fl_Button::compact (uchar v)

Decide if buttons should be rendered in compact mode.

Figure 34.4 compact button keypad using GTK+ Scheme

In compact mode, the button's surrounding border is altered to visually signal that multiple buttons are functionally linked together. To ensure the correct rendering of buttons in compact mode, all buttons must be part of the same group, positioned close to each other, and aligned with the edges of the group. Any button outlines not in contact with the parent group's outline will be displayed as separators.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>v</th>
<th>switch compact mode on (1) or off (0)</th>
</tr>
</thead>
</table>

Generated by Doxygen
34.15.3.4 down_box() [1/2]

```cpp
Fl_Boxtype Fl_Button::down_box ( ) const [inline]
```

Returns the current down box type, which is drawn when `value()` is non-zero.

Return values:

<table>
<thead>
<tr>
<th>Fl_Boxtype</th>
</tr>
</thead>
</table>

34.15.3.5 down_box() [2/2]

```cpp
void Fl_Button::down_box (  
    Fl_Boxtype b ) [inline]
```

Sets the down box type.

The default value of 0 causes FLTK to figure out the correct matching down version of `box()`.

Some derived classes (e.g. Fl_Round_Button and Fl_Light_Button use down_box() for special purposes. See docs of these classes.

Parameters:

| in  | b    | down box type |

34.15.3.6 draw()

```cpp
void Fl_Button::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar  
s->draw(); // calls Fl_Scrollbar::draw()  
```

Implements Fl_Widget.

Reimplemented in Fl_Light_Button, Fl_Return_Button, and Fl_Shortcut_Button.

34.15.3.7 handle()

```cpp
int Fl_Button::handle (  
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.

This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.
34.15 Fl_Button Class Reference

Parameters

| in | event | the kind of event received |

Return values

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

See also

Fl_Event

Reimplemented from Fl_Widget.
Reimplemented in Fl_Light_Button, Fl_Repeat_Button, Fl_Return_Button, and Fl_Shortcut_Button.

34.15.3.8 set()

int Fl_Button::set ( ) [inline]

Same as value(1).

See also

value(int v)

34.15.3.9 shortcut() [1/2]

int Fl_Button::shortcut ( ) const [inline]

Returns the current shortcut key for the button.

Return values

| int |

34.15.3.10 shortcut() [2/2]

void Fl_Button::shortcut ( int s ) [inline]

Sets the shortcut key to s.

Setting this overrides the use of ‘&’ in the label(). The value is a bitwise OR of a key and a set of shift flags, for example: FL_ALT | 'a', or FL_ALT | (FL_F + 10), or just 'a'. A value of 0 disables the shortcut.

The key can be any value returned by Fl::event_key(), but will usually be an ASCII letter. Use a lower-case letter unless you require the shift key to be held down.

The shift flags can be any set of values accepted by Fl::event_state(). If the bit is on, that shift key must be pushed. Meta, Alt, Ctrl, and Shift must be off if they are not in the shift flags (zero for the other bits indicates a "don't care" setting).

Parameters

| in | s | bitwise OR of key and shift flags |
### 34.15.3.11 value()

```
int Fl_Button::value (int v)
```

Sets the current value of the button.
A non-zero value sets the button to 1 (ON), and zero sets it to 0 (OFF).

**Parameters**

| i | n | v | button value |

See also

- `set()`, `clear()`

The documentation for this class was generated from the following files:

- `Fl_Button.H`
- `Fl_Button.cxx`

### 34.16 Fl_Cairo_State Class Reference

Contains all the necessary info on the current cairo context.

```
#include <Fl_Cairo.H>
```

#### Public Member Functions

- `bool autolink () const`
  
  *Gets the autolink option. See Fl::cairo_autolink_context(bool)*

- `void autolink (bool b)`
  
  *Sets the autolink option, only available with –enable-cairoext.*

- `cairo_t * cc () const`
  
  *Gets the current cairo context.*

- `void cc (cairo_t *c, bool own=true)`
  
  *Sets the current cairo context.*

- `void * gc () const`
  
  *Gets the last gc attached to a cc.*

- `void gc (void *c)`
  
  *Sets the gc c to keep track on.*

- `void * window () const`
  
  *Sets the last window attached to a cc.*

- `void window (void *w)`
  
  *Sets the window w to keep track on.*

### 34.16.1 Detailed Description

Contains all the necessary info on the current cairo context.

A private internal & unique corresponding object is created to permit cairo context state handling while keeping it opaque. For internal use only.

**Note**

Only available when configure has the –enable-cairo or –enable-cairoext option or one or both of the CMake options OPTION_CAIRO or OPTION_CAIROEXT is set (ON)

### 34.16.2 Member Function Documentation

Generated by Doxygen
### 34.17 Fl_Cairo_Window Class Reference

This defines an FLTK window with Cairo support.

```cpp
#include <Fl_Cairo_Window.H>
```

Inheritance diagram for Fl_Cairo_Window:

![Inheritance Diagram](image)

#### Public Types

- `typedef void(cairo_draw_cb)(Fl_Cairo_Window *self, cairo_t *def)`

  *The Cairo draw callback prototype you need to implement.*

#### Public Member Functions

- `Fl_Cairo_Window(int W, int H, const char *L=0)`
- `Fl_Cairo_Window(int X, int Y, int W, int H, const char *L=0)`
- `void set_draw_cb(cairo_draw_cb cb)`

  *You must provide a draw callback that implements your Cairo rendering.*

#### Protected Member Functions

- `void draw() FL_OVERRIDE`

  *Overloaded to provide Cairo callback support.*

#### Additional Inherited Members

##### 34.17.1 Detailed Description

This defines an FLTK window with Cairo support.

This class overloads the virtual `draw()` method for you, so that the only thing you have to do is to provide your Cairo code. All Cairo context handling is achieved transparently.
The default coordinate system for Cairo drawing commands within Fl_Cairo_Window is FLTK's coordinate system, where the \(x, y, w, h\) values are relative to the top/left corner of the Fl_Cairo_Window, as one would expect with regular FLTK drawing commands, e.g. \((0 \times w-1), (0 \times h-1)\). Example:

```c
static void my_cairo_draw_cb(Fl_Cairo_Window *window, cairo_t *cr) {
    // Draw an "X"
    const double xmax = (window->w() - 1);
    const double ymax = (window->h() - 1);
    cairo_set_line_width(cr, 1.00); // line width for drawing
    cairo_set_source_rgb(cr, 1.0, 0.5, 0.0); // orange
    cairo_move_to(cr, 0.0, 0.0); cairo_line_to(cr, xmax, ymax); // draw diagonal "/\n    cairo_move_to(cr, 0.0, ymax); cairo_line_to(cr, xmax, 0.0); // draw diagonal "/\n    cairo_stroke(cr); // stroke the lines
}
```

The FLTK coordinate system differs from the default native Cairo coordinate system which uses normalized \((0.0 \ldots 1.0)\) values for x and y, e.g. \((0 \times 1.0), (0 \times 1.0)\). So beware of this when copy/pasting Cairo example programs that assume normalized values. If need be, you can revert to the Cairo coordinate system by simply calling `cairo_scale()` with the widget's \(w()\) and \(h()\) values. Example:

```c
static void my_cairo_draw_cb(Fl_Cairo_Window *window, cairo_t *cr) {
    cairo_scale(cr, window->w(), window->h()); // use Cairo's default coordinate system
    [..use 0.0 to 1.0 values from here on..]
}
```

See also
- examples/cairo-draw-x.cxx
- test/cairo_test.cxx

Note

Class Fl_Cairo_Window requires the FLTK library to have been built with CMake option OPTION_CAIRO or configure --enable-cairo.

You can alternatively define your custom Cairo FLTK window, and thus at least override the `draw()` method to provide custom Cairo support. In this case you will probably use `Fl::cairo_make_current(Fl_Window*)` to attach a context to your window. You should do this only when your window is the current window.

See also
- Fl_Window::current()

### 34.17.2 Member Function Documentation

#### 34.17.2.1 draw()

```c
void Fl_Cairo_Window::draw ( ) [inline], [protected], [virtual]
```

Overloaded to provide Cairo callback support.

Implements Fl_Widget.

#### 34.17.2.2 set_draw_cb()

```c
void Fl_Cairo_Window::set_draw_cb (cairo_draw_cb cb ) [inline]
```

You must provide a draw callback that implements your Cairo rendering. This method permits you to set your Cairo callback to `cb`.

The documentation for this class was generated from the following file:

- Fl_Cairo_Window.H

### 34.18 Fl_Callback_User_Data Class Class Reference

A class prototype that allows for additional data in callbacks.

```c
#include <Fl_Widget.H>
```
34.18.1 Detailed Description

A class prototype that allows for additional data in callbacks. Users can extend this class and pass it to widget callbacks. Widgets can take ownership of the callback data, deleting the data when the widget itself is deleted. The destructor of this class is virtual, allowing for additional code to deallocate resources when the user data is deleted.

See also

- `FL_FUNCTION_CALLBACK_3`, `FL_METHOD_CALLBACK_1`, `FL_INLINE_CALLBACK_2`
- `Fl_Widget::callback(Fl_Callback*, Fl_Callback_User_Data*, bool)`
- `Fl_Widget::user_data(Fl_Callback_User_Data*, bool)`

The documentation for this class was generated from the following file:

- `Fl_Widget.H`

34.19 Fl_Chart Class Reference

`Fl_Chart` displays simple charts.

```c++
#include <Fl_Chart.H>
```

Inheritance diagram for Fl_Chart:

```
Fl_Widget

|------|------------------|
|      | Fl_Chart
|      | Fl_Widget
```

### Public Member Functions

- **void** `add (double val, const char *str=0, unsigned col=0)`
  
  Adds the data value `val` with optional label `str` and color `col` to the chart.

- **uchar** `autosize () const`
  
  Gets whether the chart will automatically adjust the bounds of the chart.

- **void** `autosize (uchar n)`
  
  Sets whether the chart will automatically adjust the bounds of the chart.

- **void** `bounds (double a, double b)`
  
  Gets the lower and upper bounds of the chart values.

- **void** `bounds (double *a, double *b)`
  
  Sets the lower and upper bounds of the chart values.

- **void** `clear ()`
  
  Removes all values from the chart.

- **Fl_Chart** (int X, int Y, int W, int H, const char *L=0)
  
  Create a new `Fl_Chart` widget using the given position, size and label string.

- **void** `insert (int ind, double val, const char *str=0, unsigned col=0)`
  
  Inserts a data value `val` at the given position `ind`.

- **int** `maxsize () const`
  
  Gets the maximum number of data values for a chart.

- **void** `maxsize (int m)`
  
  Sets the maximum number of data values for a chart.

- **void** `replace (int ind, double val, const char *str=0, unsigned col=0)`
  
  Replaces a data value `val` at the given position `ind`.

- **int** `size () const`
Returns the number of data values in the chart.

- void size (int W, int H)
  Sets the widget size (width, height).

- Fl_Color textcolor () const
  Gets the chart's text color.

- void textcolor (Fl_Color n)
  Sets the chart's text color to n.

- Fl_Font textfont () const
  Gets the chart's text font.

- void textfont (Fl_Font s)
  Sets the chart's text font to s.

- Fl_Fontsize textsize () const
  Gets the chart's text size.

- void textsize (Fl_Fontsize s)
  Sets the chart's text size to s.

- ~Fl_Chart ()
  Destroys the Fl_Chart widget and all of its data.

Protected Member Functions

- void draw () FL_OVERRIDE
  Draws the Fl_Chart widget.

Static Protected Member Functions

- static void draw_barchart (int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[], double min, double max, int autosize, int maxnumb, Fl_Color textcolor)
  Draws a bar chart.

- static void draw_horbarchart (int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[], double min, double max, int autosize, int maxnumb, Fl_Color textcolor)
  Draws a horizontal bar chart.

- static void draw_linechart (int type, int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[], double min, double max, int autosize, int maxnumb, Fl_Color textcolor)
  Draws a line chart.

- static void draw_piechart (int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[], int special, Fl_Color textcolor)
  Draws a pie chart.

Additional Inherited Members

34.19.1 Detailed Description

Fl_Chart displays simple charts.
It is provided for Forms compatibility.

Figure 34.6 Fl_Chart
Todo  Refactor Fl_Chart::type() information.

The type of an Fl_Chart object can be set using type(uchar t) to:

<table>
<thead>
<tr>
<th>Chart Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_BAR_CHART</td>
<td>Each sample value is drawn as a vertical bar.</td>
</tr>
<tr>
<td>FL_FILLED_CHART</td>
<td>The chart is filled from the bottom of the graph to the sample values.</td>
</tr>
<tr>
<td>FL_HORBAR_CHART</td>
<td>Each sample value is drawn as a horizontal bar.</td>
</tr>
<tr>
<td>FL_LINE_CHART</td>
<td>The chart is drawn as a polyline with vertices at each sample value.</td>
</tr>
<tr>
<td>FL_PIE_CHART</td>
<td>A pie chart is drawn with each sample value being drawn as a proportionate slice in the circle.</td>
</tr>
<tr>
<td>FL_SPECIALPIE_CHART</td>
<td>Like FL_PIE_CHART, but the first slice is separated from the pie.</td>
</tr>
<tr>
<td>FL_SPIKE_CHART</td>
<td>Each sample value is drawn as a vertical line.</td>
</tr>
</tbody>
</table>

34.19.2 Constructor & Destructor Documentation

34.19.2.1 Fl_Chart()

Fl_Chart::Fl_Chart (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ L = 0  
)  
Create a new Fl_Chart widget using the given position, size and label string.  
The default boxstyle is FL_NO_BOX.  

Parameters

| in | X,Y,W,H | position and size of the widget |
|    | L       | widget label, default is no label |

34.19.3 Member Function Documentation

34.19.3.1 add()

void Fl_Chart::add (  
    double val,  
    const char ∗ str = 0,  
    unsigned col = 0  
)  
Adds the data value val with optional label str and color col to the chart.  

Parameters

| in | val     | data value |
|    | str     | optional data label |
|    | col     | optional data color |
34.19.3.2 autosize() [1/2]

uchar Fl_Chart::autosize ( ) const [inline]

Gets whether the chart will automatically adjust the bounds of the chart.

Returns

non-zero if auto-sizing is enabled and zero if disabled.

34.19.3.3 autosize() [2/2]

void Fl_Chart::autosize ( uchar n ) [inline]

Sets whether the chart will automatically adjust the bounds of the chart.

Parameters

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>n</td>
<td>non-zero to enable automatic resizing, zero to disable.</td>
</tr>
</tbody>
</table>

34.19.3.4 bounds() [1/2]

void Fl_Chart::bounds ( double * a, double * b ) const [inline]

Gets the lower and upper bounds of the chart values.

Parameters

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>a,b</td>
<td>are set to lower, upper</td>
</tr>
</tbody>
</table>

34.19.3.5 bounds() [2/2]

void Fl_Chart::bounds ( double a, double b )

Sets the lower and upper bounds of the chart values.

Parameters

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>a,b</td>
<td>are used to set lower, upper</td>
</tr>
</tbody>
</table>

34.19.3.6 draw()

void Fl_Chart::draw ( void ) [protected], [virtual]

Draws the Fl_Chart widget.

Implements Fl_Widget.

34.19.3.7 draw_barchart()

void Fl_Chart::draw_barchart ( 
Draws a bar chart. `x, y, w, h` is the bounding box, `entries` the array of `numb` entries, and `min` and `max` the boundaries.

Parameters

| in | `x, y, w, h` | Widget position and size |
| in | `numb` | Number of values |
| in | `entries` | Array of values |
| in | `min` | Lower boundary |
| in | `max` | Upper boundary |
| in | `autosize` | Whether the chart autosizes |
| in | `maxnumb` | Maximal number of entries |
| in | `textcolor` | Text color |

34.19.3.8 `draw_horbarchart()`

```cpp
void Fl_Chart::draw_horbarchart (  
    int x,  
    int y,  
    int w,  
    int h,  
    int numb,  
    FL_CHART_ENTRY entries[],  
    double min,  
    double max,  
    int autosize,  
    int maxnumb,  
    Fl_Color textcolor ) [static], [protected]
```

Draws a horizontal bar chart. `x, y, w, h` is the bounding box, `entries` the array of `numb` entries, and `min` and `max` the boundaries.

Parameters

| in | `x, y, w, h` | Widget position and size |
| in | `numb` | Number of values |
| in | `entries` | Array of values |
| in | `min` | Lower boundary |
| in | `max` | Upper boundary |
| in | `autosize` | Whether the chart autosizes |
| in | `maxnumb` | Maximal number of entries |
| in | `textcolor` | Text color |
34.19.3.9  draw_linechart()

```cpp
void Fl_Chart::draw_linechart (  
    int type,
    int x,
    int y,
    int w,
    int h,
    int numb,
    FL_CHART_ENTRY entries[],  
    double min,
    double max,
    int autosize,
    int maxnumb,
    Fl_Color textcolor ) [static], [protected]
```

Draws a line chart.

x, y, w, h is the bounding box, entries the array of numb entries, and min and max the boundaries.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>int</td>
<td>Chart type</td>
</tr>
<tr>
<td>x, y, w, h</td>
<td>int</td>
<td>Widget position and size</td>
</tr>
<tr>
<td>numb</td>
<td>int</td>
<td>Number of values</td>
</tr>
<tr>
<td>entries</td>
<td>FL_CHART_ENTRY</td>
<td>Array of values</td>
</tr>
<tr>
<td>min</td>
<td>double</td>
<td>Lower boundary</td>
</tr>
<tr>
<td>max</td>
<td>double</td>
<td>Upper boundary</td>
</tr>
<tr>
<td>autosize</td>
<td>int</td>
<td>Whether the chart autosizes</td>
</tr>
<tr>
<td>maxnumb</td>
<td>int</td>
<td>Maximal number of entries</td>
</tr>
<tr>
<td>textcolor</td>
<td>Fl_Color</td>
<td>Text color</td>
</tr>
</tbody>
</table>

34.19.3.10  draw_piechart()

```cpp
void Fl_Chart::draw_piechart (  
    int x,
    int y,
    int w,
    int h,
    int numb,
    FL_CHART_ENTRY entries[],  
    int special,
    Fl_Color textcolor ) [static], [protected]
```

Draws a pie chart.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x, y, w, h</td>
<td>int</td>
<td>bounding box</td>
</tr>
<tr>
<td>numb</td>
<td>int</td>
<td>number of chart entries</td>
</tr>
<tr>
<td>entries</td>
<td>int</td>
<td>array of chart entries</td>
</tr>
<tr>
<td>special</td>
<td>int</td>
<td>special (?)</td>
</tr>
<tr>
<td>textcolor</td>
<td>Fl_Color</td>
<td>text color</td>
</tr>
</tbody>
</table>
34.19.3.11 insert()

```cpp
void Fl_Chart::insert (  
    int ind,  
    double val,  
    const char * str = 0,  
    unsigned col = 0 )
```

Inserts a data value `val` at the given position `ind`. Position 1 is the first data value.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>ind</th>
<th>insertion position</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>val</td>
<td>data value</td>
</tr>
<tr>
<td>in</td>
<td>str</td>
<td>optional data label</td>
</tr>
<tr>
<td>in</td>
<td>col</td>
<td>optional data color</td>
</tr>
</tbody>
</table>

34.19.3.12 maxsize()

```cpp
void Fl_Chart::maxsize (  
    int m )
```

Sets the maximum number of data values for a chart. If you do not call this method then the chart will be allowed to grow to any size depending on available memory.

**Parameters**

| in | m | maximum number of data values allowed. |

34.19.3.13 replace()

```cpp
void Fl_Chart::replace (  
    int ind,  
    double val,  
    const char * str = 0,  
    unsigned col = 0 )
```

Replaces a data value `val` at the given position `ind`. Position 1 is the first data value.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>ind</th>
<th>insertion position</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>val</td>
<td>data value</td>
</tr>
<tr>
<td>in</td>
<td>str</td>
<td>optional data label</td>
</tr>
<tr>
<td>in</td>
<td>col</td>
<td>optional data color</td>
</tr>
</tbody>
</table>

34.19.3.14 size()

```cpp
void Fl_Chart::size (  
    int W,  
    int H ) [inline]
```

Sets the widget size (width, height). This is the same as calling `Fl_Widget::size(int W, int H);`
Parameters

| in | $W, H$ | new width and height of the widget |

The documentation for this class was generated from the following files:

- `Fl_Chart.H`
- `Fl_Chart.cxx`

### 34.20 FL_CHART_ENTRY Struct Reference

For internal use only.

```
#include <Fl_Chart.H>
```

**Public Attributes**

- `unsigned col`
  
  For internal use only.
- `char str[FL_CHART_LABEL_MAX+1]`
  
  For internal use only.
- `float val`
  
  For internal use only.

#### 34.20.1 Detailed Description

For internal use only.

The documentation for this struct was generated from the following file:

- `Fl_Chart.H`

### 34.21 Fl_Check_Browser Class Reference

The `Fl_Check_Browser` widget displays a scrolling list of text lines that may be selected and/or checked by the user.

```
#include <Fl_Check_Browser.H>
```

**Inheritance diagram for Fl_Check_Browser:**

```
Fl_Widget

Fl_Group

Fl_Browser_

Fl_Check_Browser
```

**Public Member Functions**

- `int add (char *s)`
  
  Add a new unchecked line to the end of the browser.
- `int add (char *s, int b)`
  
  Add a new line to the end of the browser.
- `int add (const char *s)`
  
  See `int Fl_Check_Browser::add(char *s)`
- `int add` (const char *s, int b)
  
  `See int Fl_Check_Browser::add(char *s)`

- `void check_all`()
  
  Sets all the items checked.

- `void check_none`()
  
  Sets all the items unchecked.

- `int checked` (int item) const
  
  Gets the current status of item item.

- `void checked` (int item, int b)
  
  Sets the check status of item item to b.

- `void clear`()
  
  Remove every item from the browser.

- `Fl_Check_Browser` (int x, int y, int w, int h, const char *l=0)
  
  The constructor makes an empty browser.

- `void *item_at` (int index) const FL_OVERRIDE
  
  This method must be provided by the subclass to return the item for the specified index.

- `void item_swap` (int ia, int ib)
  
  This optional method should be provided by the subclass to efficiently swap browser items a and b, such as for sorting.

- `int nchecked` () const
  
  Returns how many items are currently checked.

- `int nitems` () const
  
  Returns how many lines are in the browser.

- `void remove` (int item)
  
  Remove line n and make the browser one line shorter.

- `void set_checked` (int item)
  
  Equivalent to `Fl_Check_Browser::checked(item, 1)`.

- `char *text` (int item) const
  
  Return a pointer to an internal buffer holding item item's text.

- `int value` () const
  
  Returns the index of the currently selected item.

- `~Fl_Check_Browser`()
  
  The destructor deletes all list items and destroys the browser.

### Protected Member Functions

- `int handle` (int) FL_OVERRIDE
  
  Handles the event within the normal widget bounding box.

- `void item_draw` (void *, int, int, int, int) const FL_OVERRIDE
  
  This method must be provided by the subclass to draw the item in the area indicated by X, Y, W, H.

- `void *item_first` () const FL_OVERRIDE
  
  This method must be provided by the subclass to return the first item in the list.

- `int item_height` (void *) const FL_OVERRIDE
  
  This method must be provided by the subclass to return the height of item in pixels.

- `void *item_next` (void *) const FL_OVERRIDE
  
  This method must be provided by the subclass to return the item in the list after item.

- `void *item_prev` (void *) const FL_OVERRIDE
  
  This method must be provided by the subclass to return the item in the list before item.

- `void item_select` (void *, int) FL_OVERRIDE
  
  This method must be implemented by the subclass if it supports multiple selections; sets the selection state to val for the item.
• int item_selected (void ∗) const FL_OVERRIDE
  This method must be implemented by the subclass if it supports multiple selections; returns the selection state for item.
• const char ∗ item_text (void ∗item) const FL_OVERRIDE
  This optional method returns a string (label) that may be used for sorting.
• int item_width (void ∗) const FL_OVERRIDE
  This method must be provided by the subclass to return the width of the item in pixels.

Additional Inherited Members

34.21.1 Detailed Description

The Fl_Check_Browser widget displays a scrolling list of text lines that may be selected and/or checked by the user.

34.21.2 Member Function Documentation

34.21.2.1 add() [1/2]

int Fl_Check_Browser::add (char ∗s)

Add a new unchecked line to the end of the browser.

See also
  add(char ∗s, int b)

34.21.2.2 add() [2/2]

int Fl_Check_Browser::add (char ∗s, int b)

Add a new line to the end of the browser.

The text is copied using the strdup() function. It may also be NULL to make a blank line. It can set the item checked if b is not 0.

34.21.2.3 handle()

int Fl_Check_Browser::handle {
  int event ) [protected], [virtual]
Handles the event within the normal widget bounding box.

Parameters

| in  | event | The event to process. |

Returns

  1 if event was processed, 0 if not.

Reimplemented from Fl_Browser_.

34.21.2.4 item_at()

void ∗ Fl_Check_Browser::item_at (int index) const [virtual]
This method must be provided by the subclass to return the item for the specified index.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>index</td>
<td>int</td>
<td>The index of the item to be returned</td>
</tr>
</tbody>
</table>

Returns

The item at the specified index.

Reimplemented from Fl_Browser_.

### 34.21.2.5 item_draw()

```c
def Fl_Check_Browser::item_draw (void *item, int X, int Y, int W, int H) const [protected], [virtual]
```

This method must be provided by the subclass to draw the item in the area indicated by X, Y, W, H.

Implements Fl_Browser_.

### 34.21.2.6 item_first()

```c
def Fl_Check_Browser::item_first () const [protected], [virtual]
```

This method must be provided by the subclass to return the first item in the list.

See also

- item_first(), item_next(), item_last(), item_prev()

Implements Fl_Browser_.

### 34.21.2.7 item_height()

```c
def Fl_Check_Browser::item_height (void *item) const [protected], [virtual]
```

This method must be provided by the subclass to return the height of item in pixels. Allow for two additional pixels for the list selection box.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>item</td>
<td>void *</td>
<td>The item whose height is returned.</td>
</tr>
</tbody>
</table>

Returns

The height of the specified item in pixels.

See also

- item_height(), item_width(), item_quick_height()

Implements Fl_Browser_.

Generated by Doxygen
34.21.2.8  item_next()

```cpp
void * Fl_Check_Browser::item_next () const [protected], [virtual]
```

This method must be provided by the subclass to return the item in the list after item.

See also

```cpp
item_first(), item_next(), item_last(), item_prev()
```

Implements Fl_Browser_.

34.21.2.9  item_prev()

```cpp
void * Fl_Check_Browser::item_prev () const [protected], [virtual]
```

This method must be provided by the subclass to return the item in the list before item.

See also

```cpp
item_first(), item_next(), item_last(), item_prev()
```

Implements Fl_Browser_.

34.21.2.10  item_select()

```cpp
void Fl_Check_Browser::item_select ( 
    void * item, 
    int val ) [protected], [virtual]
```

This method must be implemented by the subclass if it supports multiple selections; sets the selection state to val for the item.

Sets the selection state for item, where optional val is 1 (select, the default) or 0 (de-select).

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The item to be selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>val</td>
<td>The optional selection state; 1=select, 0=de-select. The default is to select the item (1).</td>
</tr>
</tbody>
</table>

Reimplemented from Fl_Browser_.

34.21.2.11  item_selected()

```cpp
int Fl_Check_Browser::item_selected ( 
    void * item ) const [protected], [virtual]
```

This method must be implemented by the subclass if it supports multiple selections; returns the selection state for item.

The method should return 1 if item is selected, or 0 otherwise.

**Parameters**

| in  | item | The item to test. |

Reimplemented from Fl_Browser_.

Generated by Doxygen
### 34.21.12 item_swap()

```cpp
void Fl_Check_Browser::item_swap (void * a, void * b) [virtual]
```

This optional method should be provided by the subclass to efficiently swap browser items `a` and `b`, such as for sorting.

**Parameters**

- **in** `a,b` The two items to be swapped.

Reimplemented from `Fl_Browser`.

### 34.21.13 item_text()

```cpp
const char * Fl_Check_Browser::item_text (void * item) const [protected], [virtual]
```

This optional method returns a string (label) that may be used for sorting.

**Parameters**

- **in** `item` The item whose label text is returned.

**Returns**

The item’s text label. (Can be NULL if blank)

Reimplemented from `Fl_Browser`.

### 34.21.14 item_width()

```cpp
int Fl_Check_Browser::item_width (void * item) const [protected], [virtual]
```

This method must be provided by the subclass to return the width of the `item` in pixels. Allow for two additional pixels for the list selection box.

**Parameters**

- **in** `item` The item whose width is returned.

**Returns**

The width of the item in pixels.

Implements `Fl_Browser`.

### 34.21.15 nitems()

```cpp
int Fl_Check_Browser::nitems () const [inline]
```

Returns how many lines are in the browser. The last line number is equal to this.

### 34.21.16 remove()

```cpp
int Fl_Check_Browser::remove (int item)
```
Remove line n and make the browser one line shorter.
Returns the number of lines left in the browser.
The documentation for this class was generated from the following files:

- Fl_Check_Browser.H
- Fl_Check_Browser.cxx

### 34.22 Fl_Check_Button Class Reference

A button with a "checkmark" to show its status.
Inheritance diagram for Fl_Check_Button:

```
Fl_Widget
    Fl_Button
        Fl_Light_Button
            Fl_Check_Button
```

**Public Member Functions**

- **Fl_Check_Button (int X, int Y, int W, int H, const char ∗L=0)**
  
  Creates a new Fl_Check_Button widget using the given position, size, and label string.

**Additional Inherited Members**

#### 34.22.1 Detailed Description

A button with a "checkmark" to show its status.

![Figure 34.7 Fl_Check_Button](image)

Figure 34.7 Fl_Check_Button

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for `type()` and `when()`.
The Fl_Check_Button subclass displays its "ON" state by showing a "checkmark" rather than drawing itself pushed in.

#### 34.22.2 Constructor & Destructor Documentation

##### 34.22.2.1 Fl_Check_Button()

Fl_Check_Button::Fl_Check_Button (int X, int Y, int W, int H, const char ∗L=0)

Creates a new Fl_Check_Button widget using the given position, size, and label string.
The default box type is FL_NO_BOX, which draws the label w/o a box right of the checkmark.
The selection_color() sets the color of the checkmark. Default is FL_FOREGROUND_COLOR (usually black). You can use down_box() to change the box type of the checkmark. Default is FL_DOWN_BOX.

Parameters

| in | X,Y,W,H | position and size of the widget |
| in | L       | widget label, default is no label |

The documentation for this class was generated from the following files:

- Fl_Chock_Button.H
- Fl_Choice_Button.cxx

### 34.23 Fl_Choice Class Reference

A button that is used to pop up a menu.

```cpp
#include <Fl_Choice.H>
```

Inheritance diagram for Fl_Choice:

```
Fl_Widget
   ▼
    Fl_Menu_
       ▼
        Fl_Choice
            ▼
                Fl_Scheme_Choice
```

#### Public Member Functions

- **Fl_Choice** (int X, int Y, int W, int H, const char *L=0)
  
  Create a new Fl_Choice widget using the given position, size and label string.

- **int handle** (int) FL_OVERRIDE
  
  Handles the specified event.

- **int value** () const
  
  Gets the index of the last item chosen by the user.

- **int value** (const Fl_Menu_Item *v)
  
  Sets the currently selected value using a pointer to menu item.

- **int value** (int v)
  
  Sets the currently selected value using the index into the menu item array.

#### Protected Member Functions

- **void draw** () FL_OVERRIDE
  
  Draws the widget.

#### Additional Inherited Members

### 34.23.1 Detailed Description

A button that is used to pop up a menu.
This is a button that, when pushed, pops up a menu (or hierarchy of menus) defined by an array of Fl_Menu_Item objects. Motif calls this an OptionButton.

The only difference between this and a Fl_Menu_Button is that the name of the most recent chosen menu item is displayed inside the box, while the label is displayed outside the box. However, since the use of this is most often to control a single variable rather than do individual callbacks, some of the Fl_Menu_Button methods are redescribed here in those terms.

When the user clicks a menu item, value() is set to that item and then:

- The item’s callback is done if one has been set; the Fl_Choice is passed as the Fl_Widget* argument, along with any userdata configured for the callback.
- If the item does not have a callback, the Fl_Choice widget’s callback is done instead, along with any userdata configured for it. The callback can determine which item was picked using value(), mvalue(), item_pathname(), etc.

All three mouse buttons pop up the menu. The Forms behavior of the first two buttons to increment/decrement the choice is not implemented. This could be added with a subclass, however. The menu will also pop up in response to shortcuts indicated by putting a ‘&’ character in the label(). See Fl_Button::shortcut(int s) for a description of this.

Typing the shortcut() of any of the items will do exactly the same as when you pick the item with the mouse. The ‘&’ character in item names are only looked at when the menu is popped up, however.

The inherited Fl_Widget::changed() and related methods can be used as follows:

- int Fl_Widget::changed() const This value is true when the user picks a different value. It is turned off by value() and just before doing a callback (the callback can turn it back on if desired).
- void Fl_Widget::set_changed() This method sets the changed() flag.
- void Fl_Widget::clear_changed() This method clears the changed() flag.

The inherited Fl_Menu_::down_box() methods can be used as follows:

- Fl_Boxtype Fl_Menu_::down_box() const Gets the current down box, which is used when the menu is popped up. The default down box type is FL_DOWN_BOX.
- void Fl_Menu_::down_box(Fl_Boxtype b) Sets the current down box type to b.

Simple example:

```c
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Choice.H>
int main() { Fl_Window *win = new Fl_Window(300,200); Fl_Choice *choice = new Fl_Choice(100,10,100,25,"Choice:"); choice->add("Zero"); choice->add("One"); choice->add("Two"); choice->add("Three"); choice->value(2); // make "Two" selected by default (zero based!) win->end(); win->show(); return Fl::run(); }
```
### 34.23.2 Constructor & Destructor Documentation

#### 34.23.2.1 Fl_Choice()

```cpp
Fl_Choice::Fl_Choice ( int X, int Y, int W, int H, const char ∗ L = 0 )
```

Create a new Fl_Choice widget using the given position, size and label string. The default boxtype is FL_UP_BOX. The constructor sets menu() to NULL. See Fl_Menu_ for the methods to set or change the menu.

**Parameters**

| in | X,Y,W,H | position and size of the widget |
| in | L       | widget label, default is no label |

### 34.23.3 Member Function Documentation

#### 34.23.3.1 draw()

```cpp
void Fl_Choice::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own draw() method*, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.

#### 34.23.3.2 handle()

```cpp
int Fl_Choice::handle ( int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't do anything with it.

**Parameters**

| in | event | the kind of event received |

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Return values

<table>
<thead>
<tr>
<th>0</th>
<th>if the event was not used or understood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

Fl_Event

Reimplemented from Fl_Widget.
Reimplemented in Fl_Scheme_Choice.

### 34.23.3 value() [1/3]

```cpp
int Fl_Choice::value ( ) const [inline]
```

Gets the index of the last item chosen by the user. The index is -1 initially.

### 34.23.3.4 value() [2/3]

```cpp
int Fl_Choice::value (const Fl_Menu_Item * v)
```

Sets the currently selected value using a pointer to menu item. Changing the selected value causes a **redraw**.

**Parameters**

| in | v | pointer to menu item in the menu item array. |

**Returns**

non-zero if the new value is different to the old one.

### 34.23.3.5 value() [3/3]

```cpp
int Fl_Choice::value (int v)
```

Sets the currently selected value using the index into the menu item array. Changing the selected value causes a **redraw**.

**Parameters**

| in | v | index of value in the menu item array. |

**Returns**

non-zero if the new value is different to the old one.

The documentation for this class was generated from the following files:

- Fl_Choice.H
- Fl_Choice.cxx

### 34.24 Fl_Clock Class Reference

This widget provides a round analog clock display.
#include <Fl_Clock.H>

Inheritance diagram for Fl_Clock:

```
Fl_Widget
   ↓
Fl_Clock_Output
   ↓
Fl_Clock
   ↓
Fl_Round_Clock
```

### Public Member Functions

- **Fl_Clock** (int X, int Y, int W, int H, const char *L=0)
  
  Create an Fl_Clock widget using the given position, size, and label string.

- **Fl_Clock** (uchar t, int X, int Y, int W, int H, const char *L)

  Create an Fl_Clock widget using the given clock type t, position, size, and label string.

- **int handle** (int) FL_OVERRIDE

  Handles the specified event.

- **~Fl_Clock** ()

  The destructor removes the clock.

### Additional Inherited Members

#### 34.24.1 Detailed Description

This widget provides a round analog clock display.

Fl_Clock is provided for Forms compatibility. It installs a 1-second timeout callback using Fl::add_timeout(). You can choose the rounded or square type of the clock with type(). Please see Fl_Clock_Output widget for applicable values.

![Figure 34.9 FL_SQUARE_CLOCK type](image-url)
536 Class Documentation

Figure 34.10 FL_ROUND_CLOCK type

See also

  class Fl_Clock_Output

34.24.2 Constructor & Destructor Documentation

34.24.2.1 Fl_Clock() [1/2]

    Fl_Clock::Fl_Clock (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ L = 0 )

Create an Fl_Clock widget using the given position, size, and label string.
The default clock type is FL_SQUARE_CLOCK and the default boxtype is FL_UP_BOX.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y,W,H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

34.24.2.2 Fl_Clock() [2/2]

    Fl_Clock::Fl_Clock (  
    uchar t,  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ L )

Create an Fl_Clock widget using the given clock type t, position, size, and label string.
The default clock type t is FL_SQUARE_CLOCK. You can set the clock type to FL_ROUND_CLOCK or any other
valid clock type. See Fl_Clock_Output widget for applicable values.
The default boxtype is FL_UP_BOX for FL_SQUARE_CLOCK and FL_NO_BOX for FL_ROUND_CLOCK, if set by
the constructor. If you change the clock type with type() later you should also set the boxtype with box().

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>type of clock: FL_ROUND_CLOCK or FL_SQUARE_CLOCK (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>X,Y,W,H</td>
<td>position and size of the widget</td>
</tr>
</tbody>
</table>
34.24.3 Member Function Documentation

34.24.3.1 handle()

```
int Fl_Clock::handle ( 
   int event ) [virtual]
```

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.
This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in  | event | the kind of event received |

Return values

| 0   | if the event was not used or understood |
| 1   | if the event was used and can be deleted |

See also

Fi_Event
Reimplemented from Fl_Widget.
The documentation for this class was generated from the following files:

- Fl_Clock.H
- Fl_Clock.cxx

34.25 Fl_Clock_Output Class Reference

This widget can be used to display a program-supplied time.

#include <Fl_Clock.H>
Inheritance diagram for Fl_Clock_Output:
Public Member Functions

- **Fl_Clock_Output** (int X, int Y, int W, int H, const char *L=0)
  
  Create a new Fl_Clock_Output widget with the given position, size and label.

- int **hour** () const
  
  Returns the displayed hour (0 to 23).

- int **minute** () const
  
  Returns the displayed minute (0 to 59).

- int **second** () const
  
  Returns the displayed second (0 to 60, 60=leap second).

- int **shadow** () const
  
  Returns the shadow drawing mode of the hands.

- void **shadow** (int mode)
  
  Sets the shadow drawing mode of the hands.

- ulong **value** () const
  
  Returns the displayed time.

- void **value** (int H, int m, int s)
  
  Set the displayed time.

- void **value** (ulong v)
  
  Set the displayed time.

Protected Member Functions

- void **draw** () FL_OVERRIDE
  
  Draw clock with current position and size.

- void **draw** (int X, int Y, int W, int H)
  
  Draw clock with the given position and size.

Additional Inherited Members

34.25.1 Detailed Description

This widget can be used to display a program-supplied time. The time shown on the clock is not updated. To display the current time, use Fl_Clock instead.
34.25 Fl_Clock_Output Class Reference

Values for clock type() (#include <FL/Clock.H>):
#define FL_SQUARE_CLOCK 0 // Square Clock variant
#define FL_ROUND_CLOCK 1 // Round Clock variant
#define FL_ANALOG_CLOCK FL_SQUARE_CLOCK // An analog clock is square
#define FL_DIGITAL_CLOCK FL_SQUARE_CLOCK // Not yet implemented

34.25.2 Constructor & Destructor Documentation

34.25.2.1 Fl_Clock_Output()

Fl_Clock_Output::Fl_Clock_Output (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0  
)  
Create a new Fl_Clock_Output widget with the given position, size and label.
The default clock type is FL_SQUARE_CLOCK and the default boxtype is FL_UP_BOX.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y,W,H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

34.25.3 Member Function Documentation
34.25.3.1 draw [1/2]

void Fl_Clock_Output::draw (void) [protected], [virtual]
Draw clock with current position and size.
Implements Fl_Widget.

34.25.3.2 draw [2/2]

void Fl_Clock_Output::draw (int X, int Y, int W, int H) [protected]
Draw clock with the given position and size.

Parameters

| in | X, Y, W, H | position and size |

34.25.3.3 hour()

int Fl_Clock_Output::hour ( ) const [inline]
Returns the displayed hour (0 to 23).
See also

value(), minute(), second()

34.25.3.4 minute()

int Fl_Clock_Output::minute ( ) const [inline]
Returns the displayed minute (0 to 59).
See also

value(), hour(), second()

34.25.3.5 second()

int Fl_Clock_Output::second ( ) const [inline]
Returns the displayed second (0 to 60, 60=leap second).
See also

value(), hour(), minute()

34.25.3.6 shadow [1/2]

int Fl_Clock_Output::shadow ( ) const [inline]
Returns the shadow drawing mode of the hands.
Returns

shadow drawing mode of the hands
Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no shadows</td>
</tr>
<tr>
<td>1</td>
<td>draw shadows of hands (default)</td>
</tr>
</tbody>
</table>

### 34.25.3.7 shadow() [2/2]

```cpp
void Fl_Clock_Output::shadow ( int mode ) [inline]
```

Sets the shadow drawing mode of the hands. Enables (1) or disables (0) drawing the hands with shadows. Values except 0 and 1 are reserved for future extensions and yield undefined behavior. The default is to draw the shadows (1).

**Parameters**

| in | mode | 1 = shadows (default), 0 = no shadows |

### 34.25.3.8 value() [1/3]

```cpp
ulong Fl_Clock_Output::value () const [inline]
```

Returns the displayed time. Returns the time in seconds since the UNIX epoch (January 1, 1970).

See also

- `value(ulong)`

### 34.25.3.9 value() [2/3]

```cpp
void Fl_Clock_Output::value ( int H, int m, int s )
```

Set the displayed time. Set the time in hours, minutes, and seconds.

**Parameters**

| in | H,m,s | displayed time |

See also

- `hour(), minute(), second()`

### 34.25.3.10 value() [3/3]

```cpp
void Fl_Clock_Output::value ( ulong v )
```

Set the displayed time. Set the time in seconds since the UNIX epoch (January 1, 1970).
Parameters

| in | v | seconds since epoch |

See also

value()

The documentation for this class was generated from the following files:

- Fl_Clock.H
- Fl_Clock.cxx

34.26 Fl_Color_Chooser Class Reference

The Fl_Color_Chooser widget provides a standard RGB color chooser.

```c
#include <Fl_Color_Chooser.H>
```

Inheritance diagram for Fl_Color_Chooser:

```
Fl_Widget
   ↓
Fl_Group
   ↓
Fl_Color_Chooser
```

Public Member Functions

- double b () const
  
  *Returns the current blue value.*
- Fl_Color_Chooser (int X, int Y, int W, int H, const char ∗L=0)
  
  *Creates a new Fl_Color_Chooser widget using the given position, size, and label string.*
- double g () const
  
  *Returns the current green value.*
- int handle (int e) FL_OVERRIDE
  
  *Handles all events received by this widget.*
- int hsv (double H, double S, double V)
  
  *Sets the hsv values.*
- double hue () const
  
  *Returns the current hue.*
- int mode ()
  
  *Returns which Fl_Color_Chooser variant is currently active.*
- void mode (int newMode)
  
  *Set which Fl_Color_Chooser variant is currently active.*
- double r () const
  
  *Returns the current red value.*
- int rgb (double R, double G, double B)
  
  *Sets the current rgb color values.*
- double saturation () const
  
  *Returns the saturation.*
- double value () const
  
  *Returns the value/brightness.*
Static Public Member Functions

- static void hsv2rgb (double H, double S, double V, double &R, double &G, double &B)
  
  This static method converts HSV colors to RGB colorspace.

- static void rgb2hsv (double R, double G, double B, double &H, double &S, double &V)
  
  This static method converts RGB colors to HSV colorspace.

Related Functions

(Note that these are not member functions.)

- int fl_color_chooser (const char∗ name, double &r, double &g, double &b, int cmode)
  
  Pops up a window to let the user pick an arbitrary RGB color.

- int fl_color_chooser (const char∗ name, uchar &r, uchar &g, uchar &b, int cmode)
  
  Pops up a window to let the user pick an arbitrary RGB color.

Additional Inherited Members

34.26.1 Detailed Description

The Fl_Color_Chooser widget provides a standard RGB color chooser.

You can place any number of the widgets into a panel of your own design. The diagram shows the widget as part of a color chooser dialog created by the fl_color_chooser() function. The Fl_Color_Chooser widget contains the hue box, value slider, and rgb input fields from the above diagram (it does not have the color chips or the Cancel or OK buttons). The callback is done every time the user changes the rgb value. It is not done if they move the hue control in a way that produces the same rgb value, such as when saturation or value is zero.

The fl_color_chooser() function pops up a window to let the user pick an arbitrary RGB color. They can pick the hue and saturation in the "hue box" on the left (hold down CTRL to just change the saturation), and the brightness using the vertical slider. Or they can type the 8-bit numbers into the RGB Fl_Value_Input fields, or drag the mouse across them to adjust them. The pull-down menu lets the user set the input fields to show RGB, HSV, or 8-bit RGB (0 to 255).

The user can press CTRL-C to copy the currently selected color value as text in RGB hex format with leading zeroes to the clipboard, for instance FL_GREEN would be '00FF00' (since FLTK 1.4.0).

fl_color_chooser() returns non-zero if the user picks ok, and updates the RGB values. If the user picks cancel or closes the window this returns zero and leaves RGB unchanged.

If you use the color chooser on an 8-bit screen, it will allocate all the available colors, leaving you no space to exactly represent the color the user picks! You can however use fl_rectf() to fill a region with a simulated color using dithering.

Callback reasons can be FL_REASON_DRAGGED, FL_REASON_CHANGED, or FL_REASON_RESELECTED.

34.26.2 Constructor & Destructor Documentation

Generated by Doxygen
34.26.2.1 Fl_Color_Chooser()

Fl_Color_Chooser::Fl_Color_Chooser{
    int X,
    int Y,
    int W,
    int H,
    const char ∗ L = 0
}

Creates a new Fl_Color_Chooser widget using the given position, size, and label string. The recommended dimensions are 200x95. The color is initialized to black.

Parameters:

| in | X,Y,W,H | position and size of the widget |
| in | L       | widget label, default is no label |

34.26.3 Member Function Documentation

34.26.3.1 b()

double Fl_Color_Chooser::b ( ) const [inline]

Returns the current blue value.
0 <= b <= 1.

34.26.3.2 g()

double Fl_Color_Chooser::g ( ) const [inline]

Returns the current green value.
0 <= g <= 1.

34.26.3.3 handle()

int Fl_Color_Chooser::handle{
    int e ) [virtual]

Handles all events received by this widget.
This specific handle() method processes the standard 'copy' function as seen in other input widgets. It copies the current color value to the clipboard as a string in RGB format ('RRGGBB'). This format is independent of the Fl_Color_Chooser display format setting. No other formats are supplied.
The keyboard events handled are:

- ctrl-c
- ctrl-x
- ctrl-Insert

All other events are processed by the parent class Fl_Group.
This enables the user to choose a color value, press ctrl-c to copy the value to the clipboard and paste it into a color selection widget in another application window or any other text input (e.g. a preferences dialog or an editor).

Note

Keyboard event handling by the current focus widget has priority, hence moving the focus to one of the buttons or selecting text in one of the input widgets effectively disables this special method.

Parameters:

| in | e | current event |

Generated by Doxygen
Returns
1 if event has been handled, 0 otherwise.

See also
Fl_Group::handle(int)

Reimplemented from Fl_Widget.

### 34.26.3.4 hsv()

```cpp
int Fl_Color_Chooser::hsv (double H, double S, double V)
```

Set the hsv values.
The passed values are clamped (or for hue, modulus 6 is used) to get legal values. Does not do the callback.

**Parameters**
- **in** `H,S,V` color components.

**Returns**
1 if a new hsv value was set, 0 if the hsv value was the previous one.

### 34.26.3.5 hsv2rgb()

```cpp
void Fl_Color_Chooser::hsv2rgb (double H, double S, double V, double & R, double & G, double & B) [static]
```

This *static* method converts HSV colors to RGB colorspace.

**Parameters**
- **in** `H,S,V` color components
- **out** `R,G,B` color components

### 34.26.3.6 hue()

```cpp
double Fl_Color_Chooser::hue () const [inline]
```

Returns the current hue.
0 <= hue < 6. Zero is red, one is yellow, two is green, etc. *This value is convenient for the internal calculations - some other systems consider hue to run from zero to one, or from 0 to 360.*

### 34.26.3.7 mode() [1/2]

```cpp
int Fl_Color_Chooser::mode () [inline]
```

Returns which Fl_Color_Chooser variant is currently active.
Returns

color modes are rgb(0), byte(1), hex(2), or hsv(3)

34.26.3.8 mode() [2/2]

void Fl_Color_Chooser::mode ( int newMode )

Set which Fl_Color_Chooser variant is currently active.

Parameters

| IN | newMode | color modes are rgb(0), byte(1), hex(2), or hsv(3) |

34.26.3.9 r()

double Fl_Color_Chooser::r ( ) const [inline]

Returns the current red value.

\[0 \leq r \leq 1.\]

34.26.3.10 rgb()

int Fl_Color_Chooser::rgb ( double R, double G, double B )

Sets the current rgb color values.

Does not do the callback. Does not clamp (but out of range values will produce psychedelic effects in the hue selector).

Parameters

| IN | R,G,B | color components. |

Returns

1 if a new rgb value was set, 0 if the rgb value was the previous one.

34.26.3.11 rgb2hsv()

void Fl_Color_Chooser::rgb2hsv ( double R, double G, double B, double & H, double & S, double & V ) [static]

This static method converts RGB colors to HSV colorspace.

Parameters

| IN | R,G,B | color components |

| OUT | H,S,V | color components |
34.26.3.12 saturation()

double Fl_Color_Chooser::saturation ( ) const [inline]
Returns the saturation.
0 \leq \text{saturation} \leq 1.

34.26.3.13 value()

double Fl_Color_Chooser::value ( ) const [inline]
Returns the value/brightness.
0 \leq \text{value} \leq 1.

The documentation for this class was generated from the following files:

- Fl_Color_Chooser.H
- Fl_Color_Chooser.cxx

34.27 Fl_Copy_Surface Class Reference

Supports copying of graphical data to the clipboard.
#include <Fl_Copy_Surface.H>

Inheritance diagram for Fl_Copy_Surface:

```
Fl_Surface_Device
    Fl_Widget_Surface
        Fl_Copy_Surface
```

Public Member Functions

- Fl_Copy_Surface (int w, int h)
  the constructor
- int h ()
  Returns the pixel height of the copy surface.
- bool is_current () FL_OVERRIDE
  Is this surface the current drawing surface?
- void origin (int *x, int *y) FL_OVERRIDE
  Computes the coordinates of the current origin of graphics functions.
- void origin (int x, int y) FL_OVERRIDE
  Sets the position of the origin of graphics in the drawable part of the drawing surface.
- int printable_rect (int *w, int *h) FL_OVERRIDE
  Computes the width and height of the drawable area of the drawing surface.
- void set_current () FL_OVERRIDE
  Make this surface the current drawing surface.
- int w ()
  Returns the pixel width of the copy surface.
- ~Fl_Copy_Surface ()
  the destructor

Generated by Doxygen
Protected Member Functions

- void translate (int x, int y) FL_OVERRIDE
  Translates the current graphics origin accounting for the current rotation.
- void untranslate () FL_OVERRIDE
  Undoes the effect of a previous translate() call.

Additional Inherited Members

34.27.1 Detailed Description

Supports copying of graphical data to the clipboard.

After creation of an Fl_Copy_Surface object, make it the current drawing surface calling Fl_Surface_Device::push_current(), and all subsequent graphics requests will be recorded in the clipboard. It's possible to draw widgets (using Fl_Copy_Surface::draw() ) or to use any of the Drawing functions or the Color & Font functions. Finally, delete the Fl_Copy_Surface object to load the clipboard with the graphical data.

Fl_Gl_Window’s can be copied to the clipboard as well.

Usage example:

```cpp
Fl_Widget *g = ...; // a widget you want to copy to the clipboard
Fl_Copy_Surface *copy_surf = new Fl_Copy_Surface(g->w(), g->h()); // create an Fl_Copy_Surface object
Fl_Surface_Device::push_current(copy_surf); // direct graphics requests to the clipboard
fl_color(FL_WHITE); fl_rectf(0, 0, g->w(), g->h()); // draw a white background
copy_surf->draw(g); // draw the g widget in the clipboard
Fl_Surface_Device::pop_current(); // direct graphics requests back to their previous destination
delete copy_surf; // after this, the clipboard is loaded
```

Platform details:

- Windows: Transparent RGB images copy without transparency. The graphical data are copied to the clipboard in two formats: 1) as an 'enhanced metafile'; 2) as a color bitmap. Applications to which the clipboard content is pasted can use the format that suits them best.
- Mac OS: The graphical data are copied to the clipboard (a.k.a. pasteboard) in two 'flavors': 1) in vectorial form as PDF data; 2) in bitmap form as a TIFF image. Applications to which the clipboard content is pasted can use the flavor that suits them best.
- X11 and Wayland: the graphical data are copied to the clipboard as an image in BMP format.

34.27.2 Constructor & Destructor Documentation

34.27.2.1 Fl_Copy_Surface()

```cpp
Fl_Copy_Surface::Fl_Copy_Surface ( int w,
                                 int h )
```

the constructor

Parameters

| w,h | Width and height of the drawing surface in FLTK units |

34.27.3 Member Function Documentation

34.27.3.1 is_current()

```cpp
bool Fl_Copy_Surface::is_current ( ) [virtual]
```

Is this surface the current drawing surface?
Reimplemented from Fl_Surface_Device.

34.27.3.2 origin() [1/2]

```cpp
void Fl_Copy_Surface::origin ( int * x, int * y ) [virtual]
```
Computes the coordinates of the current origin of graphics functions.

Parameters:
- `out x, y`: If non-null, `*x` and `*y` are set to the horizontal and vertical coordinates of the graphics origin.

Reimplemented from Fl_Widget_Surface.

34.27.3.3 origin() [2/2]

```cpp
void Fl_Copy_Surface::origin ( int x, int y ) [virtual]
```
Sets the position of the origin of graphics in the drawable part of the drawing surface. Arguments should be expressed relatively to the result of a previous `printable_rect()` call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive `origin()` calls don't combine their effects. `Origin()` calls are not affected by `rotate()` calls (for classes derived from Fl_Paged_Device).

Parameters:
- `in x, y`: Horizontal and vertical positions in the drawing surface of the desired origin of graphics.

Reimplemented from Fl_Widget_Surface.

34.27.3.4 printable_rect()

```cpp
int Fl_Copy_Surface::printable_rect ( int * w, int * h ) [virtual]
```
Computes the width and height of the drawable area of the drawing surface. Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to `origin()`. If the object is derived from class Fl_Paged_Device, values account for the user-selected paper type and print orientation and are changed by `scale()` calls.

Returns:
- `0` if OK, non-zero if any error

Reimplemented from Fl_Widget_Surface.

34.27.3.5 set_current()

```cpp
void Fl_Copy_Surface::set_current ( ) [virtual]
```
Make this surface the current drawing surface. This surface will receive all future graphics requests. Starting from FLTK 1.4.0, the preferred API to change the current drawing surface is `Fl_Surface_Device::push_current() / Fl_Surface_Device::pop_current()`. 

...
Note

It’s recommended to use this function only as follows:

• The current drawing surface is the display;
• make current another surface, e.g., an Fl_Printer or an Fl_Image_Surface object, calling set_current() on this object;
• draw to that surface;
• make the display current again with Fl_Display_Device::display_device()->set_current();. Don’t do any other call to set_current() before this one.

Other scenarios of drawing surface changes should be performed via Fl_Surface_Device::push_current() / Fl_Surface_Device::pop_current().

Reimplemented from Fl_Surface_Device.

34.27.3.6 translate()

void Fl_Copy_Surface::translate (  
    int x,  
    int y ) [protected], [virtual]

Translates the current graphics origin accounting for the current rotation. Each translate() call must be matched by an untranslate() call. Successive translate() calls add up their effects. Reimplemented from Fl_Widget_Surface.

34.27.3.7 untranslate()

void Fl_Copy_Surface::untranslate (  
    void ) [protected], [virtual]

Undoes the effect of a previous translate() call. Reimplemented from Fl_Widget_Surface.

The documentation for this class was generated from the following files:

• Fl_Copy_Surface.H
• Fl_Copy_Surface.cxx

34.28 Fl_Counter Class Reference

Controls a single floating point value with button (or keyboard) arrows.
#include <Fl_Counter.H>

Inheritance diagram for Fl_Counter:

```
Fl_Widget
    |
    v
Fl_Counter
    |
    v
Fl_Simple_Counter
```

Public Member Functions

• Fl_Counter (int X, int Y, int W, int H, const char *L=0)
34.28 Fl_Counter Class Reference

**Description**

Creates a new Fl_Counter widget using the given position, size, and label string.

- **int handle (int) FL_OVERRIDE**
  Handles the specified event.

- **void lstep (double a)**
  Sets the increment for the large step buttons.

- **double step () const**
  Returns the increment for normal step buttons.

- **void step (double a)**
  Sets the increment for the normal step buttons.

- **void step (double a, double b)**
  Sets the increments for the normal and large step buttons.

- **Fl_Color textcolor () const**
  Gets the font color.

- **void textcolor (Fl_Color s)**
  Sets the font color to s.

- **Fl_Font textfont () const**
  Gets the text font.

- **void textfont (Fl_Font s)**
  Sets the text font to s.

- **Fl_Fontsize textsize () const**
  Gets the font size.

- **void textsize (Fl_Fontsize s)**
  Sets the font size to s.

- **~Fl_Counter ()**
  Destroys the valuators.

**Protected Member Functions**

- **void arrow_widths (int &w1, int &w2)**
  Compute sizes (widths) of arrow boxes.

- **void draw () FL_OVERRIDE**
  Draws the widget.

**Additional Inherited Members**

### 34.28.1 Detailed Description

Controls a single floating point value with button (or keyboard) arrows. Double arrows buttons achieve larger steps than simple arrows.

See also

Fl_Spinner for value input with vertical step arrows.

![Figure 34.14 Fl_Counter](image)

The type of an Fl_Counter object can be set using Fl_Widget::type(uchar) to:

- **FL_NORMAL_COUNTER**: Displays a counter with 4 arrow buttons.
- **FL_SIMPLE_COUNTER**: Displays a counter with only 2 arrow buttons.
34.28.2 Constructor & Destructor Documentation

34.28.2.1 Fl_Counter()

Fl_Counter::Fl_Counter {
  int X,
  int Y,
  int W,
  int H,
  const char * L = 0
}

Creates a new Fl_Counter widget using the given position, size, and label string.
The default type is FL_NORMAL_COUNTER.

Parameters

| in  | X,Y,W,H | position and size of the widget |
| in  | L       | widget label, default is no label |

34.28.3 Member Function Documentation

34.28.3.1 arrow_widths()

void Fl_Counter::arrow_widths {
  int & w1,
  int & w2 } [protected]

Compute sizes (widths) of arrow boxes.
This method computes the two sizes of the arrow boxes of Fl_Counter. You can override it in a subclass if you want
to draw fancy arrows or change the layout. However, the basic layout is fixed and can't be changed w/o overriding
the draw() and handle() methods.

Basic layout:

```
+------+-----+-------------+-----+------+
| « | < | value | > | » |
+------+-----+-------------+-----+------+
```

The returned value \( w_2 \) should be zero if the counter type() is FL_SIMPLE_COUNTER.

Parameters

| out | w1 | width of single arrow box |
| out | w2 | width of double arrow box |

34.28.3.2 draw()

void Fl_Counter::draw ( ) [protected], [virtual]

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as
soon as possible, call redraw() instead.

Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded
scrollbar, you can do it (because draw() is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.
34.28.3.3 handle()

```cpp
int Fl_Counter::handle (int event) [virtual]
```

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class. In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

**Parameters**

| in  | event | the kind of event received |

**Return values**

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

**See also**

Fl_Event

Reimplemented from Fl_Widget.

### 34.28.3.4 lstep()

```cpp
void Fl_Counter::lstep (double a) [inline]
```

Sets the increment for the large step buttons. The default value is 1.0.

**Parameters**

| in  | a | large step increment. |

### 34.28.3.5 step() [1/2]

```cpp
void Fl_Counter::step (double a) [inline]
```

Sets the increment for the normal step buttons.

**Parameters**

| in  | a | normal step increment. |
### 34.28.3.6 step() [2/2]

```c
void Fl_Counter::step (  
    double a,  
    double b  
) [inline]
```

Sets the increments for the normal and large step buttons.

**Parameters**

| in  | a,b | normal and large step increments. |

The documentation for this class was generated from the following files:

- `Fl_Counter.H`
- `Fl_Counter.cxx`

### 34.29 Fl_Device_Plugin Class Reference

This plugin socket allows the integration of new device drivers for special window or screen types.

```c
#include <Fl_Device.H>
```

Inheritance diagram for Fl_Device_Plugin:

```
   Fl_Plugin
    |   |
    v   v
Fl_Device_Plugin
```

**Public Member Functions**

- `Fl_Device_Plugin (const char *pluginName)`
  - The constructor.
- `virtual const char * klass ()`
  - Returns the class name.
- `virtual const char * name ()=0`
  - Returns the plugin name.
- `virtual int print (Fl_Widget *w)=0`
  - Prints a widget.
- `virtual Fl_RGB_Image * rectangle_capture (Fl_Widget *widget, int x, int y, int w, int h)=0`
  - Captures a rectangle of a widget as an image.

**Static Public Member Functions**

- `static Fl_Device_Plugin * opengl_plugin ()`
  - Returns the OpenGL plugin.

### 34.29.1 Detailed Description

This plugin socket allows the integration of new device drivers for special window or screen types. This class is not intended for use outside the FLTK library. It is currently used to provide an automated printing service and screen capture for OpenGL windows, if linked with fltk_gl.

### 34.29.2 Member Function Documentation
34.29.2.1 rectangle_capture()

```cpp
virtual Fl_RGB_Image * Fl_Device_Plugin::rectangle_capture (  
    Fl_Widget * widget,  
    int x,  
    int y,  
    int w,  
    int h ) [pure virtual]
```

Captures a rectangle of a widget as an image.

Returns:

The captured pixels as an RGB image

The documentation for this class was generated from the following files:

- `Fl_Device.H`
- `Fl_Device.cxx`

34.30 Fl_Dial Class Reference

The `Fl_Dial` widget provides a circular dial to control a single floating point value.

```cpp
#include <Fl_Dial.H>
```

Inheritance diagram for `Fl_Dial`:

```
Fl_Widget
  ↓
Fl_Valuator
  ↓
Fl_Dial
  ↓
Fl_Fill_Dial Fl_Line_Dial
```

Public Member Functions

- short `angle1 () const`
  
  Sets Or gets the angles used for the minimum and maximum values.

- void `angle1 (short a)`
  
  See `short angle1() const`.

- short `angle2 () const`
  
  See `short angle1() const`.

- void `angle2 (short a)`
  
  See `short angle1() const`.

- void `angles (short a, short b)`
  
  See `short angle1() const`.

- `Fl_Dial (int x, int y, int w, int h, const char *l=0)`
  
  Creates a new `Fl_Dial` widget using the given position, size, and label string.

- int `handle (int) FL_OVERRIDE`
  
  Allow subclasses to handle event based on current position and size.
Protected Member Functions

- void **draw ()** FL_OVERRIDE
  Draws dial at current position and size.
- void **draw (int X, int Y, int W, int H)**
  Draws dial at given position and size.
- int **handle (int event, int X, int Y, int W, int H)**
  Allows subclasses to handle event based on given position and size.

Additional Inherited Members

34.30.1 Detailed Description

The Fl_Dial widget provides a circular dial to control a single floating point value.

Use type() to set the type of the dial to:

- FL_NORMAL_DIAL - Draws a normal dial with a knob.
- FL_LINE_DIAL - Draws a dial with a line.
- FL_FILL_DIAL - Draws a dial with a filled arc.

34.30.2 Constructor & Destructor Documentation

34.30.2.1 Fl_Dial()

Fl_Dial::Fl_Dial (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )

Creates a new Fl_Dial widget using the given position, size, and label string.  
The default type is FL_NORMAL_DIAL.

34.30.3 Member Function Documentation

34.30.3.1 angle1()

short Fl_Dial::angle1 ( ) const [inline]
Sets Or gets the angles used for the minimum and maximum values.  
The default values are 45 and 315 (0 degrees is straight down and the angles progress clockwise).  Normally angle1 is less than angle2, but if you reverse them the dial moves counter-clockwise.
34.30.3.2 draw() [1/2]

```cpp
void Fl_Dial::draw (
    void ) [protected], [virtual]
```

Draws dial at current position and size.
Implements Fl_Widget.

34.30.3.3 draw() [2/2]

```cpp
void Fl_Dial::draw (
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Draws dial at given position and size.

Parameters

| in  | X,Y,W,H | position and size |

34.30.3.4 handle() [1/2]

```cpp
int Fl_Dial::handle (
    int event,
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Allows subclasses to handle event based on given position and size.

Parameters

| in  | event,X,Y,W,H | event to handle, related position and size. |

34.30.3.5 handle() [2/2]

```cpp
int Fl_Dial::handle (
    int e ) [virtual]
```

Allow subclasses to handle event based on current position and size.
Reimplemented from Fl_Widget.
The documentation for this class was generated from the following files:

- Fl_Dial.H
- Fl_Dial.cxx

34.31 Fl_Display_Device Class Reference

The computer’s display.

```cpp
#include <Fl_Device.H>
```

Inheritance diagram for Fl_Display_Device:
### Static Public Member Functions

- static `Fl_Display_Device * display_device ()`
  
  Returns a pointer to the unique display device.

### Additional Inherited Members

#### 34.31.1 Detailed Description

The computer's display.

When FLTK begins to access the computer's display, it creates an object of class `Fl_Display_Device` and makes it the current drawing surface.

The documentation for this class was generated from the following files:

- `Fl_Device.H`
- `Fl_Device.cxx`

#### 34.32 Fl_Double_Window Class Reference

The `Fl_Double_Window` provides a double-buffered window.

```c
#include <Fl_Double_Window.H>
```

Inheritance diagram for `Fl_Double_Window`:

```
Fl_Widget
   /         \
/           /
Fl_Group
   |         |
/     \     /
Fl_Window
   |         |
/     \     /
Fl_Double_Window
   |         |
/     \     /
Fl_Cairo_Window Fl_Overlay_Window
```

### Public Member Functions

- `Fl_Double_Window * as_double_window () FL_OVERRIDE`
  
  Return non-null if this is an `Fl_Overlay_Window` object.

- `Fl_Double_Window (int W, int H, const char * l=0)`
  
  Creates a new `Fl_Double_Window` widget using the given position, size, and label (title) string.

- `Fl_Double_Window (int X, int Y , int W, int H, const char * l=0)`
  
  See `Fl_Double_Window::Fl_Double_Window(int w, int h, const char *label = 0)`

- void `flush () FL_OVERRIDE`
  
  Forces the window to be drawn, this window is also made current and calls `draw()`.

- void `hide () FL_OVERRIDE`
  
  Makes a widget invisible.

- void `resize (int, int, int) FL_OVERRIDE`
Changes the size or position of the widget.

- void show () FL_OVERRIDE
  
  Makes a widget visible.

- void show (int a, char **b)
  
  Same as Fl_Window::show(int a, char **b)
- ~Fl_Double_Window ()
  
  The destructor also deletes all the children.

Additional Inherited Members

34.32.1 Detailed Description

The Fl_Double_Window provides a double-buffered window. It will draw the window data into an off-screen pixmap, and then copy it to the on-screen window.

34.32.2 Constructor & Destructor Documentation

34.32.2.1 ~Fl_Double_Window()

Fl_Double_Window::~Fl_Double_Window ()

The destructor also deletes all the children.

This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code.

34.32.3 Member Function Documentation

34.32.3.1 as_double_window()

Fl_Double_Window * Fl_Double_Window::as_double_window () [inline], [virtual]

Return non-null if this is an Fl_Overlay_Window object.
Reimplemented from Fl_Window.

34.32.3.2 flush()

void Fl_Double_Window::flush () [virtual]

Forces the window to be drawn, this window is also made current and calls draw().
Reimplemented from Fl_Window.
Reimplemented in Fl_Overlay_Window.

34.32.3.3 hide()

void Fl_Double_Window::hide () [virtual]

Makes a widget invisible.

See also

  show(), visible(), visible_r()

Reimplemented from Fl_Widget.
Reimplemented in Fl_Overlay_Window.
34.32.3.4 resize()

```c
void Fl_Double_Window::resize (  
    int x,  
    int y,  
    int w,  
    int h ) [virtual]
```

Changes the size or position of the widget.
This is a virtual function so that the widget may implement its own handling of resizing. The default version does not call the `redraw()` method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call `resize()` a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

`position(X, Y)` is a shortcut for `resize(X, Y, w(), h())`, and `size(W, H)` is a shortcut for `resize(x(), y(), W, H)`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x,y</th>
<th>new position relative to the parent window</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>w,h</td>
<td>new size</td>
</tr>
</tbody>
</table>

See also

- `position(int,int)`, `size(int,int)`

Reimplemented from `Fl_Widget`.
Reimplemented in `Fl_Overlay_Window`.

34.32.3.5 show()

```c
void Fl_Double_Window::show () [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like FL_SHOW.

The `visible()` method returns true if the widget is set to be visible. The `visible_r()` method returns true if the widget and all of its parents are visible. A widget is only visible if `visible()` is true on it and all of its parents.

Changing it will send FL_SHOW or FL_HIDE events to the widget. *Do not change it if the parent is not visible, as this will send false FL_SHOW or FL_HIDE events to the widget.* `redraw()` is called if necessary on this or the parent.

See also

- `hide()`, `visible()`, `visible_r()`

Reimplemented from `Fl_Widget`.
Reimplemented in `Fl_Overlay_Window`.

The documentation for this class was generated from the following files:

- `Fl_Double_Window.H`
- `Fl_Double_Window.cxx`

34.33 Fl_End Class Reference

This is a dummy class that allows you to end a `Fl_Group` in a constructor list of a class:

```c
#include <Fl_Group.H>
```

**Public Member Functions**

- `Fl_End ()`

  All it does is calling `Fl_Group::current()->end()`
34.33.1 Detailed Description

This is a dummy class that allows you to end a Fl_Group in a constructor list of a class:

```cpp
class MyClass {
 Fl_Group group;
 Fl_Button button_in_group;
 Fl_End end;
 Fl_Button button_outside_group;
 MyClass();
}
MyClass::MyClass() :
 group(10,10,100,100),
 button_in_group(20,20,60,30),
 end(),
 button_outside_group(10,120,60,30) {
 [.ctor code..]
 }
```

The documentation for this class was generated from the following file:

- Fl_Group.H

34.34 Fl_EPS_File_Surface Class Reference

Encapsulated PostScript drawing surface.

```cpp
#include <Fl_PostScript.H>
```

Inheritance diagram for Fl_EPS_File_Surface:

```
Fl_EPS_File_Surface
|     |
|     |     Fl_Widget_Surface
|     |     |     Fl_Surface_Device
```

Public Member Functions

- int close ()
  Completes all EPS output.
- FILE * file ()
  Returns the underlying FILE pointer.
- Fl_EPS_File_Surface (int width, int height, FILE *eps_output, Fl_Color background=FL_WHITE, Fl_PostScript_Close_Command closef=NULL)
  Constructor.
- void origin (int *px, int *py) FL_OVERRIDE
  Computes the coordinates of the current origin of graphics functions.
- void origin (int x, int y) FL_OVERRIDE
  Sets the position of the origin of graphics in the drawable part of the drawing surface.
- int printable_rect (int *w, int *h) FL_OVERRIDE
  Computes the width and height of the drawable area of the drawing surface.
- void translate (int x, int y) FL_OVERRIDE
  Translates the current graphics origin accounting for the current rotation.
- void untranslate () FL_OVERRIDE
  Undoes the effect of a previous translate() call.
- ~Fl_EPS_File_Surface ()
  Destructor.
Protected Member Functions

- `Fl_PostScript_Graphics_Driver * driver ()`
  
  Returns the PostScript driver of this drawing surface.

Additional Inherited Members

34.34.1 Detailed Description

Encapsulated PostScript drawing surface.

This drawing surface allows to store any FLTK graphics in vectorial form in an "Encapsulated PostScript" file.

Usage example:

```cpp
Fl_Window *win = ...// Window to draw to an .eps file
int ww = win->decorated_w();
int wh = win->decorated_h();
FILE *eps = fl_fopen("/path/to/mywindow.eps", "w");
if (eps) {
    Fl_EPS_File_Surface *surface = new Fl_EPS_File_Surface(ww, wh, eps, win->color());
    Fl_Surface_Device::push_current(surface);
    surface->draw_decorated_window(win);
    Fl_Surface_Device::pop_current();
    delete surface; // the .eps file is not complete until the destructor was run
}
```

34.34.2 Constructor & Destructor Documentation

34.34.2.1 `Fl_EPS_File_Surface()`

```cpp
Fl_EPS_File_Surface::Fl_EPS_File_Surface ( 
    int width,
    int height,
    FILE * eps_output,
    Fl_Color background = FL_WHITE,
    Fl_PostScript_Close_Command closef = NULL )
```

Constructor.

Parameters

<table>
<thead>
<tr>
<th>width,height</th>
<th>Width and height of the EPS drawing area</th>
</tr>
</thead>
<tbody>
<tr>
<td>eps_output</td>
<td>A writable FILE pointer where the Encapsulated PostScript data will be sent</td>
</tr>
<tr>
<td>background</td>
<td>Color expected to cover the background of the EPS drawing area. This parameter affects only the drawing of transparent <code>Fl_RGB_Image</code> objects: transparent areas of RGB images are blended with the background color. Under the X11 + pango platform, transparent RGB images are correctly blended to their background, thus this parameter has no effect.</td>
</tr>
<tr>
<td>closef</td>
<td>If not NULL, the destructor or <code>closef()</code> will call <code>closef(eps_output)</code> after all EPS data has been sent. If NULL, <code>fclose(eps_output)</code> is called instead. This allows to close the FILE pointer by, e.g., <code>pclose</code>, or, using a function such as &quot;int keep_open(FILE*) (return 0);&quot;, to keep it open after completion of all output to <code>eps_output</code>. Function <code>closef</code> should return non zero to indicate an error.</td>
</tr>
</tbody>
</table>

34.34.2.2 `~Fl_EPS_File_Surface()`

```cpp
Fl_EPS_File_Surface::~Fl_EPS_File_Surface ( )
```

Destructor.

By default, the destructor closes with function `fclose()` the underlying FILE. See the constructor for how to close it differently or to keep it open. Use `closef()` before object destruction to receive the status code of output operations. If `closef()` is not used and if EPS output results in error, the destructor displays an alert message with `fl_alert()`.
### 34.34.3 Member Function Documentation

#### 34.34.3.1 close()

```cpp
int Fl_EPS_File_Surface::close ( )
```
Completes all EPS output.
The only operation possible with the **Fl_EPS_File_Surface** object after calling `close()` is its destruction.

**Returns**
The status code of output operations to the FILE object. 0 indicates success.

#### 34.34.3.2 origin() [1/2]

```cpp
void Fl_EPS_File_Surface::origin ( 
    int * x,
    int * y ) [virtual]
```
Computes the coordinates of the current origin of graphics functions.

**Parameters**
- **out x,y** If non-null, *x* and *y* are set to the horizontal and vertical coordinates of the graphics origin.

Reimplemented from **Fl_Widget_Surface**.

#### 34.34.3.3 origin() [2/2]

```cpp
void Fl_EPS_File_Surface::origin ( 
    int x,
    int y ) [virtual]
```
Sets the position of the origin of graphics in the drawable part of the drawing surface.
Arguments should be expressed relatively to the result of a previous `printable_rect()` call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive `origin()` calls don’t combine their effects. `origin()` calls are not affected by `rotate()` calls (for classes derived from **Fl_Paged_Device**).

**Parameters**
- **in x,y** Horizontal and vertical positions in the drawing surface of the desired origin of graphics.

Reimplemented from **Fl_Widget_Surface**.

#### 34.34.3.4 printable_rect()

```cpp
int Fl_EPS_File_Surface::printable_rect ( 
    int * w,
    int * h ) [virtual]
```
Computes the width and height of the drawable area of the drawing surface.
Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to `origin()`. If the object is derived from class **Fl_Paged_Device**, values account for the user-selected paper type and print orientation and are changed by `scale()` calls.
Returns

0 if OK, non-zero if any error

Reimplemented from Fl_Widget_Surface.

### 34.34.3.5 translate()

```cpp
void Fl_EPS_File_Surface::translate (int x, int y) [virtual]
```

Translates the current graphics origin accounting for the current rotation. Each translate() call must be matched by an untranslate() call. Successive translate() calls add up their effects. Reimplemented from Fl_Widget_Surface.

### 34.34.3.6 untranslate()

```cpp
void Fl_EPS_File_Surface::untranslate (void ) [virtual]
```

Undoes the effect of a previous translate() call. Reimplemented from Fl_Widget_Surface.

The documentation for this class was generated from the following file:

- Fl_PostScript.H

### 34.35 Fl_File_Browser Class Reference

The Fl_File_Browser widget displays a list of filenames, optionally with file-specific icons.

```cpp
#include <Fl_File_Browser.H>
```

Inheritance diagram for Fl_File_Browser:

```
<table>
<thead>
<tr>
<th>Fl_Widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fl_Group</td>
</tr>
<tr>
<td>Fl_Browser_</td>
</tr>
<tr>
<td>Fl_Browser</td>
</tr>
<tr>
<td>Fl_File_Browser</td>
</tr>
</tbody>
</table>
```

#### Public Types

- enum {FILES, DIRECTORIES}

#### Public Member Functions

- const char * errmsg () const
  
  Returns OS error messages, or NULL if none.

- void errmsg (const char *emsg)
  
  Sets OS error message to a string, which can be NULL.

- int filetype () const
  
  Sets or gets the file browser type, FILES or DIRECTORIES.
34.35 Fl_File_Browser Class Reference

- void filetype (int t)
  Sets or gets the file browser type, FILES or DIRECTORIES.
- const char * filter () const
  Sets or gets the filename filter.
- void filter (const char *pattern)
  Sets or gets the filename filter.
- Fl_File_Browser (int, int, int, int, const char * = 0)
  The constructor creates the Fl_File_Browser widget at the specified position and size.
- uchar iconsize () const
  Sets or gets the size of the icons.
- void iconsize (uchar s)
  Sets or gets the size of the icons.
- int load (const char *directory, Fl_File_Sort_F *sort=fl_numericsort)
  Loads the specified directory into the browser.
- Fl_Fontsize textsize () const
- void textsize (Fl_Fontsize s)

Additional Inherited Members

34.35.1 Detailed Description

The Fl_File_Browser widget displays a list of filenames, optionally with file-specific icons.

34.35.2 Constructor & Destructor Documentation

34.35.2.1 Fl_File_Browser()

Fl_File_Browser::Fl_File_Browser (int X, int Y, int W, int H, const char * l = 0)

The constructor creates the Fl_File_Browser widget at the specified position and size.
The destructor destroys the widget and frees all memory that has been allocated.

34.35.3 Member Function Documentation

34.35.3.1 errmsg() [1/2]

const char * Fl_File_Browser::errmsg ( ) const [inline]
Returns OS error messages, or NULL if none.
Use when advised.

34.35.3.2 errmsg() [2/2]

void Fl_File_Browser::errmsg (const char * emsg )
Sets OS error message to a string, which can be NULL.
Frees previous if any. void errmsg(const char *emsg);
34.35.3.3 filetype() [1/2]

```cpp
int Fl_File_Browser::filetype () const [inline]
```
Sets or gets the file browser type, FILES or DIRECTORIES.
When set to FILES, both files and directories are shown. Otherwise only directories are shown.

34.35.3.4 filetype() [2/2]

```cpp
void Fl_File_Browser::filetype ( int t ) [inline]
```
Sets or gets the file browser type, FILES or DIRECTORIES.
When set to FILES, both files and directories are shown. Otherwise only directories are shown.

34.35.3.5 filter() [1/2]

```cpp
const char ∗ Fl_File_Browser::filter ( ) const [inline]
```
Sets or gets the filename filter.
The pattern matching uses the `fl_filename_match()` function in FLTK.

34.35.3.6 filter() [2/2]

```cpp
void Fl_File_Browser::filter ( const char ∗ pattern )
```
Sets or gets the filename filter.
The pattern matching uses the `fl_filename_match()` function in FLTK.

34.35.3.7 iconsize() [1/2]

```cpp
uchar Fl_File_Browser::iconsize ( ) const [inline]
```
Sets or gets the size of the icons.
The default size is 20 pixels.

34.35.3.8 iconsize() [2/2]

```cpp
void Fl_File_Browser::iconsize ( uchar s ) [inline]
```
Sets or gets the size of the icons.
The default size is 20 pixels.

34.35.3.9 load()

```cpp
int Fl_File_Browser::load ( const char ∗ directory,
                          Fl_File_Sort_F ∗ sort = fl_numericsort )
```
Loads the specified directory into the browser.
If icons have been loaded then the correct icon is associated with each file in the list.
If directory is "", all mount points (unix) or drive letters (Windows) are listed.
The sort argument specifies a sort function to be used with `fl_filename_list()`.
Return value is the number of filename entries, or 0 if none. On error, 0 is returned, and `errmsg()` has OS error string if non-NULL.
The documentation for this class was generated from the following files:

- Fl_File_Browser.H
- Fl_File_Browser.cxx

34.36 Fl_File_Chooser Class Reference

The Fl_File_Chooser widget displays a standard file selection dialog that supports various selection modes.
Public Types

- enum **Type** { SINGLE = 0 , MULTI = 1 , CREATE = 2 , DIRECTORY = 4 }

  Determines the type of file chooser presented to the user.

Public Member Functions

- **Fl_Widget** ∗ add extra (**Fl_Widget** ∗gr)
  
  Adds an extra widget at the bottom of the **Fl_File_Chooser** window.

- void **callback** (void (∗cb)(**Fl_File_Chooser** ∗, void ∗), void ∗d=0)
  
  Sets the file chooser callback cb and associated data d.

- **Fl_Color** **color** ()
  
  Gets the background color of the **Fl_File_Browser** list.

- void **color** (**Fl_Color** c)
  
  Sets the background color of the **Fl_File_Browser** list.

- int **count** ()
  
  Returns the number of selected files.

- char ∗ **directory** ()
  
  Gets the current directory.

- void **directory** (const char ∗d)
  
  Sets the current directory.

- const char ∗ **filter** ()
  
  Gets the current filename filter patterns.

- void **filter** (const char ∗p)
  
  Sets the current filename filter patterns.

- int **filter_value** ()
  
  Gets the current filename filter selection.

- void **filter_value** (int f)
  
  Sets the current filename filter selection.

- **Fl_File_Chooser** (const char ∗pathname, const char ∗pattern, int type_val, const char ∗title)
  
  The constructor creates the **Fl_File_Chooser** dialog shown.

- int **h** () const

- void **hide** ()
  
  Hides the **Fl_File_Chooser** window.

- uchar **iconsize** ()
  
  Gets the size of the icons in the **Fl_File_Browser**.

- void **iconsize** (uchar s)
  
  Sets the size of the icons in the **Fl_File_Browser**.

- const char ∗ **label** ()
  
  Gets the title bar text for the **Fl_File_Chooser**.

- void **label** (const char ∗l)
  
  Sets the title bar text for the **Fl_File_Chooser**.

- const char ∗ **ok_label** ()
  
  Gets the label for the "ok" button in the **Fl_File_Chooser**.

- void **ok_label** (const char ∗l)
  
  Sets the label for the "ok" button in the **Fl_File_Chooser**.

- void **position** (int x, int y)

- int **preview** () const
  
  Returns the current state of the preview box.

- void **preview** (int e)
  
  Enable or disable the preview tile.

- void **rescan** ()
Reloads the current directory in the Fl_File_Browser.

- **void rescan_keep_filename ()**
  Rescan the current directory without clearing the filename, then select the file if it is in the list.

- **void resize (int x, int y, int w, int h)**
  Shows the Fl_File_Chooser window.

- **int shown ()**
  Returns non-zero if the file chooser main window show() has been called, but not hide().

- **void size (int w, int h)**
  Gets the current Fl_File_Browser text color.

- **Fl_Color textcolor ()**
  Sets the current Fl_File_Browser text color.

- **Fl_Font texfont ()**
  Gets the current Fl_File_Browser text font.

- **void texfont (Fl_Font f)**
  Sets the current Fl_File_Browser text font.

- **Fl_Fontsize texsize ()**
  Gets the current Fl_File_Browser text size.

- **void texsize (Fl_Fontsize s)**
  Sets the current Fl_File_Browser text size.

- **int type ()**
  Gets the current type of Fl_File_Chooser.

- **void type (int t)**
  Sets the current type of Fl_File_Chooser.

- **void * user_data () const**
  Gets the file chooser user data.

- **void user_data (void *d)**
  Sets the file chooser user data d.

- **void value (const char *filename)**
  Gets the current value of the selected file.

- **const char * value (int f=1)**
  Gets the current value of the selected file(s).

- **int visible ()**
  Returns 1 if the Fl_File_Chooser window is visible.

- **int w () const**

- **int x () const**

- **int y () const**

- **~Fl_File_Chooser ()**
  Destroys the widget and frees all memory used by it.

### Public Attributes

- **Fl_Button *newButton**
  The "new directory" button is exported so that application developers can control the appearance and use.

- **Fl_Check_Button *previewButton**
  The "preview" button is exported so that application developers can control the appearance and use.

- **Fl_Check_Button *showHiddenButton**
  When checked, hidden files (i.e., filename begins with dot) are displayed.
Static Public Attributes

- static const char * add_favorites_label = "Add to Favorites"
  [standard text may be customized at run-time]
- static const char * all_files_label = "All Files (*)"
  [standard text may be customized at run-time]
- static const char * custom_filter_label = "Custom Filter"
  [standard text may be customized at run-time]
- static const char * existing_file_label = "Please choose an existing file!"
  [standard text may be customized at run-time]
- static const char * favorites_label = "Favorites"
  [standard text may be customized at run-time]
- static const char * filename_label = "Filename:"
  [standard text may be customized at run-time]
- static const char * filesystems_label = Fl::system_driver()->filesystems_label()
  [standard text may be customized at run-time]
- static const char * hidden_label = "Show hidden files"
  [standard text may be customized at run-time]
- static const char * manageFavorites_label = "Manage Favorites"
  [standard text may be customized at run-time]
- static const char * new_directory_label = "New Directory?"
  [standard text may be customized at run-time]
- static const char * new_directory_tooltip = "Create a new directory."
  [standard text may be customized at run-time]
- static const char * preview_label = "Preview"
  [standard text may be customized at run-time]
- static const char * save_label = "Save"
  [standard text may be customized at run-time]
- static const char * show_label = "Show:"
  [standard text may be customized at run-time]
- static Fl_File_Sort_F * sort = fl_numericsort
  the sort function that is used when loading the contents of a directory.

Protected Member Functions

- void show_error_box (int val)
  Show error box if val=1, hide if val=0.

Related Functions

(Note that these are not member functions.)

- char * fl_dir_chooser (const char *message, const char *fname, int relative)
  Shows a file chooser dialog and gets a directory.
- char * fl_file_chooser (const char *message, const char *pat, const char *fname, int relative)
  Shows a file chooser dialog and gets a filename.
- void fl_file_chooser_callback (void(*)(const char *))
  Set the file chooser callback.
- void fl_file_chooser_ok_label (const char *l)
  Set the "OK" button label.

Generated by Doxygen
34.36.1 Detailed Description

The Fl_File_Chooser widget displays a standard file selection dialog that supports various selection modes.

![Fl_File_Chooser Test](image)

**Figure 34.16 Fl_File_Chooser**

Features include:

- Multiple filter patterns can be specified, with parenthesis around filters, and tabs to separate each pattern, e.g.:
  ```c
  char pattern[] = "Image Files (*.bmp,*.gif,*.jpg,*.png,*.xbm,*.xpm)\t"
  "Web Files (*.htm,*.html,*.php)\t"
  "All Files (*)";
  ```

- If no "*" pattern is provided, then an entry for "All Files (*)" is automatically added.

- An optional file preview box is provided which can be toggled by programmer or user showing images, or the first 2048 bytes of printable text.

- Preview image loading functions can be registered to provide custom file previews.

- The favorites button shows up to 100 user-saved favorite directories, the user's home directory, and a filesystem item.

- A simple dialog is provided for managing saved directories.

- Shortcut keys are provided:

<table>
<thead>
<tr>
<th>Shortcut</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt+a</td>
<td>Adds a directory to the favorites list</td>
</tr>
<tr>
<td>Alt+m</td>
<td>Manages the favorites list</td>
</tr>
<tr>
<td>Alt+f</td>
<td>Shows the filesystem list</td>
</tr>
<tr>
<td>Alt+h</td>
<td>Go to the home directory</td>
</tr>
<tr>
<td>Alt+0..9</td>
<td>going to any of the first 10 favorites</td>
</tr>
</tbody>
</table>

Generated by Doxygen
The Fl_File_Chooser widget transmits UTF-8 encoded filenames to its user. It is recommended to open files that may have non-ASCII names with the fl_fopen() or fl_open() utility functions that handle these names in a cross-platform way (whereas the standard fopen()/open() functions fail on the Windows platform to open files with a non-ASCII name).

The Fl_File_Chooser class also exports several static values that may be used to localize or customize the appearance of all file chooser dialogs:

<table>
<thead>
<tr>
<th>Member</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>add_favorites_label</td>
<td>&quot;Add to Favorites&quot;</td>
</tr>
<tr>
<td>all_files_label</td>
<td>&quot;All Files (*)&quot;</td>
</tr>
<tr>
<td>custom_filter_label</td>
<td>&quot;Custom Filter&quot;</td>
</tr>
<tr>
<td>existing_file_label</td>
<td>&quot;Please choose an existing file!&quot;</td>
</tr>
<tr>
<td>favorites_label</td>
<td>&quot;Favorites&quot;</td>
</tr>
<tr>
<td>filename_label</td>
<td>&quot;Filename:&quot;</td>
</tr>
<tr>
<td>filesystems_label</td>
<td>&quot;My Computer&quot; (Windows) &quot;File Systems&quot; (all others)</td>
</tr>
<tr>
<td>hidden_label</td>
<td>&quot;Show hidden files:&quot;</td>
</tr>
<tr>
<td>manage_favorites_label</td>
<td>&quot;Manage Favorites&quot;</td>
</tr>
<tr>
<td>new_directory_label</td>
<td>&quot;New Directory?&quot;</td>
</tr>
<tr>
<td>new_directory_tooltip</td>
<td>&quot;Create a new directory.&quot;</td>
</tr>
<tr>
<td>preview_label</td>
<td>&quot;Preview&quot;</td>
</tr>
<tr>
<td>save_label</td>
<td>&quot;Save&quot;</td>
</tr>
<tr>
<td>show_label</td>
<td>&quot;Show:&quot;</td>
</tr>
<tr>
<td>sort</td>
<td>fl_numericsort</td>
</tr>
</tbody>
</table>

The Fl_File_Chooser::sort member specifies the sort function that is used when loading the contents of a directory and can be customized at run-time.

The Fl_File_Chooser class also exports the Fl_File_Chooser::newButton and Fl_File_Chooser::previewButton widgets so that application developers can control their appearance and use.

### 34.36.2 Member Enumeration Documentation

#### 34.36.2.1 Type

**enum Fl_File_Chooser::Type**

Determines the type of file chooser presented to the user.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE</td>
<td>Select a single, existing file.</td>
</tr>
<tr>
<td>MULTI</td>
<td>Select one or more existing files.</td>
</tr>
<tr>
<td>CREATE</td>
<td>When used alone, select a single, existing file or specify a new filename.</td>
</tr>
<tr>
<td></td>
<td>Can be combined with DIRECTORY (e.g. CREATE</td>
</tr>
<tr>
<td>DIRECTORY</td>
<td>Select a single, existing directory. Can be combined with CREATE.</td>
</tr>
</tbody>
</table>
34.36.3 Constructor & Destructor Documentation

34.36.3.1 Fl_File_Chooser()

Fl_File_Chooser::Fl_File_Chooser (  
    const char * pathname,  
    const char * pattern,  
    int type_val,  
    const char * title )

The constructor creates the Fl_File_Chooser dialog shown.

- The `pathname` argument can be a directory name or a complete file name (in which case the corresponding file is highlighted in the list and in the filename input field.)

- The `pattern` argument can be a NULL string or "*" to list all files, or it can be a series of descriptions and filter strings separated by tab characters (\t). The format of filters is either "Description text (patterns)" or just "patterns". A file chooser that provides filters for HTML and image files might look like: "HTML Files (*.html)
\tImage Files (*.bmp,gif,jpg,png)"

  The file chooser will automatically add the "All Files (*)" pattern to the end of the string you pass if you do not provide one. The first filter in the string is the default filter. See the FLTK documentation on fl_filename_match() for the kinds of pattern strings that are supported.

- The `type_val` argument can be one of the Fl_File_Chooser::Type values.

- The `title` argument is used to set the title bar text for the Fl_File_Chooser window.

34.36.4 Member Function Documentation

34.36.4.1 add_extra()

Fl_Widget * Fl_File_Chooser::add_extra (  
    Fl_Widget * extra )

Adds an extra widget at the bottom of the Fl_File_Chooser window.
You can use any Fl_Widget or Fl_Group. If you use an Fl_Group, set its (x, y) coordinates to (0, 0) and position its children relative to (0, 0) inside the Fl_Group container widget. Make sure that all child widgets of the Fl_Group are entirely included inside the bounding box of their parents, i.e. the Fl_Group widget, and the Fl_File_Chooser window, respectively.

Note
The width of the Fl_File_Chooser window is an undocumented implementation detail and may change in the future.

If `extra` is NULL any previous extra widget is removed.

Parameters

| in  | extra | Custom widget or group to be added to the Fl_File_Chooser window. |

Returns
Pointer to previous extra widget or NULL if not set previously.

Note
Fl_File_Chooser does not delete the extra widget in its destructor! The extra widget is removed from the Fl_File_Chooser window before the Fl_File_Chooser widget gets destroyed. To prevent memory leakage, don't forget to delete unused extra widgets.
34.36.2 filter()

```cpp
void Fl_File_Chooser::filter (
    const char * p )
```

Sets the current filename filter patterns.
The filter patterns use `fl_filename_match()`. Multiple patterns can be used by separating them with tabs, like "".jpg\*.png\*.gif\t"". In addition, you can provide human-readable labels with the patterns inside parenthesis, like "JPEG Files (\*.jpg)\tPNG Files (\*.png)\tGIF Files (\*.gif)\tAll Files (\*)".

Use filter(NULL) to show all files.

34.36.4.3 iconsize() [1/2]

```cpp
uchar Fl_File_Chooser::iconsize ( )
```

Gets the size of the icons in the Fl_File_Browser.
By default the icon size is set to 1.5 times the `textsize()`.

34.36.4.4 iconsize() [2/2]

```cpp
void Fl_File_Chooser::iconsize ( 
    uchar s )
```

Sets the size of the icons in the Fl_File_Browser.
By default the icon size is set to 1.5 times the `textsize()`.

34.36.4.5 preview()

```cpp
void Fl_File_Chooser::preview ( 
    int e )
```

Enable or disable the preview tile.
1 = enable preview, 0 = disable preview.

34.36.4.6 shown()

```cpp
int Fl_File_Chooser::shown ( )
```

Returns non-zero if the file chooser main window `show()` has been called, but not `hide()`.

See also

Fl_Window::shown()

34.36.4.7 value()

```cpp
const char * Fl_File_Chooser::value ( 
    int f = 1 )
```

Gets the current value of the selected file(s).
f is a 1-based index into a list of file names. The number of selected files is returned by `Fl_File_Chooser::count()`.

This sample code loops through all selected files:

```cpp
// Get list of filenames user selected from a MULTI chooser
for ( int t=1; t<chooser->count(); t++ ) {
    const char *filename = chooser->value(t);
    ...
}
```

34.36.5 Member Data Documentation
34.36.5.1 showHiddenButton

`Fl_File_Chooser::showHiddenButton`
When checked, hidden files (i.e., filename begins with dot) are displayed.
The "showHiddenButton" button is exported so that application developers can control its appearance.
The documentation for this class was generated from the following files:

- `Fl_File_Chooser.H`
- `Fl_File_Chooser.cxx`
- `Fl_File_Chooser2.cxx`
- `fl_file_dir.cxx`

34.37 Fl_File_Icon Class Reference

The `Fl_File_Icon` class manages icon images that can be used as labels in other widgets and as icons in the FileBrowser widget.

```cpp
#include <Fl_File_Icon.H>
```

Public Types

- `enum {
  ANY, PLAIN, FIFO, DEVICE,
  LINK, DIRECTORY
}`
- `enum {
  END, COLOR, LINE, CLOSEDLINE,
  POLYGON, OUTLINEPOLYGON, VERTEX
}`

Public Member Functions

- `short * add (short d)`
  Adds a keyword value to the icon array, returning a pointer to it.
- `short * add_color (Fl_Color c)`
  Adds a color value to the icon array, returning a pointer to it.
- `short * add_vertex (float x, float y)`
  Adds a vertex value to the icon array, returning a pointer to it.
- `short * add_vertex (int x, int y)`
  Adds a vertex value to the icon array, returning a pointer to it.
- `void clear ()`
  Clears all icon data from the icon.
- `void draw (int x, int y, int w, int h, Fl_Color ic, int active=1)`
  Draws an icon in the indicated area.
- `Fl_File_Icon (const char *p, int t, int nd=0, short *d=0)`
  Creates a new `Fl_File_Icon` with the specified information.
- `void label (Fl_Widget *w)`
  Applies the icon to the widget, registering the `Fl_File_Icon` label type as needed.
- `void load (const char *f)`
  Loads the specified icon image.
- `int load_fti (const char *fti)`
  Loads an SGI icon file.
- `int load_image (const char *i)`
  Load an image icon file from an image filename.
- `Fl_File_Icon * next ()`
  Returns next file icon object.
- `const char * pattern ()`
Returns the filename matching pattern for the icon.

- **int size()**
  Returns the number of words of data used by the icon.

- **int type()**
  Returns the filetype associated with the icon, which can be one of the following:

- **short * value()**
  Returns the data array for the icon.

- **~Fl_File_Icon()**
  The destructor destroys the icon and frees all memory that has been allocated for it.

### Static Public Member Functions

- **static Fl_File_Icon * find (const char *filename, int filetype=ANY)**
  Finds an icon that matches the given filename and file type.

- **static Fl_File_Icon * first ()**
  Returns a pointer to the first icon in the list.

- **static void labeltype (const Fl_Label *o, int x, int y, int w, int h, Fl_Align a)**
  Draw the icon label.

- **static void load_system_icons (void)**
  Loads all system-defined icons.

### 34.37.1 Detailed Description

The Fl_File_Icon class manages icon images that can be used as labels in other widgets and as icons in the FileBrowser widget.

### 34.37.2 Constructor & Destructor Documentation

#### 34.37.2.1 Fl_File_Icon()

```cpp
Fl_File_Icon::Fl_File_Icon (const char * p, int t, int nd = 0, short * d = 0 )
```

Creates a new Fl_File_Icon with the specified information.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>p</th>
<th>filename pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>t</td>
<td>file type</td>
</tr>
<tr>
<td>in</td>
<td>nd</td>
<td>number of data values</td>
</tr>
<tr>
<td>in</td>
<td>d</td>
<td>data values</td>
</tr>
</tbody>
</table>

### 34.37.3 Member Function Documentation

#### 34.37.3.1 add()

```cpp
short * Fl_File_Icon::add (short d)
```
Adds a keyword value to the icon array, returning a pointer to it.

Parameters

\begin{verbatim}
in d data value
\end{verbatim}

34.37.3.2 add_color()

\begin{verbatim}
short * Fl_File_Icon::add_color ( Fl_Color c ) [inline]
\end{verbatim}
Adds a color value to the icon array, returning a pointer to it.

Parameters

\begin{verbatim}
in c color value
\end{verbatim}

34.37.3.3 add_vertex() [1/2]

\begin{verbatim}
short * Fl_File_Icon::add_vertex ( float x, float y ) [inline]
\end{verbatim}
Adds a vertex value to the icon array, returning a pointer to it.
The floating point version goes from 0.0 to 1.0. The origin (0.0) is in the lower-lefthand corner of the icon.

Parameters

\begin{verbatim}
in x,y vertex coordinates
\end{verbatim}

34.37.3.4 add_vertex() [2/2]

\begin{verbatim}
short * Fl_File_Icon::add_vertex ( int x, int y ) [inline]
\end{verbatim}
Adds a vertex value to the icon array, returning a pointer to it.
The integer version accepts coordinates from 0 to 10000. The origin (0.0) is in the lower-lefthand corner of the icon.

Parameters

\begin{verbatim}
in x,y vertex coordinates
\end{verbatim}

34.37.3.5 draw()

\begin{verbatim}
void Fl_File_Icon::draw ( int x, int y, int w, int h, Fl_Color ic, int active = 1 )
\end{verbatim}
Draws an icon in the indicated area.
34.37.3.6 find()

Fli_File_Icon * Fli_File_Icon::find (  
const char * filename,  
int filetype = ANY) [static]

Finds an icon that matches the given filename and file type.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>filename</th>
<th>name of file</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>filetype</td>
<td>enumerated file type</td>
</tr>
</tbody>
</table>

Returns

matching file icon or NULL

34.37.3.7 label()

void Fli_File_Icon::label (  
Fli_Widget * w )

Applies the icon to the widget, registering the Fli_File_Icon label type as needed.

Parameters

| in      | w         | widget for which this icon will become the label |

34.37.3.8 labeltype()

void Fli_File_Icon::labeltype (  
const Fli_Label * o,  
int x,  
int y,  
int w,  
int h,  
Fli_Align a ) [static]

Draw the icon label.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>o</th>
<th>label data</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x,y,w,h</td>
<td>position and size of label</td>
</tr>
<tr>
<td>in</td>
<td>a</td>
<td>label alignment [not used]</td>
</tr>
</tbody>
</table>
34.37.3.9  load()

void Fl_File_Icon::load (  
                      const char ∗ f )

Loads the specified icon image.  
The format is deduced from the filename.

Parameters

  in  f  filename

34.37.3.10  load_fti()

int Fl_File_Icon::load_fti (  
                      const char ∗ fti )

Loads an SGI icon file.

Parameters

  in  fti  icon filename

Returns

  0 on success, non-zero on error

34.37.3.11  load_image()

int Fl_File_Icon::load_image (  
                       const char ∗ ifile )

Load an image icon file from an image filename.

Parameters

  in  ifile  image filename

Returns

  0 on success, non-zero on error

34.37.3.12  load_system_icons()

void Fl_File_Icon::load_system_icons (  
                       void ) [static]

Loads all system-defined icons.  
This call is useful when using the FileChooser widget and should be used when the application starts:  
Fl_File_Icon::load_system_icons();

34.37.3.13  next()

Fl_File_Icon ∗ Fl_File_Icon::next ( ) [inline]

Returns next file icon object.  
See Fl_File_Icon::first()
34.37.3.14 type()

```
int Fl_File_Icon::type ( ) [inline]
```

Returns the filetype associated with the icon, which can be one of the following:

- `FL_FILE_ICON::ANY`, any kind of file.
- `FL_FILE_ICON::PLAIN`, plain files.
- `FL_FILE_ICON::FIFO`, named pipes.
- `FL_FILE_ICON::DEVICE`, character and block devices.
- `FL_FILE_ICON::LINK`, symbolic links.
- `FL_FILE_ICON::DIRECTORY`, directories.

The documentation for this class was generated from the following files:

- `FL_File_Icon.H`
- `FL_File_Icon.cxx`
- `FL_File_Icon2.cxx`

### 34.38 FL_File_Input Class Reference

This widget displays a pathname in a text input field.

```
#include <FL/File_Input.H>
```

Inheritance diagram for `FL_File_Input`:

```
Fl_Widget
   ↓
Fl_Input
   ↓
Fl_Input_
   ↓
FL_File_Input
```

**Public Member Functions**

- `FL_Widget` **down_box ( ) const**
  
  *Gets the box type used for the navigation bar.*

- `void down_box (FL_Boxtype b)`
  
  *Sets the box type to use for the navigation bar.*

- `FL_Color` **errorcolor ( ) const**
  
  *Gets the current error color.*

- `void errorcolor (FL_Color c)`
  
  *Sets the current error color to c.*

- `FL_File_Input` **(int X, int Y, int W, int H, const char *L=0)**
  
  *Creates a new FL_File_Input widget using the given position, size, and label string.*

- `int handle (int event) FL_OVERRIDE`
  
  *Handle events in the widget.*

- `const char * value ( )`
  
  *Returns the current value, which is a pointer to an internal buffer and is valid only until the next event is handled.*

- `int value (const char *str)`
  
  *Sets the value of the widget given a new string value.*

- `int value (const char *str, int len)`
  
  *Sets the value of the widget given a new string value and its length.*
Protected Member Functions

- void draw() FL_OVERRIDE
  Draws the file input widget.

Additional Inherited Members

34.38.1 Detailed Description

This widget displays a pathname in a text input field. A navigation bar located above the input field allows the user to navigate upward in the directory tree. You may want to handle FL_WHEN_CHANGED events for tracking text changes and also FL_WHEN_RELEASE for button release when changing to parent dir. FL_WHEN_RELEASE callback won't be called if the directory clicked is the same as the current one.

![Figure 34.17 Fl_File_Input](image)

Note

As all Fl_Input derived objects, Fl_File_Input may call its callback when losing focus (see FL_UNFOCUS) to update its state like its cursor shape. One resulting side effect is that you should call clear_changed() early in your callback to avoid reentrant calls if you plan to show another window or dialog box in the callback.

34.38.2 Constructor & Destructor Documentation

34.38.2.1 Fl_File_Input()

```cpp
Fl_File_Input::Fl_File_Input (int X, int Y, int W, int H, const char * L = 0)
```

Creates a new Fl_File_Input widget using the given position, size, and label string. The default boxtype is FL_DOWN_BOX.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X, Y, W, H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

34.38.3 Member Function Documentation

34.38.3.1 down_box()

```cpp
void Fl_File_Input::down_box (Fl_Boxtype b ) [inline]
```

Sets the box type to use for the navigation bar.
### draw()

```cpp
def draw()
    void Fl_File_Input::draw (  
        void ) [protected], [virtual]
```

Draws the file input widget.
Implements Fl_Widget.

### errorcolor [1/2]

```cpp
Fl_Color Fl_File_Input::errorcolor ( ) const [inline]
```

Gets the current error color.
Returns FL_RED since FLTK 1.4.0 (default in 1.3.x). Retained for backwards compatibility.

**Deprecated** Will be removed in FLTK 1.5.0 or higher.

**Todo** Remove Fl_File_Input::errorcolor() in FLTK 1.5.0 or higher.

### errorcolor [2/2]

```cpp
void Fl_File_Input::errorcolor (  
    Fl_Color c ) [inline]
```

Sets the current error color to c.
Does nothing since FLTK 1.4.0. Retained for backwards compatibility.

**Deprecated** Will be removed in FLTK 1.5.0 or higher.

**Todo** Remove Fl_File_Input::errorcolor(Fl_Color) in FLTK 1.5.0 or higher.

### handle()

```cpp
int Fl_File_Input::handle (  
    int event ) [virtual]
```

Handle events in the widget.
Return non zero if event is handled.

Parameters

- **in** event

Reimplemented from Fl_Widget.

### value [1/2]

```cpp
int Fl_File_Input::value (  
    const char * str )
```

Sets the value of the widget given a new string value.
Returns non 0 on success.

Parameters

- **in** str new string value
34.38.3.7 value() [2/2]

```c
int Fl_File_Input::value (const char * str, int len)
```

Sets the value of the widget given a new string value and its length. Returns non 0 on success.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>str</td>
<td>new string value</td>
</tr>
<tr>
<td>len</td>
<td>length of value</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_File_Input.H
- Fl_File_Input.cxx

### 34.39 Fl_Fill_Dial Class Reference

Draws a dial with a filled arc.

```c
#include <Fl_Fill_Dial.H>
```

Inheritance diagram for Fl_Fill_Dial:

```
FL_Widget
   FL_Valuator
      FL_Dial
         FL_Fill_Dial
```

#### Public Member Functions

- `Fl_Fill_Dial` (int X, int Y, int W, int H, const char *L)
  
  *Creates a filled dial, also setting its type to FL_FILL_DIAL.*

#### Additional Inherited Members

### 34.39.1 Detailed Description

Draws a dial with a filled arc.

The documentation for this class was generated from the following files:

- Fl_Fill_Dial.H
- Fl_Fill_Dial.cxx

### 34.40 Fl_Fill_Slider Class Reference

Widget that draws a filled horizontal slider, useful as a progress or value meter.

```c
#include <Fl_Fill_Slider.H>
```

Inheritance diagram for Fl_Fill_Slider:

```
FL_Widget
   FL_Valuator
      FL_Dial
         FL_Fill_Slider
```
Public Member Functions

- **Fl_Fill_Slider** (int X, int Y, int W, int H, const char *L=0)
  
  Creates the slider from its position, size and optional title.

Additional Inherited Members

34.40.1 Detailed Description

Widget that draws a filled horizontal slider, useful as a progress or value meter.
The documentation for this class was generated from the following files:

- Fl_Fill_Slider.H
- Fl_Slider.cxx

34.41 Fl_Flex Class Reference

Fl_Flex is a container (layout) widget for one row or one column of widgets.

```
#include <Fl_Flex.H>
```

Inheritance diagram for Fl_Flex:

```
Fl_Widget
  ↓
Fl_Group
  ↓
Fl_Flex
```

Public Types

- enum { VERTICAL = 0, HORIZONTAL = 1, COLUMN = 0, ROW = 1 }

Public Member Functions

- virtual void end ()
  
  Ends automatic child addition and resizes all children.

- void fixed (Fl_Widget &w, int size)
  
  Set the horizontal or vertical size of a child widget.

- int fixed (Fl_Widget *w) const
  
  Return whether the given widget has a fixed size or resizes dynamically.

- void fixed (Fl_Widget *w, int size)
  
  Set the horizontal or vertical size of a child widget.

- Fl_Flex (int direction)
Construct a new `Fl_Flex` widget specifying its layout.

- `Fl_Flex (int w, int h, int direction)`
  Construct a new `Fl_Flex` widget specifying its layout and size.
- `Fl_Flex (int X, int Y, int W, int H, const char ∗L=0)`
  Construct a new `Fl_Flex` widget with the given position, size, and label.
- `Fl_Flex (int x, int y, int w, int h, int direction)`
  Construct a new `Fl_Flex` widget specifying its layout, position, and size.

- `int gap () const`
  Return the gap size of the widget.

- `void gap (int g)`
  Set the gap size of the widget.

- `int horizontal () const`
  Returns non-zero (true) if `Fl_Flex` alignment is horizontal (row mode).

- `void layout ()`
  Calculates the layout of the widget and redraws it.

- `int margin () const`
  Returns the left margin size of the widget.

- `int margin (int ∗left, int ∗top, int ∗right, int ∗bottom) const`
  Returns all (four) margin sizes of the widget.

- `void margin (int left, int top, int right, int bottom)`
  Set the margin sizes at all four edges of the `Fl_Flex` widget.

- `void margin (int m, int g=-1)`
  Set the margin and optionally the gap size of the widget.

- `bool need_layout () const`
  Returns whether layout calculation is required.

- `void need_layout (int set)`
  Set or reset the request to calculate the layout of children.

- `void resize (int x, int y, int w, int h) FL_OVERRIDE`
  Resize the container and calculate all child positions and sizes.

- `int spacing () const`
  Gets the number of extra pixels of blank space that are added between the children.

- `void spacing (int i)`
  Sets the number of extra pixels of blank space that are added between the children.

Protected Member Functions

- `virtual int alloc_size (int size) const`
  Return new size to be allocated for array of fixed size widgets.

- `void draw () FL_OVERRIDE`
  Draw the widget.

- `void init (int t=VERTICAL)`

- `void on_remove (int) FL_OVERRIDE`
  Allow derived groups to act when a child widget is removed from the group.
Additional Inherited Members

34.41.1 Detailed Description

**Fl_Flex** is a container (layout) widget for one row or one column of widgets. It provides flexible positioning of its children either in one row or in one column. **Fl_Flex** is designed to be as simple as possible. You can set individual widget sizes or let **Fl_Flex** position and size the widgets to fit in the container. All “flexible” (i.e. non-fixed size) widgets are assigned the same width or height, respectively. For details see below.

You can set the margins around all children at the inner side of the box frame (if any). **Fl_Flex** supports setting different margin sizes on top, bottom, left, and right sides. The default margin size is 0 on all edges of the container. You can set the gap size between all children. The gap size is always the same between all of its children. This is similar to the ‘spacing’ of **Fl_Pack**. The default gap size is 0.

**Fl_Flex** can either consist of a single row, i.e. type (**Fl_Flex::HORIZONTAL**) or a single column, i.e. type (**Fl_Flex::VERTICAL**). The default value is **Fl_Flex::VERTICAL** for consistency with **Fl_Pack** but you can use type() to assign a row (**Fl_Flex::HORIZONTAL**) layout.

If type() == **Fl_Flex::HORIZONTAL** widgets are resized horizontally to fit in the container and their height is the full **Fl_Flex** height minus border size and margins. You can set a fixed widget width by using fixed().

If type() == **Fl_Flex::VERTICAL** widgets are resized vertically to fit in the container and their width is the full **Fl_Flex** width minus border size and margins. You can set a fixed widget height by using fixed().

To create arbitrary spacing you can use invisible boxes of flexible or fixed sizes (see example below). Alternate constructors let you specify the layout as **Fl_Flex::HORIZONTAL** or **Fl_Flex::VERTICAL** directly.

**Fl_Flex::ROW** is an alias of **Fl_Flex::HORIZONTAL** and **Fl_Flex::COLUMN** is an alias of **Fl_Flex::VERTICAL**. The default box type is **FL_NO_BOX** as inherited from **Fl_Group**. You may need to set a box type with a solid background depending on your layout.

**Important:** You should always make sure that the **Fl_Flex** container cannot be resized smaller than its designed minimal size. This can usually be done by setting a size_range() on the window as shown in the example below. **Fl_Flex** does not take care of sensible sizes. If it is resized too small the behavior is undefined, i.e. widgets may overlap and/or shrink to zero size.

**Hint:** In many cases **Fl_Flex** can be used as a drop-in replacement for **Fl_Pack**. This is the recommended single row/column container since FLTK 1.4.0. Its resizing behavior is much more predictable (as expected) than that of **Fl_Pack** which "resizes itself to shrink-wrap itself around all of the children".

**Fl_Flex** containers can be nested so you can create flexible layouts with multiple columns and rows. However, if your UI design is more complex you may want to use **Fl_Grid** instead.

Example:

```c
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Flex.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Button.H>

int main(int argc, char **argv) {
    Fl_Double_Window window(410, 40, "Simple Fl_Flex Demo");
    Fl_Flex flex(5, 5, 400, 30, Fl_Flex::HORIZONTAL);
    Fl_Button b1(0, 0, 0, 0, "File");
    Fl_Button b2(0, 0, 0, 0, "Save");
    Fl_Box bx(0, 0, 0, 0);
    Fl_Button b3(0, 0, 0, 0, "Exit");
    flex.fixed(bx, 60); // set fix width of invisible box
    flex.gap(10);
    flex.end();
    window.resizable(flex);
    window.end();
    window.size_range(300, 30);
    window.show(argc, argv);
    return Fl::run();
}
```

Figure 34.18 Fl_Flex
Since 1.4.0

34.41.2 Member Enumeration Documentation

34.41.2.1 anonymous enum

anonymous enum

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTICAL</td>
<td>vertical layout (one column)</td>
</tr>
<tr>
<td>HORIZONTAL</td>
<td>horizontal layout (one row)</td>
</tr>
<tr>
<td>COLUMN</td>
<td>alias for VERTICAL</td>
</tr>
<tr>
<td>ROW</td>
<td>alias for HORIZONTAL</td>
</tr>
</tbody>
</table>

34.41.3 Constructor & Destructor Documentation

34.41.3.1 Fl_Flex() [1/4]

Fl_Flex::Fl_Flex (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0  
)  
Construct a new Fl_Flex widget with the given position, size, and label.  
You can set type(Fl_Flex::HORIZONTAL) or type(Fl_Flex::VERTICAL). The default is type(-
Fl_Flex::VERTICAL).  
Alternate constructors let you specify the layout as Fl_Flex::HORIZONTAL or Fl_Flex::VERTICAL directly.  
Fl_Flex::ROW is an alias of Fl_Flex::HORIZONTAL and Fl_Flex::COLUMN is an alias of Fl_Flex::VERTICAL.

Parameters

<table>
<thead>
<tr>
<th>in X,Y</th>
<th>position</th>
</tr>
</thead>
<tbody>
<tr>
<td>in W,H</td>
<td>size (width and height)</td>
</tr>
<tr>
<td>in L</td>
<td>label (optional)</td>
</tr>
</tbody>
</table>

See also

Fl_Flex::Fl_Flex(int direction)
Fl_Flex::Fl_Flex(int w, int h, int direction)
Fl_Flex::Fl_Flex(int x, int y, int w, int h, int direction)
Fl_Flex::Fl_Flex(int x, int y, int w, int h, const char *L)

34.41.3.2 Fl_Flex() [2/4]

Fl_Flex::Fl_Flex (  
    int direction  
)  
Construct a new Fl_Flex widget specifying its layout.
Use `Fl_Flex::HORIZONTAL` (aka `Fl_Flex::ROW`) or `Fl_Flex::VERTICAL` (aka `Fl_Flex::COLUMN`) as the direction argument.
This constructor sets the position and size to (0, 0, 0, 0) which is suitable for nested `Fl_Flex` widgets. Use one of the other constructors to set the desired position and size as well.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>direction</th>
<th>horizontal (row) or vertical (column) layout</th>
</tr>
</thead>
</table>

See also

`Fl_Flex::Fl_Flex(int w, int h, int direction)`
`Fl_Flex::Fl_Flex(int x, int y, int w, int h, int direction)`
`Fl_Flex::Fl_Flex(int x, int y, int w, int h, const char *L)`

### 34.41.3.3 `Fl_Flex()` [3/4]

```cpp
Fl_Flex::Fl_Flex(const char *L, int w, int h, int direction );
```

Construct a new `Fl_Flex` widget specifying its layout and size.
Use `Fl_Flex::HORIZONTAL` (aka `Fl_Flex::ROW`) or `Fl_Flex::VERTICAL` (aka `Fl_Flex::COLUMN`) as the direction argument.
This constructor sets the position to (x = 0, y = 0) which is suitable for nested `Fl_Flex` widgets. Use one of the other constructors to set the desired position as well.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>w,h</th>
<th>widget size</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>direction</td>
<td>horizontal (row) or vertical (column) layout</td>
</tr>
</tbody>
</table>

See also

`Fl_Flex::Fl_Flex(int direction)`
`Fl_Flex::Fl_Flex(int x, int y, int w, int h, int direction)`
`Fl_Flex::Fl_Flex(int x, int y, int w, int h, const char *L)`

### 34.41.3.4 `Fl_Flex()` [4/4]

```cpp
Fl_Flex::Fl_Flex(const char *L, int x, int y, int w, int h, int direction );
```

Construct a new `Fl_Flex` widget specifying its layout, position, and size.
Use `Fl_Flex::HORIZONTAL` (aka `Fl_Flex::ROW`) or `Fl_Flex::VERTICAL` (aka `Fl_Flex::COLUMN`) as the direction argument.
This constructor sets the position and size of the widget which is suitable for top level `Fl_Flex` widgets but does not set a widget label. Use `Fl_Widget::label()` to set one if desired.
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>x,y</th>
<th>widget position</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>w,h</td>
<td>widget size</td>
</tr>
<tr>
<td>in</td>
<td>direction</td>
<td>horizontal (row) or vertical (column) layout</td>
</tr>
</tbody>
</table>

See also

- `Fl_Flex::Fl_Flex(int direction)`
- `Fl_Flex::Fl_Flex(int w, int h, int direction)`
- `Fl_Flex::Fl_Flex(int x, int y, int w, int h, const char *L)`

34.41.4 Member Function Documentation

34.41.4.1 alloc_size()

```cpp
int Fl_Flex::alloc_size (int size) const [protected], [virtual]
```

Return new size to be allocated for array of fixed size widgets. This method is called when the array of fixed size widgets needs to be expanded. The current `size` is provided (size can be 0). The default method adds 8 to the current size. This can be used in derived classes to change the allocation strategy. Note that this method only queries the new size which shall be allocated but does not allocate the memory.

Parameters

| in  | size | current size |

Returns

- `int new size (to be allocated)`

34.41.4.2 draw()

```cpp
void Fl_Flex::draw (void) [protected], [virtual]
```

Draw the widget. This will finally calculate the layout of the widget and of all its children if necessary and draw the widget. Some changes of included children may require a new layout to be calculated. If this is the case the user may need to call `layout()` to make sure everything is calculated properly.

See also

- `layout()`

Implements `Fl_Widget`.

34.41.4.3 end()

```cpp
void Fl_Flex::end () [virtual]
```

Ends automatic child addition and resizes all children. This marks the `Fl_Flex` widget as changed (need_layout(1)) which forces the widget to calculate its layout depending on all children and whether they have been assigned fix sizes or not right before it is drawn.
### 34.41.4.4 fixed() [1/3]

```cpp
void Fl_Flex::fixed (Fl_Widget & w, int size) [inline]
```

Set the horizontal or vertical size of a child widget.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>w</th>
<th>widget to be affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>size</td>
<td>width (Fl_Flex::HORIZONTAL) or height (Fl_Flex::VERTICAL)</td>
</tr>
</tbody>
</table>

See also

```cpp
fixed(Fl_Widget *w, int size)
```

### 34.41.4.5 fixed() [2/3]

```cpp
int Fl_Flex::fixed (Fl_Widget * w) const
```

Return whether the given widget has a fixed size or resizes dynamically.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>w</th>
<th>widget</th>
</tr>
</thead>
</table>

**Returns**

whether the widget has a fixed size

**Return values**

<table>
<thead>
<tr>
<th>1</th>
<th>the widget has a fixed size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>the widget resizes dynamically</td>
</tr>
</tbody>
</table>

### 34.41.4.6 fixed() [3/3]

```cpp
void Fl_Flex::fixed (Fl_Widget * child, int size)
```

Set the horizontal or vertical size of a child widget.

This sets either the width or height of a child widget, depending on the type() of the Fl_Flex container (Fl_Flex::HORIZONTAL or Fl_Flex::VERTICAL). The other dimension is set to the full width or height of the Fl_Flex widget minus border and margin sizes.

This can be used to set a fixed widget width or height of children of Fl_Flex so they are not resized dynamically.

If size is 0 (zero) or negative the widget size is reset to flexible size.
Parameters

```plaintext
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>child widget to be affected</td>
</tr>
<tr>
<td>in</td>
<td>size width (Fl_Flex::HORIZONTAL) or height (Fl_Flex::VERTICAL)</td>
</tr>
</tbody>
</table>
```

34.41.4.7 gap() [1/2]

```c
int Fl_Flex::gap () const [inline]
```

Return the gap size of the widget.

Returns
gap size between all child widgets.

34.41.4.8 gap() [2/2]

```c
void Fl_Flex::gap (int g) [inline]
```

Set the gap size of the widget.
The gap size is some free space between child widgets. The size must be \( \geq 0 \). Negative values are clamped to 0.

Parameters

```plaintext
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>g gap size</td>
</tr>
</tbody>
</table>
```

34.41.4.9 horizontal()

```c
int Fl_Flex::horizontal () const [inline]
```

Returns non-zero (true) if Fl_Flex alignment is horizontal (row mode).

Returns

non-zero if Fl_Flex alignment is horizontal

Return values

```plaintext
<table>
<thead>
<tr>
<th>Value</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if type() == Fl_Flex::HORIZONTAL</td>
</tr>
<tr>
<td>0</td>
<td>if type() == Fl_Flex::VERTICAL</td>
</tr>
</tbody>
</table>
```

See class Fl_Flex documentation for details.

34.41.4.10 layout()

```c
void Fl_Flex::layout ()
```

Calculates the layout of the widget and redraws it.

If you change widgets in the Fl_Flex container you should call this method to force recalculation of child widget sizes and positions. This can be useful (necessary) if you hide(), show(), add() or remove() children.

Call this method if you need to recalculate widget positions for usage in an algorithm that places widgets at certain positions or when you need to display (show) or hide one or more children depending on the current layout (for instance a side bar).

This method also calls redraw() on the Fl_Flex widget.
34.41.4.11 margin() [1/4]

```cpp
int Fl_Flex::margin ( ) const [inline]
```

Returns the left margin size of the widget.
This returns the left margin of the widget which is not necessarily the same as all other margins.

Note

This method is useful if you never set different margin sizes.

See also

```cpp
int margin(int *left, int *top, int *right, int *bottom) to get all four margin values.
```

Returns

size of left margin.

34.41.4.12 margin() [2/4]

```cpp
int Fl_Flex::margin ( int *left, int *top, int *right, int *bottom) const [inline]
```

Returns all (four) margin sizes of the widget.
All margin sizes are returned in the given arguments. If any argument is NULL the respective value is not returned.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>left</th>
<th>returns left margin if not NULL</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>top</td>
<td>returns top margin if not NULL</td>
</tr>
<tr>
<td>in</td>
<td>right</td>
<td>returns right margin if not NULL</td>
</tr>
<tr>
<td>in</td>
<td>bottom</td>
<td>returns bottom margin if not NULL</td>
</tr>
</tbody>
</table>

Returns

whether all margins are equal

Return values

| 7   | all margins have the same size |
| 0   | at least one margin has a different size |

34.41.4.13 margin() [3/4]

```cpp
void Fl_Flex::margin ( int left, int top, int right, int bottom ) [inline]
```

Set the margin sizes at all four edges of the Fl_Flex widget.
The margin is the free space inside the widget border around all child widgets.
You must use all four parameters of this method to set the four margins in the order `left, top, right, bottom`. Negative values are set to 0 (zero). To set all margins to equal sizes, use `margin(int m)` which sets all four margins to the same size.

**Parameters**

| in | `left, top, right, bottom` | margin sizes, must be $\geq 0$ |

See also

`margin(int, int)`

### 34.41.4.14 margin() [4/4]

```cpp
void Fl_Flex::margin (  
    int m,  
    int g = -1 ) [inline]
```

Set the margin and optionally the gap size of the widget. This method can be used to set both the margin and the gap size. If you don’t use the second parameter `g` or supply a negative value the gap size is not changed. The margin is the free space inside the widget border **around** all child widgets. This method sets the margin to the same size at all four edges of the Fl_Flex widget. The gap size `g` is the free space **between** child widgets. Negative values do not change the gap value. This is the default if this argument is omitted.

**Parameters**

| in | `m` | margin size, must be $\geq 0$ |
| in | `g` | gap size (ignored, if negative) |

See also

`gap(int)`

### 34.41.4.15 need_layout() [1/2]

```cpp
bool Fl_Flex::need_layout ( ) const [inline]
```

Returns whether layout calculation is required. This should rarely be needed by user code. Used internally in `draw()`.

### 34.41.4.16 need_layout() [2/2]

```cpp
void Fl_Flex::need_layout (  
    int set ) [inline]
```

Set or reset the request to calculate the layout of children. This is intended for internal use but can also be used by user code to request layout calculation before the widget is drawn. Call this if you changed attributes or sizes of children to ensure that the layout is calculated properly. Changing other Fl_Flex attributes or resizing the widget does this automatically.

**Note**

Never call this with `set == 0` because this would defeat its purpose to recalculate the layout before the widget is drawn.
34.41.4.17  on_remove()

void Fl_Flex::on_remove (  
    int index ) [protected], [virtual]  
Allow derived groups to act when a child widget is removed from the group.  
Widgets derived from Fl_Group may store additional data for their children. Overriding this method will allow derived  
classes to remove these data structures just before the child is removed.  

Parameters  

| index | remove the child at this position in the array_ |

Reimplemented from Fl_Group.

34.41.4.18  resize()

void Fl_Flex::resize (  
    int x,  
    int y,  
    int w,  
    int h ) [virtual]  
Resize the container and calculate all child positions and sizes.  

Parameters  

| in x,y | position |
| in w,h | width and height |

Reimplemented from Fl_Widget.

34.41.4.19  spacing() [1/2]

int Fl_Flex::spacing ( ) const [inline]  
Gets the number of extra pixels of blank space that are added between the children.  
This method is the same as 'int gap()' and is defined to enable using Fl_Flex as a drop-in replacement of Fl_Pack.  

See also  

int gap()  

34.41.4.20  spacing() [2/2]

void Fl_Flex::spacing (  
    int i ) [inline]  
Sets the number of extra pixels of blank space that are added between the children.  
This method is the same as 'gap(int)' and is defined to enable using Fl_Flex as a drop-in replacement of Fl_Pack.  

See also  

void gap(int)  

The documentation for this class was generated from the following files:  

- Fl_Flex.H  
- Fl_Flex.cxx
Fl_Float_Input Class Reference

The Fl_Float_Input class is a subclass of Fl_Input that only allows the user to type floating point numbers (sign, digits, decimal point, more digits, 'E' or 'e', sign, digits).

#include <Fl_Float_Input.H>

Inheritance diagram for Fl_Float_Input:

```
Fl_Widget
   |
Fl_Input_
   |
Fl_Input
   |
Fl_Float_Input
```

Public Member Functions

- Fl_Float_Input (int X, int Y, int W, int H, const char *l=0)

  Creates a new Fl_Float_Input widget using the given position, size, and label string.

Additional Inherited Members

34.42.1 Detailed Description

The Fl_Float_Input class is a subclass of Fl_Input that only allows the user to type floating point numbers (sign, digits, decimal point, more digits, 'E' or 'e', sign, digits).

34.42.2 Constructor & Destructor Documentation

34.42.2.1 Fl_Float_Input()

Fl_Float_Input::Fl_Float_Input (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )

Creates a new Fl_Float_Input widget using the given position, size, and label string. The default boxtype is FL_DOWN_BOX.

Inherited destructor destroys the widget and any value associated with it.

The documentation for this class was generated from the following files:

- Fl_Float_Input.H
- Fl_Float_Input.cxx

34.43 Fl_FormsBitmap Class Reference

Forms compatibility Bitmap Image Widget.

#include <Fl_FormsBitmap.H>

Inheritance diagram for Fl_FormsBitmap:
Public Member Functions

- **Fl_Bitmap\* bitmap() const**
  
  Gets a the current associated Fl_Bitmap objects.

- **void bitmap(Fl_Bitmap\* B)**
  
  Sets a new bitmap.

- **Fl_FormsBitmap(Fl_Boxtype, int, int, int, int, const char\* =0)**
  
  Creates a bitmap widget from a box type, position, size and optional label specification.

- **void set(int W, int H, const uchar\* bits)**
  
  Sets a new bitmap bits with size W,H.

Protected Member Functions

- **void draw() FL_OVERRIDE**
  
  Draws the bitmap and its associated box.

Additional Inherited Members

34.43.1 Detailed Description

Forms compatibility Bitmap Image Widget.

34.43.2 Member Function Documentation

34.43.2.1 draw()

void Fl_FormsBitmap\::draw()

   void  )  [protected], [virtual]

Draws the bitmap and its associated box.
Implements Fl_Widget.

34.43.2.2 set()

void Fl_FormsBitmap\::set ( int W, int H, const uchar\* bits )

Sets a new bitmap bits with size W,H.
Deletes the previous one.
The documentation for this class was generated from the following files:

- Fl_FormsBitmap.H
- forms_bitmap.cxx
34.44 Fl_FormsPixmap Class Reference

Forms pixmap drawing routines.
#include <Fl_FormsPixmap.H>

Inheritance diagram for Fl_FormsPixmap:

```
Fl_Widget
   └── Fl_FormsPixmap
```

Public Member Functions

- **Fl_FormsPixmap** (Fl_Boxtype t, int X, int Y, int W, int H, const char *L=0)
  Creates a new Fl_FormsPixmap widget using the given box type, position, size and label string.

- **Fl_Pixmap** *Pixmap* () const
  Get the internal pixmap pointer.

- **void** Pixmap (Fl_Pixmap *B)
  Set the internal pixmap pointer to an existing pixmap.

- **void** set (char *const *bits)
  Set/create the internal pixmap using raw data.

Protected Member Functions

- **void** draw () FL_OVERRIDE
  Draws the widget.

Additional Inherited Members

34.44.1 Detailed Description

Forms pixmap drawing routines.

34.44.2 Constructor & Destructor Documentation

34.44.2.1 Fl_FormsPixmap()

```
Fl_FormsPixmap::Fl_FormsPixmap ( Fl_Boxtype t, int X, int Y, int W, int H, const char *L = 0 )
```

Creates a new Fl_FormsPixmap widget using the given box type, position, size and label string.

Parameters

<table>
<thead>
<tr>
<th>in $t$</th>
<th>box type</th>
</tr>
</thead>
<tbody>
<tr>
<td>in $X,Y,W,H$</td>
<td>position and size</td>
</tr>
<tr>
<td>in $L$</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>
34.44.3 Member Function Documentation

34.44.3.1 draw()

```c
void Fl_FormsPixmap::draw ( ) [protected], [virtual]
```

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.
Override this function to draw your own widgets.
If you ever need to call another widget’s draw method from within your own `draw()` method, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:
```c
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```
Implements `Fl_Widget`.

34.44.3.2 Pixmap()

```c
void Fl_FormsPixmap::Pixmap ( Fl_Pixmap * B ) [inline]
```

Set the internal pixmap pointer to an existing pixmap.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>existing pixmap</td>
</tr>
</tbody>
</table>

34.44.3.3 set()

```c
void Fl_FormsPixmap::set ( char *const * bits )
```

Set/create the internal pixmap using raw data.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bits</td>
<td>raw data</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- `Fl_FormsPixmap.H`
- `forms_pixmap.cxx`

34.45 Fl_FormsText Class Reference

Inheritance diagram for Fl_FormsText:

```
Fl_Widget
   /|
  / |
Fl_FormsText
```

Public Member Functions

- `Fl_FormsText (Fl_Boxtype b, int X, int Y, int W, int H, const char *l=0)`

Generated by Doxygen
Protected Member Functions

• void draw () FL_OVERRIDE
  Draws the widget.

Additional Inherited Members

34.45.1 Member Function Documentation

34.45.1.1 draw()

void Fl_FormsText::draw () [protected], [virtual]
Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.
Override this function to draw your own widgets.
If you ever need to call another widget’s draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()

Implements Fl_Widget.
The documentation for this class was generated from the following file:

• forms.H

34.46 Fl_Free Class Reference

Emulation of the Forms "free" widget.
#include <Fl_Free.H>
Inheritance diagram for Fl_Free:

```
<table>
<thead>
<tr>
<th>Fl_Widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fl_Free</td>
</tr>
</tbody>
</table>
```

Public Member Functions

• Fl_Free (uchar t, int X, int Y, int W, int H, const char *L, FL_HANDLEPTR hdl)
  Create a new Fl_Free widget with type, position, size, label and handler.
• int handle (int e) FL_OVERRIDE
  Handles the specified event.
• ~Fl_Free ()
  The destructor will call the handle function with the event FL_FREE_MEM.

Protected Member Functions

• void draw () FL_OVERRIDE
  Draws the widget.
Additional Inherited Members

34.46.1 Detailed Description

Emulation of the Forms "free" widget.

This emulation allows the free demo to run, and appears to be useful for porting programs written in Forms which use the free widget or make subclasses of the Forms widgets.

There are five types of free, which determine when the handle function is called:

- **FL_NORMAL_FREE** normal event handling.
- **FL_SLEEPING_FREE** deactivates event handling (widget is inactive).
- **FL_INPUT_FREE** accepts FL_FOCUS events.
- **FL_CONTINUOUS_FREE** sets a timeout callback 100 times a second and provides an FL_STEP event. This has obvious detrimental effects on machine performance.
- **FL_ALL_FREE** same as FL_INPUT_FREE and FL_CONTINUOUS_FREE.

34.46.2 Constructor & Destructor Documentation

34.46.2.1 Fl_Free()

```cpp
Fl_Free::Fl_Free ( uchar t,
             int X,
             int Y,
             int W,
             int H,
             const char * L,
             FL_HANDLEPTR hdl )
```

Create a new Fl_Free widget with type, position, size, label and handler.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>type</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>X, Y, W, H</td>
<td>position and size</td>
</tr>
<tr>
<td>in</td>
<td>L</td>
<td>widget label</td>
</tr>
<tr>
<td>in</td>
<td>hdl</td>
<td>handler function</td>
</tr>
</tbody>
</table>

The constructor takes both the type and the handle function. The handle function should be declared as follows:

```cpp
int handle_function(Fl_Widget *w,
             int event,
             float event_x,
             float event_y,
             char key)
```

This function is called from the handle() method in response to most events, and is called by the draw() method.

The event argument contains the event type:

```cpp
// old event names for compatibility:
#define FL_MOUSE FL_DRAG
#define FL_DRAW 0
#define FL_STEP 9
#define FL_FREEMEM 12
#define FL_FREEZE FL_UNMAP
#define FL_THAW FL_MAP
```

34.46.3 Member Function Documentation

Generated by Doxygen
34.46.3.1 draw()

```cpp
void Fl_Free::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method _from within your own draw() method_, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements `Fl_Widget`.

34.46.3.2 handle()

```cpp
int Fl_Free::handle ( int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited `handle()` method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to _override_ the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your `handle()` method although you don't really handle the event. The effect would be to _filter_ event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the `handle()` method of the base class and tell FLTK that you _consumed_ the event by returning 1 even if you didn't do anything with it.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>event</th>
<th>the kind of event received</th>
</tr>
</thead>
</table>

**Return values**

<table>
<thead>
<tr>
<th>0</th>
<th>if the event was not used or understood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

- `Fl_Event`

Reimplemented from `Fl_Widget`.

The documentation for this class was generated from the following files:

- Fl_Free.H
- forms_free.cxx

34.47 Fl_GIF_Image Class Reference

The `Fl_GIF_Image` class supports loading, caching, and drawing of Compuserve GIF<sup>SM</sup> images.

```cpp
#include <Fl_GIF_Image.H>
```

Inheritance diagram for `Fl_GIF_Image`:
Classes
- struct GIF_FRAME

Public Member Functions
- Fl_GIF_Image (const char *filename)
  This constructor loads a GIF image from the given file.
- Fl_GIF_Image (const char *imagename, const unsigned char *data)
  This constructor loads a GIF image from memory (deprecated).
- Fl_GIF_Image (const char *imagename, const unsigned char *data, const size_t length)
  This constructor loads a GIF image from memory.

Static Public Member Functions
- static bool is_animated (const char *name_)

Static Public Attributes
- static bool animate = false
  Sets how the shared image core routine should treat animated GIF files.

Protected Member Functions
- Fl_GIF_Image ()
  The default constructor creates an empty GIF image.
- Fl_GIF_Image (const char *filename, bool anim)
- Fl_GIF_Image (const char *imagename, const unsigned char *data, const size_t length, bool anim)
- void load (const char *filename, bool anim)
- void load (const char *imagename, const unsigned char *data, const size_t length, bool anim)
- void load_gif_ (class Fl_Image_Reader &rdr, bool anim=false)
- virtual void on_extension_data (GIF_FRAME &)
- virtual void on_frame_data (GIF_FRAME &)

Additional Inherited Members

34.47.1 Detailed Description
The Fl_GIF_Image class supports loading, caching, and drawing of Compuserve GIF\textsuperscript{SM} images.
The class loads the first image and supports transparency.

34.47.2 Constructor & Destructor Documentation
34.47.2.1 Fl_GIF_Image() [1/3]

Fl_GIF_Image::Fl_GIF_Image (const char * filename)
This constructor loads a GIF image from the given file.
If a GIF image is animated, Fl_GIF_Image will only read and display the first frame of the animation.
The destructor frees all memory and server resources that are used by the image.
Use Fl_Image::fail() to check if Fl_GIF_Image failed to load. fail() returns ERR_FILE_ACCESS if the file could not be opened or read, ERR_FORMAT if the GIF format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason.

Parameters

| in  | filename | a full path and name pointing to a GIF image file. |

See also

Fl_GIF_Image::Fl_GIF_Image(const char * imagename, const unsigned char * data, const long length)

34.47.2.2 Fl_GIF_Image() [2/3]

Fl_GIF_Image::Fl_GIF_Image (const char * imagename, const unsigned char * data)
This constructor loads a GIF image from memory (deprecated).

Deprecated Please use Fl_GIF_Image(const char * imagename, const unsigned char * data, const size_t length) instead.

Note

Buffer overruns will not be checked.

This constructor should not be used because the caller can't supply the memory size and the image reader can't check for "end of memory" errors.

Note

A new constructor with parameter length is available since FLTK 1.4.0.

Parameters

| in  | imagename | A name given to this image or NULL |
| in  | data      | Pointer to the start of the GIF image in memory. |

See also

Fl_GIF_Image(const char * filename)
Fl_GIF_Image(const char * imagename, const unsigned char * data, const size_t length)

34.47.2.3 Fl_GIF_Image() [3/3]

Fl_GIF_Image::Fl_GIF_Image (const char * imagename, const unsigned char * data, const size_t length)
This constructor loads a GIF image from memory. Construct an image from a block of memory inside the application. Fluid offers “binary data” chunks as a great way to add image data into the C++ source code. `imagenname` can be `NULL`. If a name is given, the image is added to the list of shared images and will be available by that name.

If a GIF image is animated, `Fl_GIF_Image` will only read and display the first frame of the animation. The destructor frees all memory and server resources that are used by the image. The third parameter `length` is used to test for buffer overruns, i.e. truncated images. Use `Fl_Image::fail()` to check if `Fl_GIF_Image` failed to load. `fail()` returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the GIF format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th><code>imagenname</code></th>
<th>A name given to this image or <code>NULL</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>data</code></td>
<td>Pointer to the start of the GIF image in memory.</td>
</tr>
<tr>
<td>in</td>
<td><code>length</code></td>
<td>Length of the GIF image in memory.</td>
</tr>
</tbody>
</table>

See also

- `Fl_GIF_Image::Fl_GIF_Image(const char *filename)`
- `Fl_Shared_Image`

Since

1.4.0

### 34.47.3 Member Data Documentation

#### 34.47.3.1 animate

```cpp
bool Fl_GIF_Image::animate = false  [static]
```

Sets how the shared image core routine should treat animated GIF files. The default is to treat them as ordinary GIF’s e.g. it creates a `Fl_GIF_Image` object. If this variable is set, then an animated GIF object `Fl_Anim_GIF_Image` is created.

The documentation for this class was generated from the following files:

- `Fl_GIF_Image.H`
- `Fl_Anim_GIF_Image.cxx`
- `Fl_GIF_Image.cxx`

### 34.48 Fl_Gl_Choice Class Reference

#### Public Member Functions

- `Fl_Gl_Choice (int m, const int *alistp, Fl_Gl_Choice *n)`

#### Friends

- `class Fl_Gl_Window_Driver`

The documentation for this class was generated from the following file:

- `Fl_Gl_Choice.H`
34.49 Fl_Gl_Window Class Reference

The Fl_Gl_Window widget sets things up so OpenGL works.

```
#include <Fl_Gl_Window.H>
```

Inheritance diagram for Fl_Gl_Window:

![Inheritance Diagram](image)

**Public Member Functions**

- **Fl_Gl_Window const * as_gl_window () const FL_OVERRIDE**
  - Returns an Fl_Gl_Window pointer if this widget is an Fl_Gl_Window.

- **int can_do ()**
  - Returns non-zero if the hardware supports the current OpenGL mode.

- **int can_do_overlay ()**
  - Returns true if the hardware overlay is possible.

- **GLContext context () const**
  - Returns a pointer to the window's OpenGL rendering context.

- **void context (GLContext, int destroy_flag=0)**
  - Sets a pointer to the GLContext that this window is using.

- **char context_valid () const**
  - Will only be set if the OpenGL context is created or recreated.

- **void context_valid (char v)**
  - See char Fl_Gl_Window::context_valid() const.

- **Fl_Gl_Window (int W, int H, const char * l=0)**
  - Creates a new Fl_Gl_Window widget using the given size, and label string.

- **Fl_Gl_Window (int X, int Y, int W, int H, const char * l=0)**
  - Creates a new Fl_Gl_Window widget using the given position, size, and label string.

- **void flush () FL_OVERRIDE**
  - Forces the window to be drawn, this window is also made current and calls draw().

- **int handle (int) FL_OVERRIDE**
  - Handle some FLTK events as needed.

- **void hide () FL_OVERRIDE**
  - Hides the window and destroys the OpenGL context.

- **void hide_overlay ()**
  - Hides the window if it is not this window, does nothing in Windows.

- **void invalidate ()**
  - The invalidate() method turns off valid() and is equivalent to calling value(0).

- **void make_current ()**
  - The make_current() method selects the OpenGL context for the widget.

- **void make_overlay_current ()**
Selects the OpenGL context for the widget's overlay.

- **FL_Mode mode ()** const
  
  Returns the current OpenGL capabilities of the window.

- **int mode** (const int &a)

  Set the OpenGL capabilities of the window using platform-specific data.

- **int mode**(int a)

  Set or change the OpenGL capabilities of the window.

- **void ortho ()**

  Sets the projection so 0,0 is in the lower left of the window and each pixel is 1 unit wide/tall.

- **int pixel_h ()**

  Gives the window height in OpenGL pixels.

- **int pixel_w ()**

  Gives the window width in OpenGL pixels.

- **float pixels_per_unit ()**

  The number of pixels per FLTK unit of length for the window.

- **void redraw_overlay ()**

  Causes draw_overlay() to be called at a later time.

- **void resize**(int, int, int, int) FL_OVERRIDE

  Changes the size or position of the widget.

- **void show ()** FL_OVERRIDE

  Makes a widget visible.

- **void show**(int a, char **b)

  Same as Fl_Window::show(int a, char **b)

- **void swap_buffers ()**

  The swap_buffers() method swaps the back and front buffers.

- **int swap_interval ()** const

  Gets the rate at which the GL windows swaps buffers.

- **void swap_interval**(int)

  Sets the rate at which the GL windows swaps buffers.

- **char valid ()** const

  Is turned off when FLTK creates a new context for this window or when the window resizes, and is turned on after draw() is called.

- **void valid**(char v)

  See char Fl_Gl_Window::valid() const.

- **~Fl_Gl_Window ()**

  The destructor removes the widget and destroys the OpenGL context associated with it.

### Static Public Member Functions

- **static int can_do** (const int *m)

  Returns non-zero if the hardware supports the given OpenGL mode.

- **static int can_do**(int m)

  Returns non-zero if the hardware supports the given OpenGL mode.

### Protected Member Functions

- **void draw ()** FL_OVERRIDE

  Draws the Fl_Gl_Window.

- **void draw_begin ()**

  Supports drawing to an Fl_Gl_Window with the FLTK 2D drawing API.

- **void draw_end ()**

  To be used as a match for a previous call to Fl_Gl_Window::draw_begin().
Friends

- class Fl_Gl_Window_Driver

Additional Inherited Members

34.49.1 Detailed Description

The Fl_Gl_Window widget sets things up so OpenGL works. It also keeps an OpenGL "context" for that window, so that changes to the lighting and projection may be reused between redraws. Fl_Gl_Window also flushes the OpenGL streams and swaps buffers after draw() returns. OpenGL hardware typically provides some overlay bit planes, which are very useful for drawing UI controls atop your 3D graphics. If the overlay hardware is not provided, FLTK tries to simulate the overlay. This works pretty well if your graphics are double buffered, but not very well for single-buffered. Please note that the FLTK drawing and clipping functions will not work inside an Fl_Gl_Window. All drawing should be done using OpenGL calls exclusively.

See also

OpenGL and support of HighDPI displays

Note

FLTK 1.4 introduces a driver system for graphic calls. It is now possible to add a selection of widgets to an OpenGL window. The widgets will draw on top of any OpenGL rendering. The number of supported widgets will increase as the driver development improves. Program test/cube.cxx illustrates how to do that.

FLTK expects that when an Fl_Gl_Window is a child of a parent Fl_Window, the child window lies entirely inside its parent window. If that's not the case, what happens to the part of the GL subwindow which leaks outside its parent is undefined and susceptible to be platform-specific.

34.49.2 Constructor & Destructor Documentation

34.49.2.1 Fl_Gl_Window() [1/2]

Fl_Gl_Window::Fl_Gl_Window (  
    int \text{ \textbar} \textbar \text{ \textbar}  
    int \text{ \textbar} \text{ \textbar} \text{ \textbar}  
    const char * l = 0 \text{ } [\text{inline}]  
)

Creates a new Fl_Gl_Window widget using the given size, and label string. The default boxtype is FL_NO_BOX. The default mode is FL_RGB|FL_DOUBLE|FL_DEPTH.

34.49.2.2 Fl_Gl_Window() [2/2]

Fl_Gl_Window::Fl_Gl_Window (  
    int \text{ \textbar} \text{ \textbar} \text{ \textbar}  
    int \text{ \textbar} \text{ \textbar} \text{ \textbar}  
    const char * l = 0 \text{ } [\text{inline}]  
)

Creates a new Fl_Gl_Window widget using the given position, size, and label string. The default boxtype is FL_NO_BOX. The default mode is FL_RGB|FL_DOUBLE|FL_DEPTH.

34.49.3 Member Function Documentation
34.49.3.1  
**as_gl_window() [1/2]**

```c
Fl_Gl_Window* Fl_Gl_Window::as_gl_window ( ) const [inline], [virtual]
```

Reimplemented from `Fl_Widget`.

34.49.3.2  
**as_gl_window() [2/2]**

```c
Fl_Gl_Window* Fl_Gl_Window::as_gl_window ( ) [inline], [virtual]
```

Returns an `Fl_Gl_Window` pointer if this widget is an `Fl_Gl_Window`. Use this method if you have a widget (pointer) and need to know whether this widget is derived from `Fl_Gl_Window`. If it returns non-NULL, then the widget in question is derived from `Fl_Gl_Window`.

Return values

| NULL | if this widget is not derived from `Fl_Gl_Window`. |

Note

This method is provided to avoid dynamic_cast.

See also

`Fl_Widget::as_group(), Fl_Widget::as_window()`

Reimplemented from `Fl_Widget`.

34.49.3.3  
**can_do()**

```c
static int Fl_Gl_Window::can_do ( const int* m ) [inline], [static]
```

Returns non-zero if the hardware supports the given OpenGL mode.

See also

`Fl_Gl_Window::mode(const int*a)`

34.49.3.4  
**can_do_overlay()**

```c
int Fl_Gl_Window::can_do_overlay ( )
```

Returns true if the hardware overlay is possible. If this is false, FLTK will try to simulate the overlay, with significant loss of update speed. Calling this will cause FLTK to open the display.

34.49.3.5  
**context() [1/2]**

```c
GLContext Fl_Gl_Window::context ( ) const [inline]
```

Returns a pointer to the window's OpenGL rendering context.

See also

`void context(GLContext c, int destroy_flag)`
34.49.3.6 context() [2/2]

```cpp
void Fl_Gl_Window::context (GLContext v,
    int destroy_flag = 0 )
```

Sets a pointer to the GLContext that this window is using.

This is a system-dependent structure, but it is portable to copy the context from one window to another. You can also set it to NULL, which will force FLTK to recreate the context the next time make_current() is called, this is useful for getting around bugs in OpenGL implementations.

If destroy_flag is true the context will be destroyed by fltk when the window is destroyed, or when the mode() is changed, or the next time context(x) is called.

34.49.3.7 context_valid()

```cpp
char Fl_Gl_Window::context_valid ( ) const [inline]
```

Will only be set if the OpenGL context is created or recreated.

It differs from Fl_Gl_Window::valid() which is also set whenever the context changes size.

34.49.3.8 draw()

```cpp
void Fl_Gl_Window::draw ( )  [protected], [virtual]
```

Draws the Fl_Gl_Window.

You must subclass Fl_Gl_Window and provide an implementation for draw(). You may also provide an implementation of draw_overlay() if you want to draw into the overlay planes. You can avoid reinitializing the viewport and lights and other things by checking valid() at the start of draw() and only doing the initialization if it is false.

The draw() method can only use OpenGL calls. Do not attempt to call X, any of the functions in <FL/fl_draw.H>, or glX directly. Do not call gl_start() or gl_finish().

If double-buffering is enabled in the window, the back and front buffers are swapped after this function is completed.

The following pseudo-code shows how to use "if (!valid())" to initialize the viewport:

```cpp
void mywindow::draw() {
    if (!valid()) {
        glViewport(0,0,pixel_w(),pixel_h());
        glFrustum(...) or glOrtho(...) ...
        ...other initialization...
    }
    if (!context_valid()) {
        ...load textures, etc. ...
    }
    // clear screen
    glClearColor(...);
    glClear(...);
    ... draw your geometry here ...
}
```

Actual example code to clear screen to black and draw a 2D white "X":

```cpp
void mywindow::draw() {
    if (!valid()) {
        glLoadIdentity();
        glViewport(0,0,pixel_w(),pixel_h());
        glOrtho(-w(),w(),-h(),h(),-1,1);
    }
    // Clear screen
    glClearColor(0.0f, 0.0f, 0.0f, 1.0f);
    // Draw white 'X'
    glColor3f(1.0f, 1.0f, 1.0f);
    glBegin(GL_LINES);
    glVertex2f(w(), h()); glVertex2f(-w(),-h()); glEnd();
    glBegin(GL_LINES);
    glVertex2f(w(),-h()); glVertex2f(-w(), h()); glEnd();
}
```

Regular FLTK widgets can be added as children to the Fl_Gl_Window. To correctly overlay the widgets, Fl_Gl_Window::draw() must be called after rendering the main scene.

```cpp
void mywindow::draw() {
    // draw 3d graphics scene
    Fl_Gl_Window::draw();
    // -- or --
    draw_begin();
    Fl_Window::draw();
    // other 2d drawing calls, overlays, etc.
    draw_end();
}
```

Implements Fl_Widget.

Reimplemented in Fl_Glut_Window.
34.49.3.9 draw_begin()

```cpp
void Fl_Gl_Window::draw_begin ( ) [protected]
```

Supports drawing to an Fl_Gl_Window with the FLTK 2D drawing API.

See also
- Using FLTK widgets in OpenGL Windows

34.49.3.10 draw_end()

```cpp
void Fl_Gl_Window::draw_end ( ) [protected]
```

To be used as a match for a previous call to Fl_Gl_Window::draw_begin().

See also
- Using FLTK widgets in OpenGL Windows

34.49.3.11 flush()

```cpp
void Fl_Gl_Window::flush ( ) [virtual]
```

Forces the window to be drawn, this window is also made current and calls draw().
Reimplemented from Fl_Window.

34.49.3.12 handle()

```cpp
int Fl_Gl_Window::handle ( int event ) [virtual]
```

Handle some FLTK events as needed.
Reimplemented from Fl_Widget.
Reimplemented in Fl_Glut_Window.

34.49.3.13 hide()

```cpp
void Fl_Gl_Window::hide ( ) [virtual]
```

Hides the window and destroys the OpenGL context.
Reimplemented from Fl_Widget.

34.49.3.14 make_current()

```cpp
void Fl_Gl_Window::make_current ( )
```

The make_current() method selects the OpenGL context for the widget.
It is called automatically prior to the draw() method being called and can also be used to implement feedback and/or selection within the handle() method.

34.49.3.15 make_overlay_current()

```cpp
void Fl_Gl_Window::make_overlay_current ( )
```

Selects the OpenGL context for the widget's overlay.
This method is called automatically prior to the draw_overlay() method being called and can also be used to implement feedback and/or selection within the handle() method.
34.49.3.16 mode() [1/3]

Fl_Mode Fl_Gl_Window::mode ( ) const [inline]
Returns the current OpenGL capabilities of the window.
Don't use this if capabilities were set through Fl_Gl_Window::mode(const int *a).

34.49.3.17 mode() [2/3]

int Fl_Gl_Window::mode ( const int * a ) [inline]
Set the OpenGL capabilities of the window using platform-specific data.

Parameters

| a | zero-ending array of platform-specific attributes and attribute values |

Unix/Linux platform: attributes are GLX attributes adequate for the 3rd argument of the glXChooseVisual() function (e.g., GLX_DOUBLEBUFFER, defined by including <GL/glx.h>).

Note

What attributes are adequate here is subject to change. The preferred, stable public API is Fl_Gl_Window::mode(int a).

Windows platform: this member function is of no use.

Mac OS X platform: attributes belong to the CGLPixelFormatAttribute enumeration (defined by including <OpenGL/OpenGL.h>, e.g., kCGLPFADoubleBuffer) and may be followed by adequate attribute values.

34.49.3.18 mode() [3/3]

int Fl_Gl_Window::mode ( int a ) [inline]
Set or change the OpenGL capabilities of the window.
The value can be any of the following OR'd together:

- FL_RGB - RGB color (not indexed)
- FL_RGB8 - RGB color with at least 8 bits of each color
- FL_INDEX - Indexed mode
- FL_SINGLE - not double buffered
- FL_DOUBLE - double buffered
- FL_ACCUM - accumulation buffer
- FL_ALPHA - alpha channel in color
- FL_DEPTH - depth buffer
- FL_STENCIL - stencil buffer
- FL_MULTISAMPLE - multisample antialiasing
- FL_OPENGL3 - use OpenGL version 3.0 or more.

FL_RGB and FL_SINGLE have a value of zero, so they are "on" unless you give FL_INDEX or FL_DOUBLE.
If the desired combination cannot be done, FLTK will try turning off FL_MULTISAMPLE. If this also fails the show() will call Fl::error() and not show the window.

You can change the mode while the window is displayed. This is most useful for turning double-buffering on and off.
Under X this will cause the old X window to be destroyed and a new one to be created. If this is a top-level window this will unfortunately also cause the window to blink, raise to the top, and be de-iconized, and the xid() will change, possibly breaking other code. It is best to make the GL window a child of another window if you wish to do this!

mode() must not be called within draw() since it changes the current context.
The FL_OPENGL3 flag is required to access OpenGL version 3 or more under the X11 and MacOS platforms; it's optional under Windows and Wayland. See more details in Using OpenGL 3.0 (or higher versions).
34.49.3.19 ortho()

```cpp
void Fl_Gl_Window::ortho()
```

Sets the projection so 0,0 is in the lower left of the window and each pixel is 1 unit wide/tall.
If you are drawing 2D images, your draw() method may want to call this if valid() is false.

34.49.3.20 pixel_h()

```cpp
int Fl_Gl_Window::pixel_h()
```

Gives the window height in OpenGL pixels.
When an Fl_Gl_Window is mapped to a HighDPI display, the value given by Fl_Gl_Window::h() which is expressed
in FLTK units, may differ from the window height in pixels. Calls to OpenGL functions expecting pixel values (e.g.,
glViewport) should therefore use pixel_h() rather than h(). Method pixel_h() detects when the GUI is rescaled or
when the window has been moved between low and high resolution displays and automatically adjusts the returned
value.

Version

1.3.4

34.49.3.21 pixel_w()

```cpp
int Fl_Gl_Window::pixel_w()
```

Gives the window width in OpenGL pixels.
When an Fl_Gl_Window is mapped to a HighDPI display, the value given by Fl_Gl_Window::w() which is expressed
in FLTK units, may differ from the window width in pixels. Calls to OpenGL functions expecting pixel values (e.g.,
glViewport) should therefore use pixel_w() rather than w(). Method pixel_w() detects when the GUI is rescaled or
when the window has been moved between low and high resolution displays and automatically adjusts the
returned value.

Version

1.3.4

34.49.3.22 pixels_per_unit()

```cpp
float Fl_Gl_Window::pixels_per_unit()
```

The number of pixels per FLTK unit of length for the window. This method dynamically adjusts its value when the GUI is rescaled or when the window is moved to/from displays of
distinct resolutions. This method is useful, e.g., to convert, in a window's handle() method, the FLTK units returned
by Fl::event_x() and Fl::event_y() to the pixel units used by the OpenGL source code.

Version

1.3.4

34.49.3.23 redraw_overlay()

```cpp
void Fl_Gl_Window::redraw_overlay()
```

Causes draw_overlay() to be called at a later time.
Initially the overlay is clear. If you want the window to display something in the overlay when it first appears, you
must call this immediately after you show() your window.
### 34.49.3.24 resize()

```cpp
t void Fl_Gl_Window::resize (  
    int x,  
    int y,  
    int w,  
    int h ) [virtual]
```

Changes the size or position of the widget. This is a virtual function so that the widget may implement its own handling of resizing. The default version does not call the `redraw()` method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position. Some window managers under X11 call `resize()` a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations. `position(X, Y)` is a shortcut for `resize(X, Y, w(), h())`, and `size(W, H)` is a shortcut for `resize(x(), y(), W, H)`.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x, y</td>
</tr>
<tr>
<td>in</td>
<td>w, h</td>
</tr>
</tbody>
</table>

**See also**

- `position(int, int)`, `size(int, int)`

Reimplemented from `Fl_Widget`.

### 34.49.3.25 show()

```cpp
t void Fl_Gl_Window::show ( ) [virtual]
```

Makes a widget visible. An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like `FL_SHOW`. The `visible()` method returns true if the widget is set to be visible. The `visible_r()` method returns true if the widget and all of its parents are visible. A widget is only visible if `visible()` is true on it and all of its parents. Changing it will send `FL_SHOW` or `FL_HIDE` events to the widget. Do not change it if the parent is not visible, as this will send false `FL_SHOW` or `FL_HIDE` events to the widget. `redraw()` is called if necessary on this or the parent.

**See also**

- `hide()`, `visible()`, `visible_r()`

Reimplemented from `Fl_Widget`.

### 34.49.3.26 swap_buffers()

```cpp
t void Fl_Gl_Window::swap_buffers ( )
```

The `swap_buffers()` method swaps the back and front buffers. It is called automatically after the `draw()` method is called.

### 34.49.3.27 swap_interval()[1/2]

```cpp
t int Fl_Gl_Window::swap_interval ( ) const
```

Gets the rate at which the GL windows swaps buffers. This method can be called after the OpenGL context was created, typically within the user overridden `Fl_Gl_Window::draw()` method that will be overridden by the user.
Note
This method depends highly on the underlying OpenGL contexts and driver implementation. Some drivers return no information, most drivers don’t support intervals with multiple frames and return only 0 or 1. Some drivers have the ability to set the swap interval but no way to query it, hence this method may return -1 even though the interval was set correctly. Conversely a return value greater zero does not guarantee that the driver actually honors the setting.

Returns
- an integer greater zero if vertical blanking is taken into account when swapping OpenGL buffers
- 0 if the vertical blanking is ignored
- -1 if the information can not be retrieved

### 34.49.3.28 swap_interval() [2/2]

```cpp
void Fl_Gl_Window::swap_interval ( int frames )
```

Sets the rate at which the GL windows swaps buffers.
This method can be called after the OpenGL context was created, typically within the user overridden `Fl_Gl_Window::draw()` method that will be overridden by the user.

Note
This method depends highly on the underlying OpenGL contexts and driver implementation. Most driver seem to accept only 0 and 1 to swap buffer asynchronously or in sync with the vertical blank.

Parameters
- **in frames** set the number of vertical frame blanks between OpenGL buffer swaps

### 34.49.3.29 valid()

```cpp
char Fl_Gl_Window::valid ( ) const [inline]
```

Is turned off when FLTK creates a new context for this window or when the window resizes, and is turned on after `draw()` is called.

You can use this inside your `draw()` method to avoid unnecessarily initializing the OpenGL context. Just do this:

```cpp
void mywindow::draw() {
  if (!valid()) {
    glViewport(0,0,pixel_w(),pixel_h());
    glFrustum(...);
    ...other initialization...
  }
  if (!context_valid()) {
    ...load textures, etc. ...
    ... draw your geometry here ...
  }
}
```

You can turn `valid()` on by calling `valid(1)`. You should only do this after fixing the transformation inside a `draw()` or after `make_current()`. This is done automatically after `draw()` returns.

The documentation for this class was generated from the following files:
- `Fl_Gl_Window.H`
- `Fl_Gl_Overlay.cxx`
- `Fl_Gl_Window.cxx`

---

Generated by Doxygen
34.50 Fl_Glut_Bitmap_Font Struct Reference

Fltk glut font/size attributes used in the glutXXX functions

#include <glut.H>

Public Attributes

• Fl_Font font
• Fl_Fontsize size

34.50.1 Detailed Description

Fltk glut font/size attributes used in the glutXXX functions
The documentation for this struct was generated from the following file:

• glut.H

34.51 Fl_Glut_StrokeChar Struct Reference

Public Attributes

• int Number
• GLfloat Right
• const Fl_Glut_StrokeStrip * Strips

The documentation for this struct was generated from the following file:

• glut.H

34.52 Fl_Glut_StrokeFont Struct Reference

Public Attributes

• const Fl_Glut_StrokeChar ** Characters
• GLfloat Height
• char * Name
• int Quantity

The documentation for this struct was generated from the following file:

• glut.H

34.53 Fl_Glut_StrokeStrip Struct Reference

Public Attributes

• int Number
• const Fl_Glut_StrokeVertex * Vertices

The documentation for this struct was generated from the following file:

• glut.H
34.54 Fl_Glut_StrokeVertex Struct Reference

Public Attributes

- GLfloat X
- GLfloat Y

The documentation for this struct was generated from the following file:

- glut.H

34.55 Fl_Glut_Window Class Reference

GLUT is emulated using this window class and these static variables (plus several more static variables hidden in glut_compatibility.cxx):

```
#include <glut.H>
```

Inheritance diagram for Fl_Glut_Window:

```
Fl_Widget
   |
   v
Fl_Group
   |
   v
Fl_Window
   |
   v
Fl_Gl_Window
   |
   v
Fl_Glut_Window
```

Public Member Functions

- **Fl_Glut_Window** (int w, int h, const char ∗t=0)
  
  _Creates a glut window, registers to the glut windows list._

- **Fl_Glut_Window** (int x, int y, int w, int h, const char ∗t=0)
  
  _Creates a glut window, registers to the glut windows list._

- void **make_current** ()
- void **~Fl_Glut_Window** ()
  
  _Destroys the glut window, first unregister it from the glut windows list._

Public Attributes

- void(* display *)(()
- void(* entry )(int
- void(* keyboard )(uchar, int x, int y)
- int menu [3]
- void(* motion )(int x, int y)
- void(* mouse )(int b, int state, int x, int y)
- int number
- void(* overlaydisplay )()
- void(* passivemotion )(int x, int y)
- void(* reshape )(int w, int h)
- void(* special )(int, int x, int y)
- void(* visibility )(int)
Protected Member Functions

- void draw () FL_OVERRIDE
  Draws the Fl_GI_Window.

- void draw_overlay () FL_OVERRIDE
  You must implement this virtual function if you want to draw into the overlay.

- int handle (int) FL_OVERRIDE
  Handle some FLTK events as needed.

Additional Inherited Members

34.55.1 Detailed Description

GLUT is emulated using this window class and these static variables (plus several more static variables hidden in glutCompatibility.cxx):

34.55.2 Member Function Documentation

34.55.2.1 draw()

```cpp
void Fl_Glut_Window::draw (  
    void ) [protected], [virtual]

Draws the Fl_Glut_Window.
You must subclass Fl_Glut_Window and provide an implementation for draw(). You may also provide an implementation of draw_overlay() if you want to draw into the overlay planes. You can avoid reinitializing the viewport and lights and other things by checking valid() at the start of draw() and only doing the initialization if it is false. The draw() method can only use OpenGL calls. Do not attempt to call X, any of the functions in <FL/fl_draw.H>, or glX directly. Do not call gl_start() or gl_finish().
```

If double-buffering is enabled in the window, the back and front buffers are swapped after this function is completed.

The following pseudo-code shows how to use "if (!valid())" to initialize the viewport:

```cpp
void mywindow::draw() {
    if (!valid()) {
        glViewport(0,0,pixel_w(),pixel_h());
        glFrustum(...) or glOrtho(...)  
        ...other initialization...
    }
    if (!context_valid()) {
        ...load textures, etc. ...
    }
    // clear screen  
    glClearColor(...);  
    glClear (...);  
    ... draw your geometry here ...
}
```

Actual example code to clear screen to black and draw a 2D white "X":

```cpp
void mywindow::draw() {
    if (!valid()) {
        glLoadIdentity();
        glViewport(0,0,pixel_w(),pixel_h());
        glOrtho(-w(),w(),-h(),h(),-1,1);
    }
    // Clear screen  
    glClearColor(GL_COLOR_BUFFER_BIT);  
    // Draw white 'X'  
    glColor3f(1.0, 1.0, 1.0);
    glBegin(GL_LINES); glVertex2f(w(), h()); glVertex2f(-w(), -h()); glEnd();
    glBegin(GL_LINES); glVertex2f(w(), -h()); glVertex2f(-w(), h()); glEnd();
}
```

Regular FLTK widgets can be added as children to the Fl_Glut_Window. To correctly overlay the widgets, Fl_Glut_Window::draw() must be called after rendering the main scene.

```cpp
void mywindow::draw() {  
    // draw 3d graphics scene  
    Fl_Glut_Window::draw();  
    // -- or --  
    draw_begin();  
    Fl_Window::draw();  
    // other 2d drawing calls, overlays, etc.  
    draw_end();
}
```
34.55.2.2 draw_overlay()

void Fl_Glut_Window::draw_overlay ( ) [protected], [virtual]
You must implement this virtual function if you want to draw into the overlay.
The overlay is cleared before this is called. You should draw anything that is not clear using OpenGL. You must use
\texttt{gl\_color(i)} to choose colors (it allocates them from the colormap using system-specific calls), and remember that
you are in an indexed OpenGL mode and drawing anything other than flat-shaded will probably not work.
Both this function and \texttt{Fl\_Gl\_Window::draw()} should check \texttt{Fl\_Gl\_Window::valid()} and set the same transformation.
If you don't your code may not work on other systems. Depending on the OS, and on whether overlays are real or
simulated, the OpenGL context may be the same or different between the overlay and main window.
Reimplemented from \texttt{Fl\_Gl\_Window}.

34.55.2.3 handle()

int Fl_Glut_Window::handle ( int event ) [protected], [virtual]
Handle some FLTK events as needed.
Reimplemented from \texttt{Fl\_Gl\_Window}.
The documentation for this class was generated from the following files:

- \texttt{glut.H}
- \texttt{glut_compatibility.cxx}

34.56 Fl\_Grid Class Reference

\texttt{Fl\_Grid} is a container (layout) widget with multiple columns and rows.
\texttt{#include <Fl\_Grid.H>}

Inheritance diagram for \texttt{Fl\_Grid}:

```
Fl_Widget
   
Fl_Group
   
Fl_Grid
```

**Classes**

- class \texttt{Cell}

**Public Member Functions**

- \texttt{Fl\_Grid::Cell * cell (Fl\_Widget * widget) const}
  
  Get the grid cell of \texttt{widget}.

- \texttt{Fl\_Grid::Cell * cell (int row, int col) const}
  
  Get the grid cell of row \texttt{row} and column \texttt{col}.

- virtual void \texttt{clear\_layout ()}
  
  Reset the layout w/o removing widgets.

- void \texttt{col\_gap (const int +value, size\_t size)}
  
  Set more than one column gaps at once.
• int \textbf{col\_gap} (int col) const
  
  Set the gap of column \textit{col}.

• void \textbf{col\_gap} (int col, int value)
  
  Set the gap of column \textit{col}.

• void \textbf{col\_weight} (const int *value, size\_t size)
  
  Set the weight of more than one column.

• int \textbf{col\_weight} (int col) const
  
  Set the weight of a column.

• void \textbf{col\_weight} (int col, int value)
  
  Set the weight of a column.

• void \textbf{col\_width} (const int *value, size\_t size)
  
  Set minimal widths of more than one column.

• int \textbf{col\_width} (int col) const
  
  Set the minimal width of a column.

• void \textbf{col\_width} (int col, int value)
  
  Set the minimal width of a column.

• void \textbf{debug} (int level=127)
  
  Output layout information of this \texttt{Fi\_Grid} to stderr.

• \texttt{Fl\_Grid} (int X, int Y, int W, int H, const char *L=0)
  
  Create a new \texttt{Fl\_Grid} widget.

• void \textbf{gap} (int *row\_gap, int *col\_gap) const
  
  Get the default gaps for rows and columns.

• virtual void \textbf{gap} (int row\_gap, int col\_gap=-1)
  
  Set default gaps for rows and columns.

• virtual void \textbf{layout} ()
  
  Calculate the grid layout and resize and position all widgets.

• virtual void \textbf{layout} (int rows, int cols, int margin=-1, int gap=-1)
  
  Set the basic layout parameters of the \texttt{Fl\_Grid} widget.

• int \textbf{margin} (int *left, int *top, int *right, int *bottom) const
  
  Returns all outside margin sizes of the grid.

• virtual void \textbf{margin} (int left, int top=-1, int right=-1, int bottom=-1)
  
  Set all margins (left, top, right, bottom).

• bool \textbf{need\_layout} () const
  
  Return whether layout calculation is required.

• void \textbf{need\_layout} (int set)
  
  Request or reset the request to calculate the layout of children.

• virtual void \textbf{resize} (int X, int Y, int W, int H) \texttt{FL\_OVERRIDE}
  
  Recalculate the layout and position and resize all widgets.

• void \textbf{row\_gap} (const int *value, size\_t size)
  
  Set more than one row gaps at once.

• int \textbf{row\_gap} (int row) const
  
  Set the gap of row \textit{row}.

• void \textbf{row\_gap} (int row, int value)
  
  Set the gap of row \textit{row}.

• void \textbf{row\_height} (const int *value, size\_t size)
  
  Set the minimal row height of more than one row.

• int \textbf{row\_height} (int row) const
  
  Set the minimal row height of one row.

• void \textbf{row\_height} (int row, int value)
  
  Set the minimal row height of one row.

• void \textbf{row\_weight} (const int *value, size\_t size)
  
  Set the weight of more than one row.

• int \textbf{row\_weight} (int row) const
• **void** **row_weight** (int row, int value)
  
  *Set the row weight of row row.*

• **short** **rows** () **const**

• **void** **show_grid** (int set)
  
  *Enable or disable drawing of the grid helper lines for visualization.*

• **void** **show_grid** (int set, **Fl_Color** col)
  
  *Enable or disable drawing of the grid helper lines for visualization.*

• **Fl_Grid::Cell** ∗ **widget** (**Fl_Widget** ∗ wi, int row, int col, **Fl_Grid_Align** align=**FL_GRID_FILL**)
  
  *Assign a widget to a grid cell and set its alignment.*

• **Fl_Grid::Cell** ∗ **widget** (**Fl_Widget** ∗ wi, int row, int col, int rowspan, int colspan, **Fl_Grid_Align** align=**FL_GRID_FILL**)
  
  *Assign a widget to a grid cell and set cell spanning and alignment.*

### Protected Member Functions

• **Cell** ∗ **add_cell** (int row, int col)

• virtual **void** **draw** () **FL_OVERRIDE**
  
  *Draws the Fl_Grid widget and all children.*

• virtual **void** **draw_grid** ()
  
  *Draws the grid helper lines for design and debugging purposes.*

• **void** **init** ()

• **void** **on_remove** (int) **FL_OVERRIDE**
  
  *Fl_Group calls this method when a child widget is about to be removed.*

• **void** **remove_cell** (int row, int col)

### Protected Attributes

• **bool** **draw_grid**_

• **Fl_Color** **grid_color**

### Friends

• class **Fl_Grid_Type**

### Additional Inherited Members

34.56.1 Detailed Description

**Fl_Grid** is a container (layout) widget with multiple columns and rows. This container widget features very flexible layouts in columns and rows w/o the need to position each child widget in x/y coordinates.

Widgets are assigned to grid cells (column, row) with their minimal sizes in **w()** and **h()**. The **x()** and **y()** positions are ignored and can be (0, 0). **Fl_Grid** calculates widget positions and resizes the widgets to fit into the grid. It is possible to create a single row or column of widgets with **Fl_Grid**.

You should design your grid with the smallest possible sizes of all widgets in mind. **Fl_Grid** will automatically assign additional space to cells according to some rules (described later) when resizing the **Fl_Grid** widget.

**Hint:** You should set a minimum window size to make sure the **Fl_Grid** is never resized below its minimal sizes. Resizing below the given widget sizes results in undefined behavior.

**Fl_Grid** and other container widgets (e.g. **Fl_Group**) can be nested. One main advantage of this usage is that widget coordinates in embedded **Fl_Group** widgets become relative to the group and will be positioned as expected.

**Todo** This (relative group coordinates of nested groups of **Fl_Grid**) needs explanation and maybe an example.
**FL_Grid** child widgets are handled by its base class **FL_Group** but **FL_Grid** stores additional data corresponding to each widget in internal grid cells.

**FL_Grid** children are allowed to span multiple columns and rows like HTML `table` cells. Individual children can have fixed sizes or be aligned inside their cells (left, right, top, bottom, and more) and/or follow their cell sizes when the **FL_Grid** container is resized.

Note to resizing: since **FL_Grid** uses its own layout algorithm the normal **FL_Group::resizable()** widget is ignored (if set). Calling **init_sizes()** is not necessary.

**Note**

**FL_Grid** is, as of FLTK 1.4.0, still in experimental state and should be used with caution. The API can still be changed although it is assumed to be almost stable - as stable as possible for a first release.

**Example:** Simple 3x3 **FL_Grid** with five buttons:

```c++
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Grid.H>
#include <FL/Fl_Button.H>

int main(int argc, char **argv) {
  Fl_Double_Window *win = new Fl_Double_Window(320, 180, "3x3 FL_Grid with Buttons");
  // create the FL_Grid container with five buttons
  FL_Grid *grid = new FL_Grid(0, 0, win->w(), win->h());
  grid->layout(3, 3, 10, 10);
  grid->color(FL_WHITE);
  Fl_Button *b0 = new Fl_Button(0, 0, 0, 0, "New");
  Fl_Button *b1 = new Fl_Button(0, 0, 0, 0, "Options");
  Fl_Button *b3 = new Fl_Button(0, 0, 0, 0, "About");
  Fl_Button *b4 = new Fl_Button(0, 0, 0, 0, "Help");
  Fl_Button *b6 = new Fl_Button(0, 0, 0, 0, "Quit");
  // assign buttons to grid positions
  grid->addWidget(b0, 0, 0);
  grid->addWidget(b1, 0, 2);
  grid->addWidget(b3, 1, 1);
  grid->addWidget(b4, 2, 0);
  grid->addWidget(b6, 2, 2);
  grid->show_grid(1); // 1 to display grid helper lines
  grid->end();
  win->end();
  win->resizable(grid);
  win->size_range(300, 100);
  win->show(argc, argv);
  return Fl::run();
}
```

![Figure 34.19 Simple 3x3 FL_Grid](image.png)
34.56.2 Constructor & Destructor Documentation

34.56.2.1 Fl_Grid()

Fl_Grid::Fl_Grid (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ L = 0  )
Create a new Fl_Grid widget.

Todo More documentation of Fl_Grid constructor?

34.56.3 Member Function Documentation

34.56.3.1 cell() [1/2]

Fl_Grid::Cell ∗ Fl_Grid::cell (  
    Fl_Widget ∗ widget ) const
Get the grid cell of widget widget.
The pointer to the cell can be used for further assignment of properties like alignment etc.
Hint: If you know the row and column index of the cell you should use Fl_Grid::cell(int row, int col) instead because it is much faster.
Please see Fl_Grid::cell(int row, int col) for details and the validity of cell pointers.

Parameters

| in   | widget | widget whose cell is requested |

Return values

| null | if widget is not assigned to a cell |

34.56.3.2 cell() [2/2]

Fl_Grid::Cell ∗ Fl_Grid::cell (  
    int row,  
    int col  )
Get the grid cell of row row and column col.
Widgets and other attributes are organized in cells (Fl_Grid::Cell).
This cell is an opaque structure (class) with some public methods. Don't assume anything about grid cell sizes and ordering in memory. These are implementation details that can be changed without notice.
The validity of an Fl_Grid::Cell pointer is limited. It will definitely be invalidated when the overall grid layout is changed, for instance by calling layout(int, int).
Adding new cells beyond the current layout limits will also invalidate cell pointers but this is not (yet) implemented.
Attempts to assign widgets to out-of-bounds cells are currently ignored.
The only well-defined usage of cell pointers is to set one or more properties like widget alignment of a cell after retrieving the cell pointer. Don't store cell pointers in your program for later reference.

Parameters

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|}
\hline
in & row & row index \\
\hline
in & col & column index \\
\hline
\end{tabular}
\end{table}

Returns

pointer to cell

Return values

\begin{itemize}
\item \textbf{NULL} if row or col is out of bounds or no widget was assigned
\end{itemize}

34.56.3.3 clear_layout()

\begin{verbatim}
void Fl_Grid::clear_layout ( ) [virtual]
\end{verbatim}

Reset the layout w/o removing widgets.
Removes all cells and sets rows and cols to zero. Existing widgets are kept as children of the Fl_Group (base class) but are hidden.
This method should be rarely used. You may want to call Fl_Grid::clear() to remove all widgets and reset the layout to zero rows and columns.
You must call layout(int rows, int cols, ...) to set a new layout, allocate new cells, and assign widgets to new cells.

\textbf{Todo} Fl_Grid::clear() needs to be implemented as documented above!

34.56.3.4 col_gap() [1/2]

\begin{verbatim}
void Fl_Grid::col_gap ( 
       const int * value, 
       size_t size )
\end{verbatim}

Set more than one column gaps at once.

See also

Fl_Grid::col_weight(const int *value, size_t size) for handling of the value array and size.

34.56.3.5 col_gap() [2/2]

\begin{verbatim}
void Fl_Grid::col_gap ( 
       int col, 
       int value )
\end{verbatim}
Set the gap of column \texttt{col}.
Note that the gap is right of each column except the last one which is ignored. Use \texttt{margin()} for the right most column.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>\texttt{col}</th>
<th>column</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{value}</td>
<td>gap size after the column</td>
</tr>
</tbody>
</table>

### 34.56.3.6 \texttt{col_weight()} [1/2]

```c
void Fl_Grid::col_weight (  
    const int * value,
    size_t size  
)
```
Set the weight of more than one column.
The values are taken from the array \texttt{value} and assigned sequentially to columns, starting from column 0. If the array \texttt{size} is too large extraneous values are ignored.
Negative values in the array are not assigned to their columns, i.e. the existing value for the corresponding column is not changed.

**Example:**
```c
int val[] = { 0, 0, 50, -1, -1, 50, 0 };
grid->col_weight(val, sizeof(val)/sizeof(val[0]));
```

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>\texttt{value}</th>
<th>an array of column weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{size}</td>
<td>the size of the array (number of values)</td>
</tr>
</tbody>
</table>

### 34.56.3.7 \texttt{col_weight()} [2/2]

```c
void Fl_Grid::col_weight (  
    int \texttt{col},
    int \texttt{value}  
)
```
Set the weight of a column.
Column and row weights are used to distribute additional space when the grid is resized beyond its defined (minimal) size. All weight values are relative and can be chosen freely. Suggested weights are in the range \{0 .. 100\}, 0 (zero) disables resizing of the column.

**How does it work?**
Whenever additional space (say: \texttt{SPACE} in pixels) is to be distributed to a set of columns the weights of all columns are added to a value \texttt{SUM}, then every single column width is increased by the value (in pseudo code):
```c
col.width += \texttt{SPACE} * \texttt{col.weight} / \texttt{SUM}
```
Resulting pixel values are rounded to the next integer and rounding differences are added to or subtracted from the column with the highest weight. If more columns have the same weight one of them is chosen.

**Note**
If none of the columns considered for resizing have weights \textgreater{} 0 then \texttt{Fl_Grid} assigns the remaining space to an arbitrary column or to all considered columns evenly. This is implementation defined and can be changed without notice. You can avoid this situation by designing your grid with sensible sizes and weights.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>\texttt{col}</th>
<th>column number (counting from 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{value}</td>
<td>weight, must be \textgreater{} 0</td>
</tr>
</tbody>
</table>
34.56.3.8  col_width() [1/2]

```cpp
void Fl_Grid::col_width(
    const int *value,
    size_t size
)
```

Set minimal widths of more than one column. The values are taken from the array `value` and assigned sequentially to columns, starting from column 0. If the array `size` is too large extraneous values are ignored. Negative values in the array are not assigned to their columns, i.e. the existing value for the corresponding column is not changed.

Example:
```cpp
int widths[] = { 0, 0, 50, -1, -1, 50, 0 };
grid->col_width(widths, sizeof(width)/sizeof(width[0]));
```

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>value</th>
<th>an array of column widths</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>size</td>
<td>the size of the array (number of values)</td>
</tr>
</tbody>
</table>

34.56.3.9  col_width() [2/2]

```cpp
void Fl_Grid::col_width(
    int col,
    int value
)
```

Set the minimal width of a column. Column widths are calculated by using the maximum of all widget widths in that column and the given column width. After calculating the width additional space is added when resizing according to the weight of the column. You can set one or more column widths in one call by using `Fl_Grid::col_width(const int *value, size_t size)`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>col</th>
<th>column number (counting from 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>value</td>
<td>minimal column width, must be &gt;= 0</td>
</tr>
</tbody>
</table>

See also

`Fl_Grid::col_width(const int *value, size_t size)`

34.56.3.10  debug()

```cpp
void Fl_Grid::debug(
    int level = 127
)
```

Output layout information of this `Fl_Grid` to stderr. Parameter `level` will be used to define the amount of output.

- 0 = nothing
- 127 = everything
- other values not yet defined
Note

It is not yet defined which kind of values level will have, either a numerical value (127 = maximum, 0 = nothing) or a bit mask that determines what to output.

Todo Add more information about cells and children.
Control output by using level.

Parameters

| in  | level | not yet used (0-127, default = 127) |

34.56.3.11 draw()

```cpp
void Fl_Grid::draw () [protected], [virtual]
```

Draws the Fl_Grid widget and all children.
If the layout has been changed layout() is called before the widget is drawn so all children are arranged as designed.

See also

- layout()
- need_layout()

Implements Fl_Widget.

34.56.3.12 draw_grid()

```cpp
void Fl_Grid::draw_grid () [protected], [virtual]
```

Draws the grid helper lines for design and debugging purposes. This method is protected so it can be modified in subclasses.

34.56.3.13 gap()[1/2]

```cpp
void Fl_Grid::gap (  
    int * row_gap,  
    int * col_gap ) const
```

Get the default gaps for rows and columns.

Parameters

| out | row_gap | pointer to int to receive column gap, may be NULL |
| out | col_gap | pointer to int to receive column gap, may be NULL |

34.56.3.14 gap()[2/2]

```cpp
void Fl_Grid::gap (  
    int row_gap,  
    int col_gap = -1 ) [virtual]
```

Set default gaps for rows and columns.
All gaps are positioned below the rows and right of their columns.
The bottom row and the right-most column don't have a gap, i.e. the gap sizes of these columns and rows are ignored. You can use a right or bottom margin instead.
You have to specify at least one argument, col_gap is optional. If you don't specify an argument or use a negative value (e.g. -1) then that margin is not affected.
You can also initialize the default gaps with layout(int, int, int).

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>row_gap</th>
<th>default gap for all rows</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>col_gap</td>
<td>default gap for all columns</td>
</tr>
</tbody>
</table>

See also

Fl_Grid::layout(int rows, int cols, int margin, int gap)

34.56.3.15 layout() [1/2]

void Fl_Grid::layout ( ) [virtual]
Calculate the grid layout and resize and position all widgets.
This is called automatically when the Fl_Grid is resized. You need to call it once after you added widgets or moved widgets between cells.
Calling it once after all modifications are completed is enough.

Todo Document when and why to call layout() w/o args. See Fl_Flex::layout()

See also

Fl_Grid::layout(int rows, int cols, int margin, int gap)

34.56.3.16 layout() [2/2]

void Fl_Grid::layout (  
  int rows,  
  int cols,  
  int margin = -1,  
  int gap = -1  ) [virtual]

Set the basic layout parameters of the Fl_Grid widget.
You need to specify at least rows and cols to define a layout before you can add widgets to the grid.
Parameters margin and gap are optional.
You can call layout(int rows, int cols, int margin, int gap) again to change the layout but this is inefficient since all cells are reallocated if the layout changed.
Calling this with the same values of rows and cols is fast and can be used to change margin and gap w/o reallocating the cells.
margin sets all margins (left, top, right, bottom) to the same value. Negative values (e.g. -1) don't change the established margins. The default value set by the constructor is 0.
gap sets row and column gaps to the same value. Negative values (e.g. -1) do not affect the established gaps. The default value set by the constructor is 0.
After you added all widgets you must call layout() once without arguments to calculate the actual layout and to position and resize all widgets.

Todo Document when and why to call layout() w/o args. See Fl_Flex::layout()

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>rows</th>
<th>number of rows</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>cols</td>
<td>number of columns</td>
</tr>
<tr>
<td>in</td>
<td>margin</td>
<td>margin size inside the Fl_Grid's border</td>
</tr>
<tr>
<td>in</td>
<td>gap</td>
<td>gap size between cells</td>
</tr>
</tbody>
</table>
34.56.3.17 margin()[1/2]

```cpp
int Fl_Grid::margin (  
    int * left,  
    int * top,  
    int * right,  
    int * bottom ) const
```

Returns all outside margin sizes of the grid. All margin sizes are returned in the given arguments. If any argument is NULL the respective value is not returned.

**Parameters**

<table>
<thead>
<tr>
<th>out</th>
<th>left</th>
<th>returns left margin if not NULL</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>top</td>
<td>returns top margin if not NULL</td>
</tr>
<tr>
<td>out</td>
<td>right</td>
<td>returns right margin if not NULL</td>
</tr>
<tr>
<td>out</td>
<td>bottom</td>
<td>returns bottom margin if not NULL</td>
</tr>
</tbody>
</table>

Returns whether all margins are equal

**Return values**

| 1 | all margins have the same size |
| 0 | at least one margin has a different size |

34.56.3.18 margin()[2/2]

```cpp
void Fl_Grid::margin (  
    int left,  
    int top = -1,  
    int right = -1,  
    int bottom = -1 ) [virtual]
```

Set all margins (left, top, right, bottom). All margins are measured in pixels inside the box borders. You need to specify at least one argument, all other arguments are optional. If you don’t specify an argument or use a negative value (e.g., -1) then that particular margin is not affected.

**Parameters**

| in | left | left margin |
| in | top  | top margin |
| in | right | right margin |
| in | bottom | bottom margin |
34.56.3.19 need_layout()

```
void Fl_Grid::need_layout (  
    int set ) [inline]
```

Request or reset the request to calculate the layout of children.  
If called with **true** (1) this calls `redraw()` to schedule a full `draw()`.  
When draw is eventually called, the layout is (re)calculated before actually drawing the widget.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>set</th>
<th>1 to request layout calculation, 0 to reset the request</th>
</tr>
</thead>
</table>

34.56.3.20 on_remove()

```
void Fl_Grid::on_remove (  
    int index ) [protected], [virtual]
```

**Fl_Group** calls this method when a child widget is about to be removed.  
Make sure that the widget is also removed from our internal list of children.  
Reimplemented from **Fl_Group**.

34.56.3.21 resize()

```
void Fl_Grid::resize (  
    int X,  
    int Y,  
    int W,  
    int H ) [virtual]
```

Recalculate the layout and position and resize all widgets.  
This method overrides **Fl_Group::resize()** and calculates all positions and sizes of its children according to its own rules.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y</th>
<th>new widget position</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>W,H</td>
<td>new widget size</td>
</tr>
</tbody>
</table>

Reimplemented from **Fl_Widget**.

34.56.3.22 row_gap() [1/2]

```
void Fl_Grid::row_gap (  
    const int * value,  
    size_t size )
```

Set more than one row gaps at once.

See also  
**Fl_Grid::col_weight(const int *value, size_t size)** for handling of the value array and `size`.

34.56.3.23 row_gap() [2/2]

```
void Fl_Grid::row_gap (  
    int row,  
    int value )
```
Set the gap of row row.
Note that the gap is below each row except the last one which is ignored. Use margin() for the bottom row.

**Parameters**

| in | row | row   |
| in | value | gap size below the row |

### 34.56.3.24 row_height() [1/2]

```cpp
void Fl_Grid::row_height(
    const int *value,
    size_t size
)
```

Set the minimal row height of more than one row.

**Parameters**

| in | value | array of height values |
| in | size  | size of array value    |

See also

Fl_Grid::col_weight(const int *value, size_t size) for handling of the value array and size.

### 34.56.3.25 row_height() [2/2]

```cpp
void Fl_Grid::row_height(
    int row,
    int value
)
```

Set the minimal row height of row row.

**Parameters**

| in | row | row   |
| in | value | minimal height of the row |

### 34.56.3.26 row_weight() [1/2]

```cpp
void Fl_Grid::row_weight(
    const int *value,
    size_t size
)
```

Set the weight of more than one row.

**Parameters**

| in | value | array of height values |
| in | size  | size of array value    |
See also

\texttt{Fl\_Grid::col\_weight(const int *value, size\_t size)} for handling of the value array and size.

### 34.56.3.27 row\_weight() [2/2]

```cpp
void Fl_Grid::rowweight(
    int row,
    int value)
```

Set the row weight of row \texttt{row}.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>row</th>
<th>row</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>weight of the row</td>
</tr>
</tbody>
</table>

### 34.56.3.28 show\_grid() [1/2]

```cpp
void Fl_Grid::show_grid(
    int set) [inline]
```

Enable or disable drawing of the grid helper lines for visualization.

Use this method during the design stage of your \texttt{Fl\_Grid} widget or for debugging if widgets are not positioned as intended.

The default is a light green color but you can change it for better contrast if needed, see \texttt{show\_grid(int set, Fl\_Color col)}.

**Note**

You can define the environment variable FLTK\_GRID\_DEBUG=1 to set \texttt{show\_grid(1)} for all \texttt{Fl\_Grid} widgets at construction time. This enables you to debug the grid layout w/o changing code.

**Parameters**

| in  | set | 1 (true) = draw, 0 = don't draw the grid |

See also

\texttt{show\_grid(int set, Fl\_Color col)}

### 34.56.3.29 show\_grid() [2/2]

```cpp
void Fl_Grid::show_grid(
    int set,
    Fl\_Color col) [inline]
```

Enable or disable drawing of the grid helper lines for visualization.

This method also sets the color used for the helper lines.

The default is a light green color but you can change it to any color for better contrast if needed.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>set</th>
<th>1 (true) = draw, 0 = don't draw the grid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>color to use for the grid helper lines</td>
</tr>
</tbody>
</table>
See also

```
show_grid(int set)
```

### 34.56.3.30 widget() [1/2]

```c
Fl_Grid::Cell * Fl_Grid::widget (  
    Fl_Widget * wi,  
    int row,  
    int col,  
    Fl_Grid_Align align = FL_GRID_FILL )
```

Assign a widget to a grid cell and set its alignment.
This short form sets row and column spanning attributes to (1, 1).
For more information see Fl_Grid::widget(Fl_Widget *wi, int row, int col, int rowspan, int colspan, Fl_Grid_Align align)

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>wi</th>
<th>widget to be assigned to the cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>row</td>
<td>row</td>
</tr>
<tr>
<td>in</td>
<td>col</td>
<td>column</td>
</tr>
<tr>
<td>in</td>
<td>align</td>
<td>widget alignment inside the cell</td>
</tr>
</tbody>
</table>

**Returns**

assigned cell

**Return values**

```
NULL if row or col is out of bounds
```

See also

```
Fl_Grid::widget(Fl_Widget *wi, int row, int col, int rowspan, int colspan, Fl_Grid_Align align)
```

### 34.56.3.31 widget() [2/2]

```c
Fl_Grid::Cell * Fl_Grid::widget (  
    Fl_Widget * wi,  
    int row,  
    int col,  
    int rowspan,  
    int colspan,  
    Fl_Grid_Align align = FL_GRID_FILL )
```

Assign a widget to a grid cell and set cell spanning and alignment.
Default alignment is FL_GRID_FILL which stretches the widget in horizontal and vertical directions to fill the whole cell(s) given by colspan and rowspan.
You can use this method to move a widget from one cell to another; it is automatically removed from its old cell. If the new cell is already assigned to another widget that widget is deassigned but kept as a child of the group.
Before you can assign a widget to a cell it must have been created as a child of the Fl_Grid widget (i.e. its Fl_Group).

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>wi</th>
<th>widget to be assigned to the cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>row</td>
<td>row</td>
</tr>
</tbody>
</table>
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in col</td>
<td>column</td>
</tr>
<tr>
<td>in rowspan</td>
<td>vertical span in cells, default 1</td>
</tr>
<tr>
<td>in colspan</td>
<td>horizontal span in cells, default 1</td>
</tr>
<tr>
<td>in align</td>
<td>widget alignment inside the cell</td>
</tr>
</tbody>
</table>

Returns

assigned cell

Return values

`NULL` if row or col is out of bounds or wi is not a child

The documentation for this class was generated from the following files:

- Fl_Grid.H
- Fl_Grid.cxx

34.57 Fl_Group Class Reference

The Fl_Group class is the FLTK container widget.

#include <Fl_Group.H>

Inheritance diagram for Fl_Group:
Public Member Functions

- **Fl_Widget **& _ddfdesign_kludge ()
  This is for forms compatibility only.

- **void** add (Fl_Widget &)
  The widget is removed from its current group (if any) and then added to the end of this group.

- **void** add (Fl_Widget *o)
  See void Fl_Group::add(Fl_Widget *w)

- **void** add_resizable (Fl_Widget *o)
  Adds a widget to the group and makes it the resizable widget.

- **Fl_Widget **const * array () const
  Returns a pointer to the array of children.

- **Fl_Group** const * as_group () const FL_OVERRIDE
  Returns an Fl_Group pointer if this widget is an Fl_Group.

- **void** begin ()
  Sets the current group so you can build the widget tree by just constructing the widgets.

- **Fl_Widget** const * child (int n) const
  Returns array()[n].

- **int** children () const
  Returns how many child widgets the group has.

- **void** clear ()
  Deletes all child widgets from memory recursively.

- **unsigned int** clip_children ()
  Returns the current clipping mode.

- **void** clip_children (int c)
  Controls whether the group widget clips the drawing of child widgets to its bounding box.

- **virtual int** delete_child (int n)
  Removes the widget at index from the group and deletes it.

- **void** end ()
  Exactly the same as current(this->parent()).

- **int** find (const Fl_Widget &o) const
  See int Fl_Group::find(const Fl_Widget *w) const.

- **int** find (const Fl_Widget *) const
  Searches the child array for the widget and returns the index.

- **Fl_Group** (int, int, int, int, const char * = 0)
  Creates a new Fl_Group widget using the given position, size, and label string.

- **void** focus (Fl_Widget *W)

- **void** forms_end ()
  This is for forms compatibility only.

- **int** handle (int) FL_OVERRIDE
  Handles the specified event.

- **void** init_sizes ()
  Resets the internal array of widget sizes and positions.

- **void** insert (Fl_Widget &, int i)
  The widget is removed from its current group (if any) and then inserted into this group.

- **void** insert (Fl_Widget &, Fl_Widget *before)
  This does insert(w, find(before)).

- **void** remove (Fl_Widget &)
  Removes a widget from the group but does not delete it.

- **void** remove (Fl_Widget *o)
Removes the widget o from the group.

- **void remove (int index)**
  Removes the widget at index from the group but does not delete it.

- **Fl_Widget * resizable () const**
  Returns the group's resizable widget.

- **void resizable (Fl_Widget &o)**
  Sets the group's resizable widget.

- **void resizable (Fl_Widget *o)**
  The resizable widget defines both the resizing box and the resizing behavior of the group and its children.

- **void resize (int, int, int, int) FL_OVERRIDE**
  Resizes the Fl_Group widget and all of its children.

- **virtual ~Fl_Group ()**
  The destructor also deletes all the children.

### Static Public Member Functions

- **static Fl_Group * current ()**
  Returns the currently active group.

- **static void current (Fl_Group *g)**
  Sets the current group.

### Protected Member Functions

- **Fl_Rect * bounds ()**
  Returns the internal array of widget sizes and positions.

- **void draw () FL_OVERRIDE**
  Draws the widget.

- **void draw_child (Fl_Widget &widget) const**
  Forces a child to redraw.

- **void draw_children ()**
  Draws all children of the group.

- **void draw_outside_label (const Fl_Widget &widget) const**
  Parents normally call this to draw outside labels of child widgets.

- **virtual int on_insert (Fl_Widget *w, int)**
  Allow derived groups to act when a widget is added as a child.

- **virtual int on_move (int, int)**
  Allow derived groups to act when a widget is moved within the group.

- **virtual void on_remove (int)**
  Allow derived groups to act when a child widget is removed from the group.

- **int * sizes ()**
  Returns the internal array of widget sizes and positions.

- **void update_child (Fl_Widget &widget) const**
  Draws a child only if it needs it.

### Additional Inherited Members

#### 34.57.1 Detailed Description

The Fl_Group class is the FLTK container widget. It maintains an array of child widgets. These children can themselves be any widget including Fl_Group. The most important subclass of Fl_Group is Fl_Window, however groups can also be used to control radio buttons or to enforce resize behavior.
The tab and arrow keys are used to move the focus between widgets of this group, and to other groups. The only modifier grabbed is shift (for shift-tab), so that ctrl-tab, alt-up, and such are free for the app to use as shortcuts.

To remove a widget from the group and destroy it, in 1.3.x (and up) you can simply use:
```
destroy some_widget;
```
.. and this will trigger proper scheduling of the widget's removal from its parent group.

If used as a child of `Fl_Tabs`, setting `when(FL_WHEN_CLOSED)` will enable the Close button in the corresponding tab. If the user clicks the Close button, the callback of this group will be called with the callback reason `FL_REASON_CLOSED`.

### 34.57.2 Constructor & Destructor Documentation

#### 34.57.2.1 Fl_Group()

```
Fl_Group::Fl_Group (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ l = 0 )  
```

Creates a new `Fl_Group` widget using the given position, size, and label string. The default boxtype is `FL_NO_BOX`.

#### 34.57.2.2 ~Fl_Group()

```
Fl_Group::~Fl_Group ( ) [virtual]  
```

This destructor also deletes all the children.

It is allowed that the `Fl_Group` and all of its children are automatic (local) variables, but you must declare the `Fl_Group` first, so that it is destroyed last.

If you add static or automatic (local) variables to an `Fl_Group`, then it is your responsibility to remove (or delete) all such static or automatic child widgets before destroying the group - otherwise the group will attempt to call delete operator on them leading to undefined behavior!

### 34.57.3 Member Function Documentation

#### 34.57.3.1 array()

```
Fl_Widget ∗const ∗ Fl_Group::array ( ) const  
```

Returns a pointer to the array of children.

**Note**

This pointer is only valid until the next time a child is added or removed.

#### 34.57.3.2 as_group() [1/2]

```
Fl_Group const ∗ Fl_Group::as_group ( ) const [inline], [virtual]  
```

Reimplemented from `Fl_Widget`.

#### 34.57.3.3 as_group() [2/2]

```
Fl_Group ∗ Fl_Group::as_group ( ) [inline], [virtual]  
```

Returns an `Fl_Group` pointer if this widget is an `Fl_Group`. 

---

Generated by Doxygen
Use this method if you have a widget (pointer) and need to know whether this widget is derived from Fl_Group. If it returns non-NULL, then the widget in question is derived from Fl_Group, and you can use the returned pointer to access its children or other Fl_Group-specific methods.

Example:
```c
void my_callback (Fl_Widget *w, void *) {
    Fl_Group *g = w->as_group();
    if (g)
        printf ("This group has %d children\n", g->children());
    else
        printf ("This widget is not a group!\n");
}
```

Return values
- **NULL** if this widget is not derived from Fl_Group.

Note
- This method is provided to avoid dynamic_cast.

See also
- Fl_Widget::as_window(), Fl_Widget::as_gl_window()

Reimplemented from Fl_Widget.

34.57.3.4 begin()

```c
void Fl_Group::begin ( )
```

Sets the current group so you can build the widget tree by just constructing the widgets. begin() is automatically called by the constructor for Fl_Group (and thus for Fl_Window as well). begin() is exactly the same as current(this). Don’t forget to end() the group or window!

34.57.3.5 bounds()

```c
Fl_Rect * Fl_Group::bounds ( ) [protected]
```

Returns the internal array of widget sizes and positions. The bounds() array stores the initial positions of widgets as Fl_Rect’s. The size of the array is children() + 2.

- The first Fl_Rect is the group,
- the second is the resizable (clipped to the group),
- the rest are the children.

This is a convenient order for the resize algorithm. If the group and/or the resizable() is a Fl_Window (or subclass) then the x() and y() coordinates of their respective Fl_Rect’s are zero.

Note
- You should never need to use this protected method directly, unless you have special needs to rearrange the children of a Fl_Group. Fl_Tile uses this to rearrange its widget positions. The returned array should be considered read-only. Do not change its contents. If you need to rearrange children in a group, do so by resizing the children and call init_sizes().

#include <FL/Fl_Rect.H> if you want to access the bounds() array in your derived class. Fl_Rect.H is intentionally not included by Fl_Group.H to avoid unnecessary dependencies.

Returns
- Array of Fl_Rect’s with widget positions and sizes. The returned array is only valid until init_sizes() is called or widgets are added to or removed from the group.
See also

```
init_sizes()
```

Since

FLTK 1.4.0

### 34.57.3.6 child()

**FL_Widget * Fl_Group::child ( int n ) const [inline]**

Returns `array()[n].`

*No range checking is done!*

### 34.57.3.7 clear()

```cpp
void Fl_Group::clear ( void )
```

Deletes all child widgets from memory recursively.

This method differs from the `remove()` method in that it affects all child widgets and deletes them from memory.

The `resizable()` widget of the `Fl_Group` is set to the `Fl_Group` itself.

### 34.57.3.8 clip_children() [1/2]

```cpp
unsigned int Fl_Group::clip_children ( ) [inline]
```

Returns the current clipping mode.

Returns

`true`, if clipping is enabled, `false` otherwise.

See also

```
void Fl_Group::clip_children(int c)
```

### 34.57.3.9 clip_children() [2/2]

```cpp
void Fl_Group::clip_children ( int c ) [inline]
```

Controls whether the group widget clips the drawing of child widgets to its bounding box.

Set `c` to `1` if you want to clip the child widgets to the bounding box.

The default is to not clip (`0`) the drawing of child widgets.

### 34.57.3.10 current() [1/2]

**Fl_Group * Fl_Group::current ( ) [static]**

Returns the currently active group.

The `Fl_Widget` constructor automatically does `current() -> add(widget)` if this is not null. To prevent new widgets from being added to a group, call `Fl_Group::current(0).

### 34.57.3.11 current() [2/2]

```cpp
void Fl_Group::current ( Fl_Group * g ) [static]
```

Sets the current group.

See also

```
Fl_Group::current()
```
### 34.57.3.12 delete_child()

```cpp
int Fl_Group::delete_child ( int index ) [virtual]
```

Removes the widget at `index` from the group and deletes it. This method does nothing if `index` is out of bounds. This method differs from the `remove()` method in that it deletes the widget from memory. Since this method is virtual it can be reimplemented in subclasses with additional requirements and consequences. See the documentation of subclasses. Many subclasses don't need to reimplement this method.

**Note**

This method *may* refuse to remove and delete the widget if it is an essential part of the Fl_Group, for instance a scrollbar in an Fl_Scroll group. In this case the widget is neither removed nor deleted.

This method does not call `init_sizes()` or `redraw()`. This is left to user code if necessary. Returns 0 if the widget was removed and deleted. Return values > 0 are reserved for use by FLTK core widgets. Return values < 0 are free to be used by user defined widgets.

**Todo** Reimplementation of `Fl_Group::delete_child(int)` in more FLTK subclasses. This is not yet complete.

#### Parameters

| in | index | index of child to be removed |

#### Returns

success (0) or error code

<table>
<thead>
<tr>
<th>Return values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>success</td>
</tr>
<tr>
<td>1</td>
<td>index out of range</td>
</tr>
<tr>
<td>2</td>
<td>widget not allowed to be removed (see note)</td>
</tr>
<tr>
<td>&gt;2</td>
<td>reserved for FLTK use</td>
</tr>
</tbody>
</table>

Since FLTK 1.4.0

Reimplemented in Fl_Scroll.

### 34.57.3.13 draw()

```cpp
void Fl_Group::draw ( ) [protected], [virtual]
```

Draws the widget. Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead. Override this function to draw your own widgets. If you ever need to call another widget's draw method *from within your own draw() method*, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.

34.57.3.14 draw_child()

void Fl_Group::draw_child (const Fl_Widget & widget) const [protected]

Forces a child to redraw.
This draws a child widget, if it is not clipped. The damage bits are cleared after drawing.

34.57.3.15 draw_children()

void Fl_Group::draw_children () [protected]

Draws all children of the group.
This is useful, if you derived a widget from Fl_Group and want to draw a special border or background. You can call draw_children() from the derived draw() method after drawing the box, border, or background.

34.57.3.16 end()

void Fl_Group::end ()

Exactly the same as current(this->parent()).
Any new widgets added to the widget tree will be added to the parent of the group.

34.57.3.17 find()

int Fl_Group::find (const Fl_Widget * o) const

Searches the child array for the widget and returns the index.
Returns children() if the widget is NULL or not found.

34.57.3.18 focus()

void Fl_Group::focus (Fl_Widget * W) [inline]

Deprecated This is for backwards compatibility only. You should use W->take_focus() instead.

See also

Fl_Widget::take_focus();

34.57.3.19 handle()

int Fl_Group::handle (int event) [virtual]

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.
This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in event | the kind of event received |

Generated by Doxygen
Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the event was not used or understood</td>
</tr>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

Fl_Glut_Widget

Reimplemented from Fl_Widget.
Reimplemented in Fl_Table, Fl_Terminal, Fl_Text_Display, Fl_Text_Editor, Fl_Tree, Fl_Spinner, Fl_Table_Row, Fl_Tile, Fl_Help_View, Fl_Scroll, Fl_Tabs, Fl_Window, and Fl_Glut_Window.

### 34.57.3.20 init_sizes()

def Fl_Group::init_sizes()
Resets the internal array of widget sizes and positions.
The Fl_Group widget keeps track of the original widget sizes and positions when resizing occurs so that if you resize a window back to its original size the widgets will be in the correct places. If you rearrange the widgets in your group, call this method to register the new arrangement with the Fl_Group that contains them. If you add or remove widgets, this will be done automatically.

Note

The internal array of widget sizes and positions will be allocated and filled when the next resize() occurs. For more information on the contents and structure of the bounds() array see bounds().

See also

bounds()
sizes() (deprecated)

### 34.57.3.21 insert() [1/2]

def Fl_Group::insert(Fl_Widget & o, int index)
The widget is removed from its current group (if any) and then inserted into this group. It is put at index n - or at the end, if n > children(). This can also be used to rearrange the widgets inside a group.

### 34.57.3.22 insert() [2/2]

def Fl_Group::insert(Fl_Widget & o, Fl_Widget * before) [inline]
This does insert(w, find(before)). This will append the widget if before is not in the group.

### 34.57.3.23 on_insert()

def Fl_Group::on_insert(Fl_Widget * candidate, int index) [protected], [virtual]
Allow derived groups to act when a widget is added as a child.
Widgets derived from Fl_Group may store additional data for their children. Overriding this method will allow derived classes to generate these data structures just before the child is added.
This method usually returns the same index that was given in the parameters. By setting a new index, the position of other widgets in the child pointer array can be preserved (e.g., Fl_Scroll keeps its scroll bars as the last two children). By returning -1, Fl_Group::insert will not add the child to array_. This is not recommended, but Fl_Table does something similar to forward children to a hidden group.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>candidate</td>
<td>the candidate will be added to the child array_ after this method returns.</td>
</tr>
<tr>
<td>index</td>
<td>add the child at this position in the array_</td>
</tr>
</tbody>
</table>

### Returns

- index to position the child as planned
- a new index to force the child to a different position
- -1 to keep the group from adding the candidate

Reimplemented in Fl_Scroll, Fl_Tabs, and Fl_Tile.

#### 34.57.3.24 on_move()

```cpp
int Fl_Group::on_move (int oldIndex, int newIndex) [protected], [virtual]
```

Allow derived groups to act when a widget is moved within the group. Widgets derived from Fl_Group may store additional data for their children. Overriding this method will allow derived classes to move these data structures just before the child itself is moved.

This method usually returns the new index that was given in the parameters. By setting a different destination index, the position of other widgets in the child pointer array can be preserved. By returning -1, Fl_Group::insert will not move the child.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oldIndex</td>
<td>the current index of the child that will be moved</td>
</tr>
<tr>
<td>newIndex</td>
<td>the new index of the child</td>
</tr>
</tbody>
</table>

### Returns

- newIndex to position the child as planned
- a different index to force the child to a different position
- -1 to keep the group from moving the child

Reimplemented in Fl_Scroll, Fl_Tabs, and Fl_Tile.

#### 34.57.3.25 on_remove()

```cpp
void Fl_Group::on_remove (int index) [protected], [virtual]
```

Allow derived groups to act when a child widget is removed from the group. Widgets derived from Fl_Group may store additional data for their children. Overriding this method will allow derived classes to remove these data structures just before the child is removed.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>index</td>
<td>remove the child at this position in the array_</td>
</tr>
</tbody>
</table>

Generated by Doxygen
Reimplemented in Fl_Flex, Fl_Grid, Fl_Tabs, and Fl_Tile.

34.57.3.26 remove() [1/3]

```cpp
void Fl_Group::remove (Fl_Widget & o )
```
Removes a widget from the group but does not delete it.
This method does nothing if the widget is not a child of the group.
This method differs from the `clear()` method in that it only affects a single widget and does not delete it from memory.

*Note*

If you have the child's index anyway, use `remove(int index)` instead, because this doesn't need a child lookup in the group's table of children. This can be much faster, if there are lots of children.

34.57.3.27 remove() [2/3]

```cpp
void Fl_Group::remove (Fl_Widget * o ) [inline]
```
Removes the widget `o` from the group.

See also

```cpp
void remove(Fl_Widget&)
```

34.57.3.28 remove() [3/3]

```cpp
void Fl_Group::remove (int index)
```
Removes the widget at `index` from the group but does not delete it.
This method does nothing if `index` is out of bounds.
This method differs from the `clear()` method in that it only affects a single widget and does not delete it from memory.

Since

FLTK 1.3.0

34.57.3.29 resizable() [1/3]

```cpp
Fl_Widget * Fl_Group::resizable ( ) const [inline]
```
Returns the group's resizable widget.

See `void Fl_Group::resizable(Fl_Widget *o)`

34.57.3.30 resizable() [2/3]

```cpp
void Fl_Group::resizable (Fl_Widget & o ) [inline]
```
Sets the group's resizable widget.

See `void Fl_Group::resizable(Fl_Widget *o)`

34.57.3.31 resizable() [3/3]

```cpp
void Fl_Group::resizable (Fl_Widget * o ) [inline]
```
The resizable widget defines both the resizing box and the resizing behavior of the group and its children.
If the resizable is NULL the group's size is fixed and all of the widgets in the group remain a fixed size and distance from the top-left corner. This is the default for groups derived from Fl_Window and Fl_Pack.

The resizable may be set to the group itself, in which case all of the widgets that are its direct children are resized proportionally. This is the default value for Fl_Group.

The resizable widget defines the resizing box for the group, which could be the group itself or one of the group's direct children. When the group is resized it calculates a new size and position for all of its children. Widgets that are horizontally or vertically inside the dimensions of the box are scaled to the new size. Widgets outside the box are moved.

Note

The resizable of a group must be one of

- NULL
- the group itself
- a direct child of the group.

If you set any other widget that is not a direct child of the group as its resizable then the behavior is undefined. This is not checked by Fl_Group for historical reasons.

In these examples the gray area is the resizable:

![Figure 34.21 before resize](image1)

![Figure 34.22 after resize](image2)

It is possible to achieve any type of resize behavior by using an invisible Fl_Box as the resizable and/or by using a hierarchy of Fl_Group widgets, each with their own resizing strategies.

See the How Does Resizing Work? chapter for more examples and detailed explanation.
The resizable() widget of a window can also affect the window's resizing behavior if Fl_Window::size_range() is not called. Please see Fl_Window::default_size_range() for more information on how the default size range is calculated.

See also

Fl_Window::size_range()
Fl_Window::default_size_range()
34.57.3.34 update_child()

void Fl_Group::update_child (  
    Fl_Widget & widget ) const  [protected]

Draws a child only if it needs it.
This draws a child widget, if it is not clipped and if any damage() bits are set. The damage bits are cleared after
drawing.

See also
    Fl_Group::draw_child(Fl_Widget& widget) const

The documentation for this class was generated from the following files:

• Fl_Group.H
• Fl_Group.cxx
• forms_compatibility.cxx

34.58 Fl_Help_Block Struct Reference

Public Attributes
• Fl_Color bgcolor
• uchar border
• const char * end
• int h
• int line [32]
• int ol
• int ol_num
• const char * start
• int w
• int x
• int y

The documentation for this struct was generated from the following file:

• Fl_Help_View.H

34.59 Fl_Help_Dialog Class Reference

The Fl_Help_Dialog widget displays a standard help dialog window using the Fl_Help_View widget.

Public Member Functions
• Fl_Help_Dialog ()
    The constructor creates the dialog pictured above.
• int h ()
    Returns the position and size of the help dialog.
• void hide ()
    Hides the Fl_Help_Dialog window.
• int load (const char * f)
    Loads the specified HTML file into the Fl_Help_View widget.
• void position (int xx, int yy)
    Set the screen position of the dialog.
• void resize (int xx, int yy, int ww, int hh)
    Change the position and size of the dialog.
• void show ()
Shows the Fl_Help_Dialog window.

- **void show (int argc, char **argv)**
  Shows the main Help Dialog Window Delegates call to encapsulated window. void Fl_Window::show(int argc, char **argv) instance method.

- **Fl_Fontsize textsize ()**
  Sets or gets the default text size for the help view.

- **void textsize (Fl_Fontsize s)**
  Sets or gets the default text size for the help view.

- **void topline (const char *n)**
  Sets the top line in the Fl_Help_View widget to the named or numbered line.

- **void topline (int n)**
  Sets the top line in the Fl_Help_View widget to the named or numbered line.

- **const char * value () const**
  The first form sets the current buffer to the string provided and reformats the text.

- **void value (const char *f)**
  The first form sets the current buffer to the string provided and reformats the text.

- **int visible ()**
  Returns 1 if the Fl_Help_Dialog window is visible.

- **int w ()**
  Returns the position and size of the help dialog.

- **int x ()**
  Returns the position and size of the help dialog.

- **int y ()**
  Returns the position and size of the help dialog.

- **~Fl_Help_Dialog ()**
  The destructor destroys the widget and frees all memory that has been allocated for the current file.

### 34.59.1 Detailed Description

The Fl_Help_Dialog widget displays a standard help dialog window using the Fl_Help_View widget. The Fl_Help_Dialog class is not part of the FLTK core library, but instead of fltk_images. Use --use-images when compiling with fltk-config.

![Figure 34.23 Fl_Help_Dialog](image)

### 34.59.2 Member Function Documentation
34.59.2.1 load()

```c
int Fl_Help_Dialog::load (
    const char * f )
```

Loads the specified HTML file into the Fl_Help_View widget. The filename can also contain a target name ("filename.html#target"). Always use forward slashes as path delimiters, MSWindows-style backslashes are not supported here.

**Parameters**

- `f` : the name and path of an HTML file

**Returns**

- 0 on success, -1 on error

**See also**

- Fl_Help_View::load(), fl_load_uri()

34.59.2.2 show()

```c
void Fl_Help_Dialog::show ( )
```

Shows the Fl_Help_Dialog window. Shows the main Help Dialog Window Delegates call to encapsulated window void Fl_Window::show() method.

34.59.2.3 textsize()

```c
void Fl_Help_Dialog::textsize ( 
    Fl_Fontsize s )
```

Sets or gets the default text size for the help view. Sets the internal Fl_Help_View instance text size. Delegates call to encapsulated view void Fl_Help_View::textsize(Fl_Fontsize s) instance method.

34.59.2.4 value() [1/2]

```c
const char * Fl_Help_Dialog::value ( ) const
```

The first form sets the current buffer to the string provided and reformats the text. It also clears the history of the “back” and “forward” buttons. The second form returns the current buffer contents.

34.59.2.5 value() [2/2]

```c
void Fl_Help_Dialog::value ( 
    const char * v )
```

The first form sets the current buffer to the string provided and reformats the text. It also clears the history of the “back” and “forward” buttons. The second form returns the current buffer contents.

The documentation for this class was generated from the following files:

- Fl_Help_Dialog.H
- Fl_Help_Dialog.cxx
- Fl_Help_Dialog_Dox.cxx

### 34.60 Fl_Help_Font_Stack Struct Reference

**Public Member Functions**

- `size_t count () const`
Gets the current count of font style elements in the stack.

- **Fl_Help_Font_Smittk()**
  font stack construction, initialize attributes.
- **void init(Fl_Font f, Fl_Fontsize s, Fl_Color c)**
- **void pop(Fl_Font f, Fl_Fontsize s, Fl_Color c)**
  Pops from the stack the font style triplet and calls fl_font() & fl_color() adequately.
- **void push(Fl_Font f, Fl_Fontsize s, Fl_Color c)**
  Pushes the font style triplet on the stack, also calls fl_font() & fl_color() adequately.
- **void top(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c)**
  Gets the top (current) element on the stack.

Protected Attributes

- **Fl_Help_Font_Style els_[MAX_FL_HELP_FS_ELTS]**
  font elements
- **size_t nfonts_**
  current number of fonts in stack

The documentation for this struct was generated from the following file:

- Fl_Help_View.H

34.61 Fl_Help_Font_Style Struct Reference

Fl_Help_View font stack element definition.
#include <Fl_Help_View.H>

Public Member Functions

- **Fl_Help_Font_Style(Fl_Font afont, Fl_Fontsize asize, Fl_Color acolor)**
- **void get(Fl_Font &afont, Fl_Fontsize &asize, Fl_Color &acolor)**
  Gets current font attributes.
- **void set(Fl_Font afont, Fl_Fontsize asize, Fl_Color acolor)**
  Sets current font attributes.

Public Attributes

- **Fl_Color c**
  Font Color.
- **Fl_Font f**
  Font.
- **Fl_Fontsize s**
  Font Size.

34.61.1 Detailed Description

Fl_Help_View font stack element definition.
The documentation for this struct was generated from the following file:

- Fl_Help_View.H

34.62 Fl_Help_Link Struct Reference

Definition of a link for the html viewer.
#include <Fl_Help_View.H>
**Public Attributes**

- `char filename [192]`
  
  Reference filename.
- `int h`
  
  Height of link text.
- `char name [32]`
  
  Link target (blank if none)
- `int w`
  
  Width of link text.
- `int x`
  
  X offset of link text.
- `int y`
  
  Y offset of link text.

**34.62.1 Detailed Description**

Definition of a link for the html viewer.
The documentation for this struct was generated from the following file:

- `Fl_Help_View.H`

**34.63 Fl_Help_Target Struct Reference**

*Fl_Help_Target* structure.

```c
#include <Fl_Help_View.H>
```

**Public Attributes**

- `char name [32]`
  
  Target name.
- `int y`
  
  Y offset of target.

**34.63.1 Detailed Description**

*Fl_Help_Target* structure.
The documentation for this struct was generated from the following file:

- `Fl_Help_View.H`

**34.64 Fl_Help_View Class Reference**

The *Fl_Help_View* widget displays HTML text.

```c
#include <Fl_Help_View.H>
```

Inheritance diagram for *Fl_Help_View*:
Public Member Functions

- void **clear_selection** ()
  Removes the current text selection.
- const char ∗**directory** () const
  Returns the current directory for the text in the buffer.
- const char ∗**filename** () const
  Returns the current filename for the text in the buffer.
- int **find** (const char ∗s, int p=0)
  Finds the specified string at starting position p.
- Fl_Help_View (int xx, int yy, int ww, int hh, const char ∗l=0)
  The constructor creates the Fl_Help_View widget at the specified position and size.
- int **handle** (int) FL_OVERRIDE
  Handles events in the widget.
- int **leftline** () const
  Gets the left position in pixels.
- void **leftline** (int)
  Scrolls the text to the indicated position, given a pixel column.
- void **link** (Fl_Help_Func ∗fn)
  This method assigns a callback function to use when a link is followed or a file is loaded (via Fl_Help_View::load()) that requires a different file or path.
- int **load** (const char ∗f)
  Loads the specified file.
- void **resize** (int, int, int, int) FL_OVERRIDE
  Resizes the help widget.
- int **scrollbar_size** () const
  Gets the current size of the scrollbars' troughs, in pixels.
- void **scrollbar_size** (int newSize)
  Sets the pixel size of the scrollbars' troughs to newSize, in pixels.
- void **select_all** ()
  Selects all the text in the view.
- int **size** () const
  Gets the size of the help view.
- void **size** (int W, int H)
- Fl_Color **textcolor** () const
  Returns the current default text color.
- void **textcolor** (Fl_Color c)
  Sets the default text color.
- Fl_Font **textfont** () const
  Returns the current default text font.
- void **textfont** (Fl_Font f)
  Sets the default text font.
- Fl_Fontsize **textsize** () const
  Gets the default text size.
- void **textsize** (Fl_Fontsize s)
  Sets the default text size.
- const char ∗**title** ()
  Returns the current document title, or NULL if there is no title.
- int **topline** () const
  Returns the current top line in pixels.
- void **topline** (const char ∗n)
Scrolls the text to the indicated position, given a named destination.

- **void** `topline` (int)
  - Scrolls the text to the indicated position, given a pixel line.

- **const char** ∗ `value` () const
  - Returns the current buffer contents.

- **void** `value` (const char ∗val)
  - Sets the current help text buffer to the string provided and reformats the text.

- **~Fl_Help_View** ()
  - Destroys the `Fl_Help_View` widget.

**Protected Member Functions**

- **void** `draw` () FL_OVERRIDE
  - Draws the `Fl_Help_View` widget.

**Additional Inherited Members**

**34.64.1 Detailed Description**

The `Fl_Help_View` widget displays HTML text. Most HTML 2.0 elements are supported, as well as a primitive implementation of tables. GIF, JPEG, and PNG images are displayed inline.

Supported HTML tags:

- **A**: HREF/NAME
- **B**
- **BODY**: BGCOLOR/TEXT/LINK
- **BR**
- **CENTER**
- **CODE**
- **DD**
- **DL**
- **DT**
- **EM**
- **FONT**: COLOR/SIZE/FACE=(helvetica/arial/sans/times/serif/symbol/courier)
- **H1/H2/H3/H4/H5/H6**
- **HEAD**
- **HR**
- **I**
- **IMG**: SRC/WIDTH/HEIGHT/ALT
- **KBD**
- **LI**
- **OL**
- **P**
- **PRE**
• STRONG
• TABLE: TH/TD/TR/BORDER/BGCOLOR/COLSPAN/ALIGN=CENTER|RIGHT|LEFT
• TITLE
• TT
• U
• UL
• VAR

Supported color names:
• black, red, green, yellow, blue, magenta, fuchsia, cyan, aqua, white, gray, grey, lime, maroon, navy, olive, purple, silver, teal.

Supported urls:
• Internal: file:
• External: http: ftp: https: ipp: mailto: news:

Quoted char names:
• Aacute aacute Acirc acirc acute AElig aelig Agrave agrave amp Aring aring Atilde atilde Auml auml 
• brvbar bull 
• Ccedil ccedil cedil cent copy curren 
• dagger deg divide 
• Eacute eacute Ecirc ecirc Egrave egrave ETH eth Euml euml euro 
• frac12 frac14 frac34 
• gt 
• Iacute iacute Icirc icirc iexcl Igrave igrave iquest Iuml iuml 
• laquo lt 
• macr micro middot 
• nbsp not Ntilde ntilde 
• Oacute oacute Ocirc ocirc Ograve ograve ordf ordm Oslash oslash Otilde otilde Ouml ouml 
• para permil plusmn pound 
• quot 
• raquo reg 
• sect shy sup1 sup2 sup3 szlig 
• THORN thorn times trade 
• Uacute uacute Ucirc ucirc Ugrave ugrave uml Uuml uuml 
• Yacute yacute 
• yen Yuml yuml 

Note
You can't effectively set the box() to FL_NO_BOX, this would result in FL_DOWN_BOX being used as the boxtype of the widget. This is unexpected but can't be changed for backwards compatibility. If you don't want a frame around the widget you can use FL_FLAT_BOX instead.
34.64.2 Constructor & Destructor Documentation

34.64.2.1 ∼Fl_Help_View()

Fl_Help_View::∼Fl_Help_View ( )
Destroys the Fl_Help_View widget.
The destructor destroys the widget and frees all memory that has been allocated for the current document.

34.64.3 Member Function Documentation

34.64.3.1 draw()

void Fl_Help_View::draw ( void ) [protected], [virtual]
Draws the Fl_Help_View widget.
Reimplemented from Fl_Group.

34.64.3.2 find()

int Fl_Help_View::find ( const char ∗ s, int p = 0 )
Finds the specified string s at starting position p.
The argument p and the return value are offsets in Fl_Help_View::value(), counting from 0. If p is out of range, 0 is used.
The string comparison is simple but honors some special cases:

- the specified string s must be in UTF-8 encoding
- HTML tags in value() are filtered (not compared as such, they never match)
- HTML entities like '&lt;' or '&amp;' are converted to Unicode (UTF-8)
- ASCII characters (7-bit, < 0x80) are compared case insensitive
- every newline (LF, \n) in value() is treated like a single space
- all other strings are compared as-is (byte by byte)

Todo complex HTML entities for Unicode code points > 0x80 are currently treated like one byte (not character!), and do not (yet) match correctly ("\<" matches "<" but "\€" doesn't match "€", and "\ü" doesn't match "ü")

Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>s</td>
</tr>
<tr>
<td>in</td>
<td>p</td>
</tr>
</tbody>
</table>
Returns

the matching position or -1 if not found

### 34.64.3.3 handle()

```cpp
int Fl_Help_View::handle ( int event ) [virtual]
```

Handles events in the widget.
Reimplemented from Fl_Group.

### 34.64.3.4 leftline()

```cpp
void Fl_Help_View::leftline ( int left )
```

Scrolls the text to the indicated position, given a pixel column.
If the given pixel value `left` is out of range, then the text is scrolled to the left or right side of the document, resp.

**Parameters**

<table>
<thead>
<tr>
<th>type</th>
<th>name</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>in</code></td>
<td><code>left</code></td>
<td>left column number in pixels (0 = left side)</td>
</tr>
</tbody>
</table>

### 34.64.3.5 link()

```cpp
void Fl_Help_View::link ( Fl_Help_Func * fn ) [inline]
```

This method assigns a callback function to use when a link is followed or a file is loaded (via `Fl_Help_View::load()`)
that requires a different file or path.
The callback function receives a pointer to the Fl_Help_View widget and the URI or full pathname for the file in question. It must return a pathname that can be opened as a local file or NULL:

```cpp
const char *fn(Fl_Widget *, const char *uri);
```

The link function can be used to retrieve remote or virtual documents, returning a temporary file that contains the actual data. If the link function returns NULL, the value of the Fl_Help_View widget will remain unchanged.
If the link callback cannot handle the URI scheme, it should return the uri value unchanged or set the `value()` of the widget before returning NULL.

### 34.64.3.6 load()

```cpp
int Fl_Help_View::load ( const char * f )
```

Loads the specified file.
This method loads the specified file or URL. The filename may end in a #name style target.
If the URL starts with `ftp`, `http`, `https`, `ipp`, `mailto`, or `news`, followed by a colon, FLTK will use fl_open_uri() to show the requested page in an external browser.
In all other cases, the URL is interpreted as a filename. The file is read and displayed in this browser. Note that MSWindows style backslashes are not supported in the file name.

**Parameters**

<table>
<thead>
<tr>
<th>type</th>
<th>name</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>in</code></td>
<td><code>f</code></td>
<td>filename or URL</td>
</tr>
</tbody>
</table>

**Returns**

0 on success, -1 on error
34.64.3.7 resize()

void Fl_Help_View::resize (  
    int xx,  
    int yy,  
    int ww,  
    int hh ) [virtual]

Resizes the help widget.  
Reimplemented from Fl_Group.

34.64.3.8 scrollbar_size() [1/2]

int Fl_Help_View::scrollbar_size ( ) const [inline]

Gets the current size of the scrollbars' troughs, in pixels.  
If this value is zero (default), this widget will use the Fl::scrollbar_size() value as the scrollbar's width.  

Returns

Scrollbar size in pixels, or 0 if the global Fl::scrollbar_size() is being used.

See also

Fl::scrollbar_size(int)

34.64.3.9 scrollbar_size() [2/2]

void Fl_Help_View::scrollbar_size (  
    int newSize ) [inline]

Sets the pixel size of the scrollbars' troughs to newSize, in pixels.  
Normally you should not need this method, and should use Fl::scrollbar_size(int) instead to manage the size of ALL your widgets' scrollbars.  
This ensures your application has a consistent UI, is the default behavior, and is normally what you want.  
Only use THIS method if you really need to override the global scrollbar size.  
The need for this should be rare.  
Setting newSize to the special value of 0 causes the widget to track the global Fl::scrollbar_size(), which is the default.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>newSize</th>
</tr>
</thead>
</table>
|    | Sets the scrollbar size in pixels.  
|    | If 0 (default), scrollbar size tracks the global Fl::scrollbar_size() |

See also

Fl::scrollbar_size()

34.64.3.10 topline() [1/2]

void Fl_Help_View::topline (  
    const char * n )

Scrolls the text to the indicated position, given a named destination.
Parameters

| in  | n | target name |

### 34.64.3.11 topline()

```cpp
void Fl_Help_View::topline ( int top )
```

Scrolls the text to the indicated position, given a pixel line.

If the given pixel value `top` is out of range, then the text is scrolled to the top or bottom of the document, resp.

Parameters

| in  | top | top line number in pixels (0 = start of document) |

### 34.64.3.12 value()

```cpp
void Fl_Help_View::value ( const char * val )
```

Sets the current help text buffer to the string provided and reformats the text.

The provided character string `val` is copied internally and will be freed when `value()` is called again, or when the widget is destroyed.

If `val` is NULL, then the widget is cleared.

The documentation for this class was generated from the following files:

- `Fl_Help_View.H`
- `Fl_Help_View.cxx`

### 34.65 Fl_Hold_Browser Class Reference

The `Fl_Hold_Browser` is a subclass of `Fl_Browser` which lets the user select a single item, or no items by clicking on the empty space.

```cpp
#include <Fl_Hold_Browser.H>
```

Inheritance diagram for `Fl_Hold_Browser`:

```
Fl_Widget
  ↓
Fl_Group
  ↓
Fl_Browser_
  ↓
Fl_Browser
  ↓
Fl_Hold_Browser
```

**Public Member Functions**

- **`Fl_Hold_Browser`** (int X, int Y, int W, int H, const char *L=0)
  
  Creates a new `Fl_Hold_Browser` widget using the given position, size, and label string.
Additional Inherited Members

34.65.1 Detailed Description

The Fl_Hold_Browser is a subclass of Fl_Browser which lets the user select a single item, or no items by clicking on the empty space.

As long as the mouse button is held down the item pointed to by it is highlighted, and this highlighting remains on when the mouse button is released. Normally the callback is done when the user releases the mouse, but you can change this with when(). See Fl_Browser for methods to add and remove lines from the browser.

34.65.2 Constructor & Destructor Documentation

34.65.2.1 Fl_Hold_Browser()

Fl_Hold_Browser::Fl_Hold_Browser ( 
    int X, 
    int Y, 
    int W, 
    int H, 
    const char ∗L = 0 )

Creates a new Fl_Hold_Browser widget using the given position, size, and label string. The default boxtype is FL_DOWN_BOX. The constructor specializes Fl_Browser() by setting the type to FL_HOLD_BROWSER. The destructor destroys the widget and frees all memory that has been allocated. The documentation for this class was generated from the following files:

- Fl_Hold_Browser.H
- Fl_Browser.cxx

34.66 Fl_Hor_Fill_Slider Class Reference

Inheritance diagram for Fl_Hor_Fill_Slider:

```
    Fl_Widget
     |
     v
    Fl_Valuator
     |
     v
    Fl_Slider
     |
     v
Fl_Hor_Fill_Slider
```

Public Member Functions

- Fl_Hor_Fill_Slider (int X, int Y, int W, int H, const char ∗L=0)
Additional Inherited Members
The documentation for this class was generated from the following files:

- Fl_Hor_Fill_Slider.H
- Fl_Slider.cxx

34.67  Fl_Hor_Nice_Slider Class Reference

Single thumb tab slider.
#include <Fl_Hor_Nice_Slider.H>
Inheritance diagram for Fl_Hor_Nice_Slider:

Public Member Functions

- Fl_Hor_Nice_Slider (int X, int Y, int W, int H, const char *L=0)

Additional Inherited Members

34.67.1  Detailed Description

Single thumb tab slider.

Figure 34.25 Fl_Hor_Nice_Slider with various Fl::scheme() values

The documentation for this class was generated from the following files:

- Fl_Hor_Nice_Slider.H
- Fl_Slider.cxx

34.68  Fl_Hor_Slider Class Reference

Horizontal Slider class.
#include <Fl_Hor_Slider.H>
Inheritance diagram for Fl_Hor_Slider:

Generated by Doxygen
Public Member Functions

- **Fl_Hor_Slider** (int X, int Y, int W, int H, const char *l=0)
  
  Creates a new Fl_Hor_Slider widget using the given position, size, and label string.

Additional Inherited Members

34.68.1 Detailed Description

Horizontal Slider class.

See also

- class **Fl_Slider**.

The documentation for this class was generated from the following files:

- Fl_Hor_Slider.H
- Fl_Slider.cxx

34.69 **Fl_Hor_Value_Slider Class Reference**

Inheritance diagram for Fl_Hor_Value_Slider:

Public Member Functions

- **Fl_Hor_Value_Slider** (int X, int Y, int W, int H, const char *l=0)

Additional Inherited Members

The documentation for this class was generated from the following files:

- Fl_Hor_Value_Slider.H
- Fl_Value_Slider.cxx
34.70  Fl_ICO_Image Class Reference

The Fl_ICO_Image class supports loading, caching, and drawing of Windows icon (.ico) files.

```cpp
#include <Fl_ICO_Image.H>
```

Inheritance diagram for Fl_ICO_Image:

```
Fl_Image
   |
   v
Fl_RGB_Image
   |
   v
Fl_BMP_Image
   |
   v
Fl_ICO_Image
```

Classes

- struct IconDirEntry
  
  Windows ICONDIRENTRY structure

Public Member Functions

- Fl_ICO_Image (const char *filename, int id=-1, const unsigned char *data=NULL, const size_t datasize=0)
  
  Loads the named icon image from the given .ico filename or from memory.

- const IconDirEntry *icondirentry() const
  
  Returns the array of idcount() loaded IconDirEntry structures.

- int idcount() const
  
  Returns the number of icons of various resolutions present in the ICO object.

- ~Fl_ICO_Image()
  
  Destructor.

Additional Inherited Members

34.70.1  Detailed Description

The Fl_ICO_Image class supports loading, caching, and drawing of Windows icon (.ico) files.

34.70.2  Constructor & Destructor Documentation

34.70.2.1  Fl_ICO_Image()

Fl_ICO_Image::Fl_ICO_Image (
  const char *filename,
  int id = -1,
  const unsigned char *data = NULL,
  const size_t datasize = 0 )

Loads the named icon image from the given .ico filename or from memory.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filename</td>
<td>Name of a .ico file, or of the in-memory image</td>
</tr>
</tbody>
</table>
### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>When id is -1 (default), the highest-resolution icon is loaded; when id = 0, load the icon with this ID; when id = -2, load all IconDirEntry structures but no image.</td>
</tr>
<tr>
<td>data</td>
<td>NULL, or in-memory icon data</td>
</tr>
<tr>
<td>datasize</td>
<td>Size in bytes of the data byte array (used when data is not NULL)</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- `FL_ICO_Image.H`
- `FL_ICO_Image.hxx`

## 34.71 Fl_Image Class Reference

Base class for image caching, scaling and drawing.

```cpp
#include <Fl_Image.H>
```

### Inheritance diagram for Fl_Image:

```
Fl_Image
    | Fl_Bitmap
    | Fl_Pixmap
    | Fl_RGB_Image
    | Fl_Shared_Image
    | Fl_Tiled_Image
    | Fl_XBM_Image
    | Fl_GIF_Image
    | Fl_XPM_Image
    | Fl_BMP_Image
    | Fl_JPEG_Image
    | Fl_PNG_Image
    | Fl_PNM_Image
    | Fl_SVG_Image
```

### Public Member Functions

- virtual class Fl_Shared_Image * as_shared_image ()
  
  Returns whether an image is an Fl_Shared_Image or not.

- virtual void color_average (Fl_Color c, float i)
  
  The color_average() method averages the colors in the image with the provided FLTK color value.

- Fl_Image * copy () const
  
  Creates a copy of the image in the same size.

- virtual Fl_Image * copy (int W, int H) const
  
  Creates a resized copy of the image.

- int count () const
  
  Returns the number of data values associated with the image.

- int d () const
  
  Returns the image depth.

- const char * const * data () const
  
  Returns a pointer to the current image data array.

- int data_h () const
  
  Returns the height of the image data.

- int data_w () const
  
  Returns the width of the image data.

- virtual void desaturate ()

### Generated by Doxygen
The `desaturate()` method converts an image to grayscale.

- void **draw** (int X, int Y)
  Draws the image to the current drawing surface.
- virtual void **draw** (int X, int Y, int W, int H, int cx=0, int cy=0)
  Draws the image to the current drawing surface with a bounding box.
- int **fail** () const
  Returns a value that is not 0 if there is currently no image available.
- **Fl_Image** (int W, int H, int D)
  The constructor creates an empty image with the specified width, height, and depth.
- int **h** () const
  Returns the current image drawing height in FLTK units.
- void **inactive** ()
  The `inactive()` method calls `color_average(FL_BACKGROUND_COLOR, 0.33f)` to produce an image that appears grayed out.
- virtual void **label** (Fl_Menu_Item ∗m)
  This method is an obsolete way to set the image attribute of a menu item.
- virtual void **label** (Fl_Widget ∗w)
  This method is an obsolete way to set the image attribute of a widget or menu item.
- int **ld** () const
  Returns the current line data size in bytes.
- virtual void **release** ()
  Releases an Fl_Image - the same as `delete this`.
- virtual void **scale** (int width, int height, int proportional=1, int can_expand=0)
  Sets the drawing size of the image.
- virtual void **uncache** ()
  If the image has been cached for display, delete the cache data.
- int **w** () const
  Returns the current image drawing width in FLTK units.
- virtual ~Fl_Image ()
  The destructor is a virtual method that frees all memory used by the image.

**Static Public Member Functions**

- static Fl_Labeltype **define_FL_IMAGE_LABEL** ()
- static Fl_RGB_Scaling **RGB_scaling** ()
  Returns the currently used RGB image scaling method.
- static void **RGB_scaling** (Fl_RGB_Scaling)
  Sets the RGB image scaling method used for copy(int, int).
- static Fl_RGB_Scaling **scaling_algorithm** ()
  Gets what algorithm is used when resizing a source image to draw it.
- static void **scaling_algorithm** (Fl_RGB_Scaling algorithm)
  Sets what algorithm is used when resizing a source image to draw it.

**Static Public Attributes**

- static const int **ERR_FILE_ACCESS** = -2
- static const int **ERR_FORMAT** = -3
- static const int **ERR_MEMORY_ACCESS** = -4
- static const int **ERR_NO_IMAGE** = -1
- static bool **register_images_done** = false
  True after `fl_register_images()` was called, false before.
Protected Member Functions

- void d (int D)
  
  Sets the current image depth.
- void data (const char *const *p, int c)
  
  Sets the current data pointer and count of pointers in the array.
- void draw_empty (int X, int Y)
  
  The protected method draw_empty() draws a box with an X in it.
- void draw_scaled (int X, int Y, int W, int H)
  
  Draw the image to the current drawing surface rescaled to a given width and height.
- void h (int H)
  
  Sets the height of the image data.
- void ld (int LD)
  
  Sets the current line data size in bytes.
- void w (int W)
  
  Sets the width of the image data.

Static Protected Member Functions

- static void labeltype (const Fl_Label *lo, int lx, int ly, int lw, int lh, Fl_Align la)
- static void measure (const Fl_Label *lo, int &lw, int &lh)

Friends

- class Fl_Graphics_Driver

34.71.1 Detailed Description

Base class for image caching, scaling and drawing. Fl_Image is the base class used for caching, scaling and drawing all kinds of images in FLTK. This class keeps track of common image data such as the pixels, colormap, width, height, and depth. Virtual methods are used to provide type-specific image handling.

Each image possesses two (width, height) pairs:

1. The width and height of the raw image data are returned by data_w() and data_h(). These values are set when the image is created and remain unchanged.

2. The width and height of the area filled by the image when it gets drawn are returned by w() and h(). These values are equal to data_w() and data_h() when the image is created and can be changed by the scale() member function.

Since the Fl_Image class does not support image drawing by itself, calling the Fl_Image::draw() method results in a box with an X in it being drawn instead.

34.71.2 Constructor & Destructor Documentation

34.71.2.1 Fl_Image()

Fl_Image::Fl_Image (  
  int W,  
  int H,  
  int D  
)

The constructor creates an empty image with the specified width, height, and depth. The width and height are in pixels. The depth is 0 for bitmaps, 1 for pixmap (colormap) images, and 1 to 4 for color images.
34.71.3 Member Function Documentation

34.71.3.1 as_shared_image()

```cpp
virtual class Fl_Shared_Image * Fl_Image::as_shared_image ( ) [inline], [virtual]
```

Returns whether an image is an Fl_Shared_Image or not. This virtual method returns a pointer to an Fl_Shared_Image if this object is an instance of Fl_Shared_Image or NULL if not. This can be used to detect if a given Fl_Image object is a shared image, i.e. derived from Fl_Shared_Image.

Since

1.4.0

Reimplemented in Fl_Shared_Image.

34.71.3.2 color_average()

```cpp
void Fl_Image::color_average ( Fl_Color c, float i ) [virtual]
```

The color_average() method averages the colors in the image with the provided FLTK color value. The first argument specifies the FLTK color to be used. The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color. An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory. Reimplemented in Fl_Anim_GIF_Image, Fl_RGB_Image, Fl_Pixmap, Fl_Shared_Image, Fl_SVG_Image, and Fl_Tiled_Image.

34.71.3.3 copy() [1/2]

```cpp
Fl_Image * Fl_Image::copy ( ) const [inline]
```

Creates a copy of the image in the same size. The new image should be released when you are done with it. This does exactly the same as 'Fl_Image::copy(int W, int H) const' where W and H are the width and height of the source image, respectively. This applies also to all subclasses of Fl_Image in the FLTK library.

The following two copy() calls are equivalent:

```cpp
Fl_Image *img1 = new Fl_Image(...);
// ...
Fl_Image *img2 = img1->copy();
Fl_Image *img3 = img1->copy(img1->w(), img1->h());
```

For details see 'Fl_Image::copy(int w, int h) const'.

See also

Fl_Image::release()

Note

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from Fl_Image or any subclass your overridden methods of 'Fl_Image::copy() const' and 'Fl_Image::copy(int, int) const' must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

---

**Generated by Doxygen**
34.71.3.4  copy() [2/2]

```cpp
Fl_Image * Fl_Image::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.
The new image should be released when you are done with it.
Note: since FLTK 1.4.0 you can use Fl_Image::release() for all types of images (i.e. all subclasses of Fl_Image) instead of operator delete for Fl_Image's and Fl_Image::release() for Fl_Shared_Image's.
The new image data will be converted to the requested size. RGB images are resized using the algorithm set by Fl_Image::RGB_scaling().
For the new image the following equations are true:

- \( w() == \text{data}_w() == \bar{W} \)
- \( h() == \text{data}_h() == \bar{H} \)

Parameters

| in   | \( W,H \) | Requested width and height of the new image |

Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of Fl_RGB_Image, Fl_SVG_Image, Fl_Pixmap, Fl_Bitmap, Fl_Tiled_Image, Fl_Anim_GIF_Image and Fl_Shared_Image. Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an Fl_GIF_Image is an object of class Fl_Pixmap.
Since FLTK 1.4.0 this method is 'const'. If you derive your own class from Fl_Image or any subclass your overridden methods of 'Fl_Image::copy() const' and 'Fl_Image::copy(int, int) const' must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented in Fl_Anim_GIF_Image, Fl_Bitmap, Fl_RGB_Image, Fl_Pixmap, Fl_Shared_Image, Fl_SVG_Image, and Fl_Tiled_Image.

34.71.3.5  count()

```cpp
int Fl_Image::count ( ) const [inline]
```

Returns the number of data values associated with the image.
The value will be 0 for images with no associated data, 1 for bitmap and color images, and greater than 2 for pixmap images.
See also

data()

34.71.3.6  d()

```cpp
int Fl_Image::d ( ) const [inline]
```

Returns the image depth.
The return value will be 0 for bitmaps, 1 for pixmaps, and 1 to 4 for color images.

34.71.3.7  data() [1/2]

```cpp
const char *const * Fl_Image::data ( ) const [inline]
```

Returns a pointer to the current image data array.
There can be 0, 1, or more pointers to actual image data in an image.
Use the count() method to find the size of the data array. You must not dereference the data() pointer if count() equals zero.

Generated by Doxygen
Note
data() may return NULL.

Example:
Fl_RGB_Image has exactly one pointer which points at the \( R, G, B \) data array of the image. The total size of this array depends on several attributes like \texttt{data\_w()}, \texttt{data\_h()}, \texttt{d()} and \texttt{ld()} and is basically \texttt{data\_w()} \* \texttt{data\_h()} \* \texttt{d()} but there are exceptions if \texttt{ld()} is non-zero: see description of \texttt{ld()}. Since FLTK 1.4.0 \texttt{w()} and \texttt{h()} are no longer significant for the image data size if \texttt{scale()} has been called on the image to set a different display size. Other image types have different numbers and types of data pointers which are implementation details and not documented here.

See also
\texttt{count()}, \texttt{w()}, \texttt{h()}\texttt{, data\_w()}, \texttt{data\_h()}, \texttt{d()}, \texttt{ld()}

34.71.3.8 data() [2/2]

```cpp
void Fl_Image::data (const char *const *p, int c) [inline], [protected]
```

Sets the current data pointer and count of pointers in the array.
There can be 0, 1, or more pointers to actual image data in an image.

See also
\texttt{const char* const* data(), count(), w(), h(), data\_w(), data\_h(), d(), ld()}

34.71.3.9 desaturate()

```cpp
void Fl_Image::desaturate () [virtual]
```

The desaturate() method converts an image to grayscale.
If the image contains an alpha channel (depth = 4), the alpha channel is preserved.
An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
Reimplemented in Fl_Anim_GIF_Image, Fl_RGB_Image, Fl_Pixmap, Fl_Shared_Image, Fl_SVG_Image, and Fl_Tiled_Image.

34.71.3.10 draw() [1/2]

```cpp
void Fl_Image::draw (int X, int Y) [inline]
```

Draws the image to the current drawing surface.

Parameters
\( X,Y \) specify the upper-lefthand corner of the image.

34.71.3.11 draw() [2/2]

```cpp
void Fl_Image::draw (int X, int Y, int W, int H,
```
int \_W,\nint \_cx = 0,\nint \_cy = 0 \) [virtual]\n
Draws the image to the current drawing surface with a bounding box. Arguments \_X, \_Y, \_W, \_H specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the \_cx and \_cy arguments. In other words: \texttt{fl\_push\_clip(X, Y, W, H)} is applied, the image is drawn with its upper-left corner at \_X-\_cx, \_Y-\_cy and its own width and height, \texttt{fl\_pop\_clip()} is applied. Reimplemented in \texttt{Fl\_Anim\_GIF\_Image}, \texttt{Fl\_Bitmap}, \texttt{Fl\_RGB\_Image}, \texttt{Fl\_Pixmap}, \texttt{Fl\_Shared\_Image}, \texttt{Fl\_SVG\_Image}, and \texttt{Fl\_Tiled\_Image}.

34.71.3.12 draw_empty()

\begin{verbatim}
void Fl\_Image::draw\_empty (  
    int \_X,  
    int \_Y ) [protected]
\end{verbatim}

The protected method \texttt{draw\_empty()} draws a box with an X in it. It can be used to draw any image that lacks image data.

34.71.3.13 draw_scaled()

\begin{verbatim}
int Fl\_Image::draw\_scaled (  
    int \_X,  
    int \_Y,  
    int \_W,  
    int \_H ) [protected]
\end{verbatim}

Draw the image to the current drawing surface rescaled to a given width and height. Intended for internal use by the FLTK library.

**Parameters**

| \_X, \_Y | position of the image's top-left |
| \_W, \_H | width and height for the drawn image |

**Returns**

1

*Deprecated* Only for API compatibility with FLTK 1.3.4.

34.71.3.14 fail()

\begin{verbatim}
int Fl\_Image::fail ( ) const
\end{verbatim}

Returns a value that is not 0 if there is currently no image available.

**Example use:**

\begin{verbatim}
// [...]
Fl\_Box box(X, Y, W, H);  
Fl\_JPEG\_Image jpeg("/tmp/foo.jpg");  
switch (jpeg.fail()) {  
  case Fl\_Image::ERR\_NO\_IMAGE:  
    case Fl\_Image::ERR\_FILE\_ACCESS:  
      fl\_alert("/tmp/foo.jpg: %s", strerror(errno)); // shows actual os error to user  
    exit(1);  
  case Fl\_Image::ERR\_FORMAT:  
    fl\_alert("/tmp/foo.jpg: couldn't decode image");  
    exit(1);  
}  
box.image(jpeg);  
\end{verbatim}

Generated by Doxygen
Returns

Image load failure if non-zero

Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The image was loaded successfully</td>
</tr>
<tr>
<td>ERR_NO_IMAGE</td>
<td>No image was found</td>
</tr>
<tr>
<td>ERR_FILE_ACCESS</td>
<td>There was a file access related error (errno should be set)</td>
</tr>
<tr>
<td>ERR_FORMAT</td>
<td>Image decoding failed</td>
</tr>
<tr>
<td>ERR_MEMORY_ACCESS</td>
<td>Image decoder tried to access memory outside of given memory block</td>
</tr>
</tbody>
</table>

34.71.3.15 h() [1/2]

int Fl_Image::h ( ) const [inline]

Returns the current image drawing height in FLTK units.
The values of h() and data_h() are identical unless scale() has been called after which they may differ.

34.71.3.16 h() [2/2]

void Fl_Image::h ( int H ) [inline], [protected]

Sets the height of the image data.
This protected function sets both image heights: the height of the image data returned by data_h() and the image
drawing height in FLTK units returned by h().

34.71.3.17 inactive()

void Fl_Image::inactive ( ) [inline]

The inactive() method calls color_average(FL_BACKGROUND_COLOR, 0.33f) to produce an image that appears
grayed out.
An internal copy is made of the original image before changes are applied, to avoid modifying the original image.

Note

The RGB color of FL_BACKGROUND_COLOR may change when the connection to the display is made. See
fl_open_display().

34.71.3.18 label() [1/2]

void Fl_Image::label ( Fl_Menu_Item * m ) [virtual]

This method is an obsolete way to set the image attribute of a menu item.

Deprecated Please use Fl_Menu_Item::image() instead.
Reimplemented in Fl_Bitmap, Fl_RGB_Image, and Fl_Pixmap.

34.71.3.19 label() [2/2]

void Fl_Image::label ( Fl_Widget * widget ) [virtual]

This method is an obsolete way to set the image attribute of a widget or menu item.

Deprecated Please use Fl_Widget::image() or Fl_Widget::deimage() instead.
Reimplemented in Fl_Bitmap, Fl_RGB_Image, and Fl_Pixmap.
34.71.3.20 ld() [1/2]

int Fl_Image::ld ( ) const [inline]
Returns the current line data size in bytes.

See also
  ld(int)

34.71.3.21 ld() [2/2]

void Fl_Image::ld ( int LD ) [inline], [protected]
Sets the current line data size in bytes.
Color images may contain extra data (padding) that is included after every line of color image data and is normally not present.
If LD is zero, then line data size is assumed to be data_w() * d() bytes.
If LD is non-zero, then it must be positive and larger than data_w() * d() to account for the extra data per line.

34.71.3.22 release()

virtual void Fl_Image::release ( ) [inline], [virtual]
Releases an Fl_Image - the same as 'delete this'.
This virtual method is for almost all image classes the same as calling delete image;
where image is an Fl_Image * pointer.
However, for subclass Fl_Shared_Image and its subclasses this virtual method is reimplemented and maintains shared images.
This virtual method makes it possible to destroy all image types in the same way by calling image->release();
Reasoning: If you have an 'Fl_Image *' base class pointer and don't know if the object is one of the class Fl_Shared_Image or any other subclass of Fl_Image (for instance Fl_RGB_Image) then you can't just use use operator delete since this is not appropriate for Fl_Shared_Image objects.
The virtual method release() handles this properly.

Since
  1.4.0 in the base class Fl_Image and virtual in Fl_Shared_Image
Reimplemented in Fl_Shared_Image.

34.71.3.23 RGB_scaling()

void Fl_Image::RGB_scaling ( Fl_RGB_Scaling method ) [static]
Sets the RGB image scaling method used for copy(int, int).
Applies to all RGB images, defaults to FL_RGB_SCALING_NEAREST.

34.71.3.24 scale()

void Fl_Image::scale ( int width, int height, int proportional = 1, int can_expand = 0 ) [virtual]
Sets the drawing size of the image.
This function controls the values returned by member functions w() and h() which in turn control how the image is drawn: the full image data (whose size is given by data_w() and data_h()) are drawn scaled to an area of the drawing surface sized at w() x h() FLTK units. This can make a difference if the drawing surface has more than 1
pixel per FLTK unit because the image can be drawn at the full resolution of the drawing surface. Examples of such drawing surfaces: HiDPI displays, laser printers, PostScript files, PDF printers.
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>width, height</td>
<td>maximum values, in FLTK units, that w() and h() should return</td>
</tr>
<tr>
<td>proportional</td>
<td>if not null, keep the values returned by w() and h() proportional to data_w() and data_h()</td>
</tr>
<tr>
<td>can_expand</td>
<td>if null, the values returned by w() and h() will not be larger than data_w() and data_h(), respectively</td>
</tr>
</tbody>
</table>

Note

This function generally changes the values returned by the w() and h() member functions. In contrast, the values returned by data_w() and data_h() remain unchanged.

Version

1.4 (1.3.4 and FL_ABI_VERSION for Fl_Shared_Image only)

Example code: scale an image to fit in a box

```c
Fl_Box *b = ... // a box
Fl_Image *img = new Fl_PNG_Image("/path/to/picture.png"); // read a picture file
// set the drawing size of the image to the size of the box keeping its aspect ratio
img->scale(b->w(), b->h());
b->image(img); // use the image as the box image
```

### 34.71.3.25 scaling_algorithm()

```c
static void Fl_Image::scaling_algorithm(
    Fl_RGB_Scaling algorithm) [inline], [static]
```

Sets what algorithm is used when resizing a source image to draw it. The default algorithm is FL_RGB_SCALING_BILINEAR. Drawing an Fl_Image is sometimes performed by first resizing the source image and then drawing the resized copy. This occurs, e.g., when drawing to screen under X11 without Xrender support after having called scale(). This function controls what method is used when the image to be resized is an Fl_RGB_Image.

Version

1.4

### 34.71.3.26 uncache()

```c
void Fl_Image::uncache() [virtual]
```

If the image has been cached for display, delete the cache data. This allows you to change the data used for the image and then redraw it without recreating an image object. Reimplemented in Fl_Anim_GIF_Image, Fl_Bitmap, Fl_RGB_Image, Fl_Pixmap, and Fl_Shared_Image.

### 34.71.3.27 w() [1/2]

```c
int Fl_Image::w ( ) const [inline]
```

Returns the current image drawing width in FLTK units.

The values of w() and data_w() are identical unless scaled() has been called after which they may differ.

### 34.71.3.28 w() [2/2]

```c
void Fl_Image::w ( int W ) [inline], [protected]
```

Sets the width of the image data. This protected function sets both image widths: the width of the image data returned by data_w() and the image drawing width in FLTK units returned by w().

The documentation for this class was generated from the following files:

- Fl_Image.H
- Fl_Image.cxx
34.72 Fl_Image_Reader Class Reference

Public Member Functions

- int error () const
- const char * name () const
- int open (const char *filename)
- int open (const char *imagename, const unsigned char *data)
- int open (const char *imagename, const unsigned char *data, const size_t datasize)
- unsigned char read_byte ()
- unsigned int read_dword ()
- int read_long ()
- unsigned short read_word ()
- void seek (unsigned int n)
- void skip (unsigned int n)
- long tell () const

The documentation for this class was generated from the following files:

- Fl_Image_Reader.h
- Fl_Image_Reader.cxx

34.73 Fl_Image_Surface Class Reference

Directs all graphics requests to an Fl_Image.
#include <Fl_Image_Surface.H>

Inheritance diagram for Fl_Image_Surface:

\begin{center}
\begin{tikzcd}
& \text{Fl_Surface_Device} \\
\text{Fl_Widget_Surface} & \text{Fl_Image_Surface} \\
\end{tikzcd}
\end{center}

Public Member Functions

- Fl_Image_Surface (int w, int h, int high_res=0, Fl_Offscreen off=0)
  Constructor with optional high resolution.
- Fl_Shared_Image * highres_image ()
  Returns a possibly high resolution image made of all drawings sent to the Fl_Image_Surface object.
- Fl_RGB_Image * image ()
  Returns a depth-3 image made of all drawings sent to the Fl_Image_Surface object.
- bool is_current () FL_OVERRIDE
  Is this surface the current drawing surface?
- void mask (const Fl_RGB_Image *)
  Defines a mask applied to drawings made after use of this function.
- Fl_Offscreen offscreen ()
  Returns the Fl_Offscreen object associated to the image surface.
- void origin (int x, int y) FL_OVERRIDE
  Computes the coordinates of the current origin of graphics functions.
- void origin (int x, int y) FL_OVERRIDE
  Sets the position of the origin of graphics in the drawable part of the drawing surface.
• int printable_rect (int *w, int *h) FL_OVERRIDE
  Computes the width and height of the drawable area of the drawing surface.
• void rescale ()
  Adapts the Fl_Image_Surface object to the new value of the GUI scale factor.
• void set_current () FL_OVERRIDE
  Make this surface the current drawing surface.
• ∼Fl_Image_Surface ()
  The destructor.

Protected Member Functions

• void translate (int x, int y) FL_OVERRIDE
  Translates the current graphics origin accounting for the current rotation.
• void untranslate () FL_OVERRIDE
  Undoes the effect of a previous translate() call.

Friends

• class Fl_Graphics_Driver

Additional Inherited Members

34.73.1 Detailed Description

Directs all graphics requests to an Fl_Image.
After creation of an Fl_Image_Surface object, make it the current drawing surface calling Fl_Surface_Device::push_current(),
and all subsequent graphics requests will be recorded in the image. It's possible to draw widgets (using
Fl_Image_Surface::draw()) or to use any of the Drawing functions or the Color & Font functions. Finally, call
image() on the object to obtain a newly allocated Fl_RGB_Image object. Fl_Gl_Window objects can be drawn in
the image as well.
Usage example:
// this is the widget that you want to draw into an image
Fl_Widget *g = ...;
// create an Fl_Image_Surface object
Fl_Image_Surface *image_surface = new Fl_Image_Surface(g->w(), g->h());
// direct all further graphics requests to the image
Fl_Surface_Device::push_current(image_surface);
// draw a white background
fl_color(Fl_WHITE);
fl_rectf(0, 0, g->w(), g->h());
// draw the g widget in the image
image_surface->draw(g);
// get the resulting image
Fl_RGB_image *image = image_surface->image();
// direct graphics requests back to their previous destination
Fl_Surface_Device::pop_current();
// delete the image_surface object, but not the image itself
delete image_surface;

34.73.2 Constructor & Destructor Documentation

34.73.2.1 Fl_Image_Surface()

Fl_Image_Surface::Fl_Image_Surface (  
  int w,
  int h,
  int high_res = 0,
  Fl_Offscreen off = 0 )
Constructor with optional high resolution.
Parameters

<table>
<thead>
<tr>
<th><strong>Parameter</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>( w, h )</td>
<td>Width and height of the resulting image. The value of the <code>high_res</code> parameter controls whether ( w ) and ( h ) are interpreted as pixels or FLTK units.</td>
</tr>
<tr>
<td><code>high_res</code></td>
<td>If zero, the created image surface is sized at ( w \times h ) pixels. If non-zero, the pixel size of the created image surface depends on the value of the display scale factor (see Fl::screen_scale(int)): the resulting image has the same number of pixels as an area of the display of size ( w \times h ) expressed in FLTK units.</td>
</tr>
<tr>
<td><code>off</code></td>
<td>If not null, the image surface is constructed around a pre-existing Fl_Offscreen. The caller is responsible for both construction and destruction of this Fl_Offscreen object. Is mostly intended for internal use by FLTK.</td>
</tr>
</tbody>
</table>

Version

1.3.4 (1.3.3 without the `highres` parameter)

### 34.73.3 Member Function Documentation

#### 34.73.3.1 `highres_image()`

```
Fl_Shared_Image * Fl_Image_Surface::highres_image ()
```

Returns a possibly high resolution image made of all drawings sent to the Fl_Image_Surface object. The Fl_Image_Surface object should have been constructed with Fl_Image_Surface(W, H, 1). The returned Fl_Shared_Image object is scaled to a size of WxH FLTK units and may have a pixel size larger than these values. The returned object should be deallocated with Fl_Shared_Image::release() after use.

**Deprecated** Use `image()` instead.

Version

1.4 (1.3.4 for MacOS platform only)

#### 34.73.3.2 `image()`

```
Fl_RGB_Image * Fl_Image_Surface::image ()
```

Returns a depth-3 image made of all drawings sent to the Fl_Image_Surface object. The returned object contains its own copy of the RGB data; the caller is responsible for deleting it.

See also

Fl_Image_Surface::mask(Fl_RGB_Image*)

#### 34.73.3.3 `is_current()`

```
bool Fl_Image_Surface::is_current () [virtual]
```

Is this surface the current drawing surface? Reimplemented from Fl_Surface_Device.

#### 34.73.3.4 `mask()`

```
void Fl_Image_Surface::mask (const Fl_RGB_Image * mask )
```

Defines a mask applied to drawings made after use of this function.
The mask is an Fl_RGB_Image made of a white scene drawn on a solid black background; the drawable part of the image surface is reduced to the white areas of the mask after this member function gets called. If necessary, the mask image is internally replaced by a copy resized to the surface’s pixel size. Overall, the image returned by Fl_Image_Surface::image() contains all drawings made until the mask() method assigned a mask, at which point subsequent drawing operations to the image surface were passed through the white areas of the mask. On some platforms, shades of gray in the mask image control the blending of foreground and background pixels; mask pixels closer in color to white produce image pixels closer to the image surface pixel, those closer to black produce image pixels closer to what the image surface pixel was before the call to mask(). The mask is easily constructed using an Fl_Image_Surface object, drawing white areas on a black background there, and calling Fl_Image_Surface::image().

Parameters

| mask | A depth-3 image determining the drawable areas of the image surface. The mask object is not used after return from this member function. |

Note

- The image surface must not be the current drawing surface when this function gets called.
- The mask can have any size but is best when it has the size of the image surface.
- It’s possible to use several masks in succession on the same image surface provided member function Fl_Image_Surface::image() is called between successive calls to Fl_Image_Surface::mask(const Fl_RGB_Image*).

Example of procedure to construct a masked image:

```c
int W = ..., H = ...; // width and height of the image under construction
FL_Image_Surface *surf = new FL_Image_Surface(W, H, 1);
// first, construct the mask
FL_Surface_Device::push_current(surf);
fl_color(FL_BLACK); // draw a black background
fl_rectf(0, 0, W, H);
fl_color(FL_WHITE); // next, draw in white what the mask should not filter out
fl_pie(0, 0, W, H, 0, 360); // here, an ellipse with axes lengths WxH
FL_RGB_Image *mask = surf->image(); // get the mask
// second, draw the image background
fl_color(FL_YELLOW); // here, draw a yellow background
fl_rectf(0, 0, W, H);
// third, apply the mask
FL_Surface_Device::pop_current();
delieate mask; // the mask image can be safely deleted at this point
FL_Surface_Device::push_current(surf);
// fourth, draw the image foreground, part of which will be filtered out by the mask
surf->draw(widget, 0, 0); // here the foreground is a drawn widget
// fifth, get the final result, masked_image, as a depth-3 FL_RGB_Image
FL_RGB_Image *masked_image = surf->image();
// Only the part of the foreground, here a drawn widget, that has not been
// filtered out by the mask, here the white ellipse, is in masked_image;
// the background, here solid yellow, shows up in the remaining areas of masked_image.
FL_Surface_Device::pop_current();
delete surf;
```

Since

1.4.0

### 34.73.3.5 offscreen()

**FL_Offscreen Fl_Image_Surface::offscreen ( )**

Returns the Fl_Offscreen object associated to the image surface.

The returned Fl_Offscreen object is deleted when the Fl_Image_Surface object is deleted, unless the Fl_Image_Surface was constructed with non-null Fl_Offscreen argument.

### 34.73.3.6 origin() [1/2]

```c
void Fl_Image_Surface::origin ( int * x, int * y ) [virtual]
```
Computes the coordinates of the current origin of graphics functions.
34.73 Fl_Image_Surface Class Reference

Parameters

<table>
<thead>
<tr>
<th>out</th>
<th>x, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.</td>
<td></td>
</tr>
</tbody>
</table>

Reimplemented from Fl_Widget_Surface.

34.73.3.7 origin() [2/2]

void Fl_Image_Surface::origin (  
  int *x,  
  int *y ) [virtual]

Sets the position of the origin of graphics in the drawable part of the drawing surface. Arguments should be expressed relatively to the result of a previous printable_rect() call. That is, printable_rect(&w, &h); origin(w/2, 0); sets the graphics origin at the top center of the drawable area. Successive origin() calls don’t combine their effects. Origin() calls are not affected by rotate() calls (for classes derived from Fl_Paged_Device).

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>x, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal and vertical positions in the drawing surface of the desired origin of graphics.</td>
<td></td>
</tr>
</tbody>
</table>

Reimplemented from Fl_Widget_Surface.

34.73.3.8 printable_rect()

int Fl_Image_Surface::printable_rect (  
  int *w,  
  int *h ) [virtual]

Computes the width and height of the drawable area of the drawing surface. Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to origin(). If the object is derived from class Fl_Paged_Device, values account for the user-selected paper type and print orientation and are changed by scale() calls.

Returns

0 if OK, non-zero if any error

Reimplemented from Fl_Widget_Surface.

34.73.3.9 rescale()

void Fl_Image_Surface::rescale ( )

Adapts the Fl_Image_Surface object to the new value of the GUI scale factor. The Fl_Image_Surface object must not be the current drawing surface. This function is useful only for an object constructed with non-zero high_res parameter.

Version

1.4

34.73.3.10 set_current()

void Fl_Image_Surface::set_current (  
  void ) [virtual]

Make this surface the current drawing surface. This surface will receive all future graphics requests. Starting from FLTK 1.4.0, the preferred API to change the current drawing surface is Fl_Surface_Device::push_current( ) / Fl_Surface_Device::pop_current().

Generated by Doxygen
Note

It's recommended to use this function only as follows:

- The current drawing surface is the display;
- make current another surface, e.g., an Fl_Printer or an Fl_Image_Surface object, calling set_current() on this object;
- draw to that surface;
- make the display current again with Fl_Display_Device::display_device() -> set_current();. Don't do any other call to set_current() before this one.

Other scenarios of drawing surface changes should be performed via Fl_Surface_Device::push_current( ) / Fl_Surface_Device::pop_current().

Reimplemented from Fl_Surface_Device.

34.73.3.11 translate()

void Fl_Image_Surface::translate (int x, int y) [protected], [virtual]

Translates the current graphics origin accounting for the current rotation.
Each translate() call must be matched by an untranslate() call. Successive translate() calls add up their effects.
Reimplemented from Fl_Widget_Surface.

34.73.3.12 untranslate()

void Fl_Image_Surface::untranslate (void ) [protected], [virtual]

Undoes the effect of a previous translate() call.
Reimplemented from Fl_Widget_Surface.

The documentation for this class was generated from the following files:

- Fl_Image_Surface.H
- Fl_Image_Surface.hxx

34.74 Fl_Input Class Reference

This is the FLTK text input widget.
#include <Fl_Input.H>

Inheritance diagram for Fl_Input:

Public Member Functions

- Fl_Input (int, int, int, const char * = 0)
  Creates a new Fl_Input widget using the given position, size, and label string.
- int handle (int) FL_OVERRIDE
  Handles the specified event.
Static Public Attributes

- static const char * copy_menu_text = "Copy"
  [this text may be customized at run-time]
- static const char * cut_menu_text = "Cut"
  [this text may be customized at run-time]
- static const char * paste_menu_text = "Paste"
  [this text may be customized at run-time]

Protected Member Functions

- void draw () FL_OVERRIDE
  Draws the widget.
- int handle_key ()
  Handles a keystroke.
- int handle_rmb ()
  Handle right mouse button down events.

Friends

- class Fl_Cocoa_Screen_Driver
- class Fl_Screen_Driver

Additional Inherited Members

34.74.1 Detailed Description

This is the FLTK text input widget. It displays a single line of text and lets the user edit it. Normally it is drawn with an inset box and a white background. The text may contain any characters, and will correctly display any UTF text, using ^X notation for unprintable control characters. It assumes the font can draw any characters of the used scripts, which is true for standard fonts under Windows and Mac OS X. Characters can be input using the keyboard or the character palette/map. Character composition is done using dead keys and/or a compose key as defined by the operating system.

<table>
<thead>
<tr>
<th>Mouse button 1</th>
<th>Moves the cursor to this point. Drag selects characters. Double click selects words. Triple click selects all line. Shift+click extends the selection. When you select text it is automatically copied to the selection buffer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouse button 2</td>
<td>Insert the selection buffer at the point clicked. You can also select a region and replace it with the selection buffer by selecting the region with mouse button 2.</td>
</tr>
<tr>
<td>Mouse button 3</td>
<td>Currently acts like button 1.</td>
</tr>
<tr>
<td>Backspace</td>
<td>Deletes one character to the left, or deletes the selected region.</td>
</tr>
<tr>
<td>Delete</td>
<td>Deletes one character to the right, or deletes the selected region. Combine with Shift for equivalent of ^X (copy+cut).</td>
</tr>
<tr>
<td>Enter</td>
<td>May cause the callback, see when().</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Windows/Linux</th>
<th>Mac</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>^A</td>
<td>Command-A</td>
<td>Selects all text in the widget.</td>
</tr>
<tr>
<td>^C</td>
<td>Command-C</td>
<td>Copy the current selection to the clipboard.</td>
</tr>
<tr>
<td>^I</td>
<td>^I</td>
<td>Insert a tab.</td>
</tr>
</tbody>
</table>

Table generated by Doxygen
34.74.2 Constructor & Destructor Documentation

34.74.2.1 Fl_Input()

Fl_Input::Fl_Input (  
  int X,  
  int Y,  
  
Generated by Doxygen
int \texttt{W},\texttt{H},\texttt{const char \ast l = 0 })

Creates a new \texttt{Fl\_Input} widget using the given position, size, and label string. The default boxtype is \texttt{FL\_DOWN\_BOX}.

### 34.74.3 Member Function Documentation

#### 34.74.3.1 draw()

```cpp
void Fl\_Input::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call \texttt{redraw()} instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method \textit{from within your own draw()} method, e.g. for an embedded scrollbar, you can do it (because \texttt{draw()} is virtual) like this:

```cpp
Fl\_Widget *s = \&scrollbar; // scrollbar is an embedded Fl\_Scrollbar
s->draw(); // calls Fl\_Scrollbar::draw()
```

Implements \texttt{Fl\_Widget}.

#### 34.74.3.2 handle()

```cpp
int Fl\_Input::handle ( int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited \texttt{handle()} method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to \textit{override} the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your \texttt{handle()} method although you don't really handle the event. The effect would be to \textit{filter} event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the \texttt{handle()} method of the base class and tell FLTK that you \textit{consumed} the event by returning 1 even if you didn't \textit{do} anything with it.

**Parameters**

| \textit{in} | \textit{event} | the kind of event received |

**Return values**

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

**See also**

\texttt{Fl\_Event}

Reimplemented from \texttt{Fl\_Widget}.

Reimplemented in \texttt{Fl\_Spinner::Fl\_Spinner\_Input}, and \texttt{Fl\_Secret\_Input}.

Generated by Doxygen
34.74.3.3 handle_key()

int Fl_Input::handle_key ( ) [protected]
Handles a keystroke.
This protected method handles a keystroke in an Fl_Input or derived class. It handles compose key sequences and can also be used e.g. in Fl_Multiline_Input, Fl_Float_Input and several more derived classes.
The details are way too complicated to be documented here and can be changed as required. If in doubt, please consult the source code.
Returns
1 if the keystroke is handled by us, 0 if not.

34.74.3.4 handle_rmb()

int Fl_Input::handle_rmb ( ) [protected]
Handle right mouse button down events.
Returns
1

The documentation for this class was generated from the following files:
• Fl_Input.H
• Fl_Input.cxx

34.75 Fl_Input_ Class Reference

This class provides a low-overhead text input field.
#include <Fl_Input_.H>

Inheritance diagram for Fl_Input_:

Public Member Functions

• int append (const char *t, int l=0, char keep_selection=0)
  Append text at the end.
• bool can_redo () const
  Check if there is a redo action available.
• bool can_undo () const
  Check if the last operation can be undone.
• int copy (int clipboard)
  Put the current selection into the clipboard.
• int copy_cuts ()
  Copies the yank buffer to the clipboard.
• Fl_Color cursor_color () const
  Gets the color of the cursor.
• void cursor_color (Fl_Color n)
  Sets the color of the cursor.
• int cut ()
Deletes the current selection.

- int cut (int a, int b)
  *Deletes all characters between index a and b.*

- int cut (int n)
  *Deletes the next n bytes rounded to characters before or after the cursor.*

- double dvalue () const
  *Returns the widget text interpreted as a floating point number.*

- Fl_Input_ (int, int, int, int, const char ∗=0)
  *Creates a new Fl_Input_ widget.*

- unsigned int index (int i) const
  *Returns the character at index i.*

- int input_type () const
  *Gets the input field type.*

- void input_type (int t)
  *Sets the input field type.*

- int insert (const char ∗t, int l=0)
  *Inserts text at the cursor position.*

- int insert_position () const
  *Gets the position of the text cursor.*

- int insert_position (int p)
  *Sets the cursor position and mark.*

- int insert_position (int p, int m)
  *Sets the index for the cursor and mark.*

- int ivalue () const
  *Returns the widget text interpreted as a signed integer.*

- int mark () const
  *Gets the current selection mark.*

- int mark (int m)
  *Sets the current selection mark.*

- int maximum_size () const
  *Gets the maximum length of the input field in characters.*

- void maximum_size (int m)
  *Sets the maximum length of the input field in characters.*

- int position () const
  *Sets the read-only state of the input field.*

- int position (int p)
  *Sets the read-only state of the input field.*

- int position (int p, int m)
  *Sets the read-only state of the input field.*

- int readonly () const
  *Sets the read-only state of the input field.*

- int redo ()
  *Redo previous undo operation.*

- int replace (int b, int e, const char ∗text, int ilen=0)
  *Deletes text from b to e and inserts the new string text.*

- void resize (int, int, int, int) FL_OVERRIDE
  *Changes the size of the widget.*

- int shortcut () const
  *Returns the shortcut key associated with this widget.*

- void shortcut (int s)
  *Sets the shortcut key associated with this widget.*

- int size () const
Returns the number of bytes in value().

- void size (int W, int H)
  
  Sets the width and height of this widget.

- int static_value (const char * )
  
  Changes the widget text.

- int static_value (const char *, int)
  
  Changes the widget text.

- int tab_nav () const
  
  Gets whether the Tab key causes focus navigation in multiline input fields or not.

- void tab_nav (int val)
  
  Sets whether the Tab key does focus navigation, or inserts tab characters into Fl_Multiline_Input.

- Fl_Color textcolor () const
  
  Gets the color of the text in the input field.

- void textcolor (Fl_Color n)
  
  Sets the color of the text in the input field.

- Fl_Font textfont () const
  
  Gets the font of the text in the input field.

- void textfont (Fl_Font s)
  
  Sets the font of the text in the input field.

- Fl_Fontsize textsize () const
  
  Gets the size of the text in the input field.

- void textsize (Fl_Fontsize s)
  
  Sets the size of the text in the input field.

- int undo ()
  
  Undoes previous changes to the text buffer.

- const char * value () const
  
  Returns the text displayed in the widget.

- int value (const char * )
  
  Changes the widget text.

- int value (const char *, int)
  
  Changes the widget text.

- int value (double value)
  
  Changes the widget text to a floating point number ("%g").

- int value (int value)
  
  Changes the widget text to a signed integer number.

- int wrap () const
  
  Gets the word wrapping state of the input field.

- void wrap (int b)
  
  Sets the word wrapping state of the input field.

- Fl_Input_ ()
  
  Destroys the widget.

Protected Member Functions

- int apply_undo ()
  
  Apply the current undo/redo operation.

- void drawtext (int, int, int, int)
  
  Draws the text in the passed bounding box.

- void drawtext (int, int, int, int, bool draw_active)
  
  Draws the text in the passed bounding box.

- void handle_mouse (int, int, int, int keepmark=0)
Handles mouse clicks and mouse moves.

- `int handleText (int e, int, int, int, int)`
  Handles all kinds of text field related events.

- `int lineEnd (int i)`
  Finds the end of a line.

- `int lineStart (int i)`
  Finds the start of a line.

- `int linesPerPage ()`

- `void maybeDoCallback (Fl_Callback_Reason reason=FL_REASON_UNKNOWN)`
  Moves the cursor to the column given by `up_down_pos`.

- `int wordEnd (int i)`
  Finds the end of a word.

- `int wordStart (int i)`
  Finds the start of a word.

- `int xscroll ()`

- `int yscroll ()`

- `void yscroll (int yOffset)`

### Additional Inherited Members

#### 34.75.1 Detailed Description

This class provides a low-overhead text input field.

This is a virtual base class below `Fl_Input`. It has all the same interfaces, but lacks the `handle()` and `draw()` method. You may want to subclass it if you are one of those people who likes to change how the editing keys work. It may also be useful for adding scrollbars to the input field.

This can act like any of the subclasses of `Fl_Input`, by setting `type()` to one of the following values:

- `#define FL_NORMAL_INPUT 0`
- `#define FL_FLOAT_INPUT 1`
- `#define FL_INT_INPUT 2`
- `#define FL_MULTILINE_INPUT 4`
- `#define FL_SECRET_INPUT 5`
- `#define FL_INPUT_TYPE 7`
- `#define FL_INPUT_READONLY 8`
- `#define FL_NORMAL_OUTPUT (FL_NORMAL_INPUT | FL_INPUT_READONLY)`
- `#define FL_MULTILINE_OUTPUT (FL_MULTILINE_INPUT | FL_INPUT_READONLY)`
- `#define FL_INPUT_WRAP 16`
- `#define FL_MULTILINE_INPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_WRAP)`
- `#define FL_MULTILINE_OUTPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_READONLY | FL_INPUT_WRAP)`

All variables that represent an index into a text buffer are byte-oriented, not character oriented, counting from 0 (at or before the first character) to `size()` (at the end of the buffer, after the last byte). Since UTF-8 characters can be up to six bytes long, simply incrementing such an index will not reliably advance to the next character in the text buffer. Indices and pointers into the text buffer should always point at a 7 bit ASCII character or the beginning of a UTF-8 character sequence. Behavior for false UTF-8 sequences and pointers into the middle of a sequence are undefined.

See also

- `Fl_Text_Display, Fl_Text_Editor` for more powerful text handling widgets
- `Fl_Widget::shortcut_label(int)`

#### 34.75.2 Constructor & Destructor Documentation

##### 34.75.2.1 Fl_Input()

```cpp
Fl_Input_::Fl_Input_ (int X, int Y, int W, ...
```
int H,
const char * l = 0 )

Creates a new Fl_Input_ widget.
This function creates a new Fl_Input_ widget and adds it to the current Fl_Group. The value() is set to NULL. The
default boxtype is FL_DOWN_BOX.

Parameters

<table>
<thead>
<tr>
<th>X, Y, W, H</th>
<th>the dimensions of the new widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>an optional label text</td>
</tr>
</tbody>
</table>

34.75.2.2 ~Fl_Input_()

Fl_Input_::~Fl_Input_ ( )

Destroys the widget.
The destructor clears all allocated buffers and removes the widget from the parent Fl_Group.

34.75.3 Member Function Documentation

34.75.3.1 append()

int Fl_Input_::append ( const char * t, int l = 0, char keep_selection = 0 )

Append text at the end.
This function appends the string in t to the end of the text. It does not moves the new position or mark.

Parameters

<table>
<thead>
<tr>
<th>in t</th>
<th>text that will be appended</th>
</tr>
</thead>
<tbody>
<tr>
<td>in l</td>
<td>length of text, or 0 if the string is terminated by nul.</td>
</tr>
<tr>
<td>in keep_selection</td>
<td>if this is 1, the current text selection will remain, if 0, the cursor will move to the end of the inserted text.</td>
</tr>
</tbody>
</table>

Returns

0 if no text was appended

34.75.3.2 apply_undo()

int Fl_Input_::apply_undo ( ) [protected]

Apply the current undo/redo operation.
It's up to undo() and redo() to push and pop actions to and from the lists.

Returns

1 if the current action changed any text.

See also

undo(), redo()
34.75.3.3 can_redo()

bool Fl_Input_::can_redo ( ) const
Check if there is a redo action available.

Returns

true if the widget can redo the last undo action

34.75.3.4 can_undo()

bool Fl_Input_::can_undo ( ) const
Check if the last operation can be undone.

Returns

true if the widget can undo the last change

34.75.3.5 copy()

int Fl_Input_::copy ( int clipboard )
Put the current selection into the clipboard.
This function copies the current selection between mark() and position() into the specified clipboard. This does not replace the old clipboard contents if position() and mark() are equal. Clipboard 0 maps to the current text selection and clipboard 1 maps to the cut/paste clipboard.

Parameters

| clipboard | the clipboard destination 0 or 1 |

Returns

0 if no text is selected, 1 if the selection was copied

See also

Fl::copy(const char *, int, int)

34.75.3.6 copy_cuts()

int Fl_Input_::copy_cuts ( )
Copies the yank buffer to the clipboard.
This method copies all the previous contiguous cuts from the undo information to the clipboard. This function implements the \( \wedge \)K shortcut key.

Returns

0 if the operation did not change the clipboard

See also

copy(int), cut()
34.75.3.7 cursor_color() [1/2]

Fl_Color Fl_Input_::cursor_color ( ) const [inline]

Gets the color of the cursor.

Returns

the current cursor color

34.75.3.8 cursor_color() [2/2]

void Fl_Input_::cursor_color ( Fl_Color n ) [inline]

Sets the color of the cursor.
The default color for the cursor is FL_BLACK.

Parameters

| in | n | the new cursor color |

34.75.3.9 cut() [1/3]

int Fl_Input_::cut ( ) [inline]

Deletes the current selection.
This function deletes the currently selected text without storing it in the clipboard. To use the clipboard, you may call copy() first or copy_cuts() after this call.

Returns

0 if no data was copied

34.75.3.10 cut() [2/3]

int Fl_Input_::cut ( int a, int b ) [inline]

Deletes all characters between index a and b.
This function deletes the currently selected text without storing it in the clipboard. To use the clipboard, you may call copy() first or copy_cuts() after this call.

Parameters

| a,b | range of bytes rounded to full characters and clamped to the buffer |

Returns

0 if no data was copied

34.75.3.11 cut() [3/3]

int Fl_Input_::cut ( int n ) [inline]

Deletes the next n bytes rounded to characters before or after the cursor.
This function delete the currently selected text without storing it in the clipboard. To use the clipboard, you may call `copy()` first or `copy_cuts()` after this call.

Parameters

| n | number of bytes rounded to full characters and clamped to the buffer. A negative number will cut characters to the left of the cursor. |

Returns

0 if no data was copied

### 34.75.3.12 `drawtext()` [1/2]

```cpp
void Fl_Input_::drawtext (int X, int Y, int W, int H) [protected]
```

Draws the text in the passed bounding box. If `damage()` & `FL_DAMAGE_ALL` is true, this assumes the area has already been erased to `color()`. Otherwise it does minimal update and erases the area itself.

Parameters

| X, Y, W, H | area that must be redrawn |

### 34.75.3.13 `drawtext()` [2/2]

```cpp
void Fl_Input_::drawtext (int X, int Y, int W, int H, bool draw_active) [protected]
```

Draws the text in the passed bounding box. This version of `drawtext` allows the user to control whether the widget is drawn as active, i.e. with the text cursor, or inactive. This is useful for compound widgets where the input should be shown as active when actually the container widget is the active one.

A caller should not draw the widget with `active` set if another text widget may indeed be the active widget.

Parameters

| X, Y, W, H | area that must be redrawn |
| draw_active | if set, the cursor will be drawn, even if the widget is not active |

See also

`Fl_Input_::drawtext(int X, int Y, int W, int H)`

### 34.75.3.14 `dvalue()`

```cpp
double Fl_Input_::dvalue ( ) const
```

Generated by Doxygen
Returns the widget text interpreted as a floating point number.

Returns

double precision floating point value

See also

Fl_Input_::ivalue()
Fl_Input_::value(double)

34.75.3.15 handle_mouse()

void Fl_Input_::handle_mouse (  
    int X,  
    int Y,  
    int ,  
    int ,  
    int drag = 0 ) [protected]

Handles mouse clicks and mouse moves.

Todo Add comment and parameters

34.75.3.16 handletext()

int Fl_Input_::handletext (  
    int event,  
    int X,  
    int Y,  
    int W,  
    int H ) [protected]

Handles all kinds of text field related events. This is called by derived classes.

Todo Add comment and parameters

34.75.3.17 index()

unsigned int Fl_Input_::index (  
    int i ) const

Returns the character at index i. This function returns the UTF-8 character at i as a ucs4 character code.

Parameters

\[
\begin{array}{ll}
\text{in} & i \\
\text{index into the value field}
\end{array}
\]

Returns

the character at index i

34.75.3.18 input_type() [1/2]

int Fl_Input_::input_type ( ) const [inline]
Gets the input field type.

Returns
the current input type

### 34.75.3.19 input_type() [2/2]

```cpp
void Fl_Input_::input_type (int t) [inline]
```

Sets the input field type.
A `redraw()` is required to reformat the input field.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>new input type</th>
</tr>
</thead>
</table>

### 34.75.3.20 insert()

```cpp
int Fl_Input_::insert (const char * t, int l = 0) [inline]
```

Inserts text at the cursor position.
This function inserts the string in `t` at the cursor `position()` and moves the new position and mark to the end of the inserted text.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>text that will be inserted</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>l</td>
<td>length of text, or 0 if the string is terminated by <code>nul</code>.</td>
</tr>
</tbody>
</table>

Returns

0 if no text was inserted

### 34.75.3.21 insert_position() [1/3]

```cpp
int Fl_Input_::insert_position ( ) const [inline]
```

Gets the position of the text cursor.

Returns
the cursor position as an index in the range 0..`size()`

See also

`insert_position(int, int)`

### 34.75.3.22 insert_position() [2/3]

```cpp
int Fl_Input_::insert_position (int p) [inline]
```

Sets the cursor position and mark.
`position(n)` is the same as `position(n, n)`.
Parameters

| p       | new index for cursor and mark |

Returns

0 if no positions changed

See also

insert_position(int, int), insert_position(), mark(int)

34.75.3.23 insert_position() [3/3]

```c
int Fl_Input_::insert_position ( int p, int m )
```

Sets the index for the cursor and mark.
The input widget maintains two pointers into the string. The position (p) is where the cursor is. The mark (m) is the other end of the selected text. If they are equal then there is no selection. Changing this does not affect the clipboard (use copy() to do that). Changing these values causes a redraw(). The new values are bounds checked.

Parameters

<table>
<thead>
<tr>
<th>p</th>
<th>index for the cursor position</th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td>index for the mark</td>
</tr>
</tbody>
</table>

Returns

0 if no positions changed

See also

position(int), position(), mark(int)

34.75.3.24 ivalue()

```c
int Fl_Input_::ivalue ( ) const
```

Returns the widget text interpreted as a signed integer.

Returns

signed integer value

See also

Fl_Input_::dvalue()
Fl_Input_::value(int)

34.75.3.25 line_end()

```c
int Fl_Input_::line_end ( int i ) const [protected]
```

Finds the end of a line.
This call calculates the end of a line based on the given index i.
### 34.75.3.26 line_start()

```c++
int Fl_Input_::line_start (int i) const [protected]
```

Finds the start of a line.

This call calculates the start of a line based on the given index `i`.

**Parameters**

- `i` starting index for the search

**Returns**

- end of the line

### 34.75.3.27 mark()[1/2]

```c++
int Fl_Input_::mark ( ) const [inline]
```

Gets the current selection mark.

**Returns**

- index into the text

### 34.75.3.28 mark()[2/2]

```c++
int Fl_Input_::mark (int m) [inline]
```

Sets the current selection mark.

`mark(n)` is the same as `insert_position(insert_position(),n)`.

**Parameters**

- `m` new index of the mark

**Returns**

- 0 if the mark did not change

See also

- `insert_position()`, `insert_position(int, int)`
34.75.3.29 maximum_size() [1/2]

int Fl_Input_::maximum_size ( ) const [inline]
Gets the maximum length of the input field in characters.
See also maximum_size(int).

34.75.3.30 maximum_size() [2/2]

void Fl_Input_::maximum_size ( int m ) [inline]
Sets the maximum length of the input field in characters.
This limits the number of characters that can be inserted in the widget.
Since FLTK 1.3 this is different than the buffer size, since one character can be more than one byte in UTF-8 encoding. In FLTK 1.1 this was the same (one byte = one character).

34.75.3.31 position() [1/3]

int Fl_Input_::position ( ) const [inline]
Deprecated "in 1.4.0 - use insert_position() instead"

34.75.3.32 position() [2/3]

int Fl_Input_::position ( int p ) [inline]
Deprecated "in 1.4.0 - use insert_position(p) instead"

34.75.3.33 position() [3/3]

int Fl_Input_::position ( int p, int m ) [inline]
Deprecated "in 1.4.0 - use insert_position(p, m) or Fl_Widget::position(x, y) instead"

34.75.3.34 readonly() [1/2]

int Fl_Input_::readonly ( ) const [inline]
Gets the read-only state of the input field.
Returns
    non-zero if this widget is read-only

34.75.3.35 readonly() [2/2]

void Fl_Input_::readonly ( int b ) [inline]
Sets the read-only state of the input field.
34.75.3.36  redo()

int Fl_Input_::redo ( )

Redo previous undo operation.
This call reappplies previously executed undo operations.

Returns

non-zero if any change was made.

34.75.3.37  replace()

int Fl_Input_::replace ( int b, int e, const char * text, int ilen = 0 )

Deletes text from b to e and inserts the new string text.
All changes to the text buffer go through this function. It deletes the region between b and e (either one may be
less or equal to the other), and then inserts the string text at that point and moves the mark() and position() to the
end of the insertion. Does the callback if when() & FL_WHEN_CHANGED and there is a change.
Set b and e equal to not delete anything. Set text to NULL to not insert anything.
ilen can be zero or strlen(text), which saves a tiny bit of time if you happen to already know the length of
the insertion, or can be used to insert a portion of a string. If ilen is zero, strlen(text) is used instead.
b and e are clamped to the 0..size() range, so it is safe to pass any values. b, e, and ilen are used as
numbers of bytes (not characters), where b and e count from 0 to size() (end of buffer).
If b and/or e don't point to a valid UTF-8 character boundary, they are adjusted to the previous (b) or the next (e)
valid UTF-8 character boundary, resp..
If the current number of characters in the buffer minus deleted characters plus inserted characters in text would
overflow the number of allowed characters (maximum_size()), then only the first characters of the string are inserted,
so that maximum_size() is not exceeded.
cut() and insert() are just inline functions that call replace().

Parameters

| in  | b            | beginning index of text to be deleted |
|     | e            | ending index of text to be deleted and insertion position |
| in  | text         | string that will be inserted |
| in  | ilen         | length of text or 0 for null terminated strings |

Returns

0 if nothing changed

Note

If text does not point to a valid UTF-8 character or includes invalid UTF-8 sequences, the text is inserted
nevertheless (counting invalid UTF-8 bytes as one character each).
34.75.3.38 resize()

void Fl_Input_::resize (  
    int X,  
    int Y,  
    int W,  
    int H ) [virtual]
Changes the size of the widget.  
This call updates the text layout so that the cursor is visible.

Parameters

| in | X,Y,W,H | new size of the widget |

See also

Fl_Widget::resize(int, int, int, int)

Reimplemented from Fl_Widget.

34.75.3.39 shortcut() [1/2]

int Fl_Input_::shortcut ( ) const [inline]
Return the shortcut key associated with this widget.

Returns

shortcut keystroke

See also

Fl_Button::shortcut()

34.75.3.40 shortcut() [2/2]

void Fl_Input_::shortcut (  
    int s ) [inline]
Sets the shortcut key associated with this widget.  
Pressing the shortcut key gives text editing focus to this widget.

Parameters

| in | s | new shortcut keystroke |

See also

Fl_Button::shortcut()

34.75.3.41 size() [1/2]

int Fl_Input_::size ( ) const [inline]
Returns the number of bytes in value().  
This may be greater than strlen(value()) if there are nul characters in the text.
Returns

number of bytes in the text

34.75.3.42 size() [2/2]

```cpp
void Fl_Input_::size (
    int W,
    int H   ) [inline]
```

Sets the width and height of this widget.

Parameters

| in | W, H | new width and height |

See also

Fl_Widget::size(int, int)

34.75.3.43 static_value() [1/2]

```cpp
int Fl_Input_::static_value ( 
    const char * str )
```

Changes the widget text.

This function changes the text and sets the mark and the point to the end of it. The string is not copied. If the user edits the string it is copied to the internal buffer then. This can save a great deal of time and memory if your program is rapidly changing the values of text fields, but this will only work if the passed string remains unchanged until either the Fl_Input is destroyed or value() is called again.

Parameters

| in | str | the new text |

Returns

non-zero if the new value is different than the current one

34.75.3.44 static_value() [2/2]

```cpp
int Fl_Input_::static_value ( 
    const char * str,
    int len )
```

Changes the widget text.

This function changes the text and sets the mark and the point to the end of it. The string is not copied. If the user edits the string it is copied to the internal buffer then. This can save a great deal of time and memory if your program is rapidly changing the values of text fields, but this will only work if the passed string remains unchanged until either the Fl_Input is destroyed or value() is called again.

You can use the len parameter to directly set the length if you know it already or want to put null characters in the text.

Parameters

| in | str | the new text |
| in | len | the length of the new text |
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Returns
non-zero if the new value is different than the current one

34.75.3.45  tab_nav() [1/2]

int Fl_Input_::tab_nav () const  [inline]

Gets whether the Tab key causes focus navigation in multiline input fields or not.
If enabled (default), hitting Tab causes focus navigation to the next widget.
If disabled, hitting Tab inserts a tab character into the text field.

Returns
1 if Tab advances focus (default), 0 if Tab inserts tab characters.

See also
    tab_nav(int), Fl::OPTION_ARROW_FOCUS.

34.75.3.46  tab_nav() [2/2]

void Fl_Input_::tab_nav ( int val )  [inline]

Sets whether the Tab key does focus navigation, or inserts tab characters into Fl_Multiline_Input.
By default this flag is enabled to provide the 'normal' behavior most users expect; Tab navigates focus to the next
widget. To inserting an actual Tab character, users can use Ctrl-I or copy/paste.
Disabling this flag gives the old FLTK behavior where Tab inserts a tab character into the text field, in which case
only the mouse can be used to navigate to the next field.
History: This flag was provided for backwards support of FLTK's old 1.1.x behavior where Tab inserts a tab character
instead of navigating focus to the next widget. This behavior was unique to Fl_Multiline_Input. With the advent of
Fl_Text_Editor, this old behavior has been deprecated.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>val</th>
</tr>
</thead>
</table>
|    | If val is 1, Tab advances focus (default).
|    | If val is 0, Tab inserts a tab character (old FLTK behavior).

See also
    tab_nav(), Fl::OPTION_ARROW_FOCUS.

34.75.3.47  textcolor() [1/2]

Fl_Color Fl_Input_::textcolor () const  [inline]

Gets the color of the text in the input field.

Returns
the text color

See also
    textcolor(Fl_Color)
34.75.3.48  textcolor() [2/2]

void Fl_Input_::textcolor (  
    Fl_Color n ) [inline]

Sets the color of the text in the input field.
The text color defaults to FL_FOREGROUND_COLOR.

Parameters

\[
\begin{array}{ll}
\text{in} & \text{n} \quad \text{new text color}
\end{array}
\]

See also

textcolor() 

34.75.3.49  textfont() [1/2]

Fl_Font Fl_Input_::textfont ( ) const [inline]

Gets the font of the text in the input field.

Returns

the current Fl_Font index

34.75.3.50  textfont() [2/2]

void Fl_Input_::textfont (  
    Fl_Font s ) [inline]

Sets the font of the text in the input field.
The text font defaults to FL_HELVETICA.

Parameters

\[
\begin{array}{ll}
\text{in} & \text{s} \quad \text{the new text font}
\end{array}
\]

34.75.3.51  textsize() [1/2]

Fl_Fontsize Fl_Input_::textsize ( ) const [inline]

Gets the size of the text in the input field.

Returns

the text height in pixels

34.75.3.52  textsize() [2/2]

void Fl_Input_::textsize (  
    Fl_Fontsize s ) [inline]

Sets the size of the text in the input field.
The text height defaults to FL_NORMAL_SIZE.

Parameters

\[
\begin{array}{ll}
\text{in} & \text{s} \quad \text{the new font height in pixel units}
\end{array}
\]
### 34.75.3.53 undo()

```cpp
int Fl_Input_::undo ()
```

Undoes previous changes to the text buffer.
This call undoes a number of previous calls to replace().

Returns

non-zero if any change was made.

### 34.75.3.54 up_down_position()

```cpp
int Fl_Input_::up_down_position (  
    int i,  
    int keepmark = 0 ) [protected]
```

Moves the cursor to the column given by up_down_pos.
This function is helpful when implementing up and down cursor movement. It moves the cursor from the beginning
of a line to the column indicated by the global variable up_down_pos in pixel units.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>i</th>
<th>index into the beginning of a line of text</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>keepmark</td>
<td>if set, move only the cursor, but not the mark</td>
</tr>
</tbody>
</table>

Returns

index to new cursor position

### 34.75.3.55 value() [1/5]

```cpp
const char * Fl_Input_::value ( ) const [inline]
```

Returns the text displayed in the widget.
This function returns the current value, which is a pointer to the internal buffer and is valid only until the next event
is handled.

Returns

pointer to an internal buffer - do not free() this

See also

Fl_Input_::value(const char*)

### 34.75.3.56 value() [2/5]

```cpp
int Fl_Input_::value (  
    const char * str )
```

Changes the widget text.
This function changes the text and sets the mark and the point to the end of it. The string is copied to the internal buffer. Passing NULL is the same as " ".

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>str</th>
<th>the new text</th>
</tr>
</thead>
</table>
Returns
non-zero if the new value is different than the current one

See also
FliInput_::value(const char * str, int len), FliInput_::value()

34.75.3.57  value() [3/5]

int FliInput_::value (const char * str, int len)
Changes the widget text.
This function changes the text and sets the mark and the point to the end of it. The string is copied to the internal
buffer. Passing NULL is the same as "".
You can use the length parameter to directly set the length if you know it already or want to put nul characters
in the text.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>str</th>
<th>the new text</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>len</td>
<td>the length of the new text</td>
</tr>
</tbody>
</table>

Returns
non-zero if the new value is different than the current one

See also
FliInput_::value(const char * str), FliInput_::value()

34.75.3.58  value() [4/5]

int FliInput_::value (double v)
Changes the widget text to a floating point number ("%g").

Parameters

| in  | v     | the new value |

Returns
non-zero if the new value is different than the current one

See also
FliInput_::value(const char * str), FliInput_::ivalue()

34.75.3.59  value() [5/5]

int FliInput_::value (int v)
Changes the widget text to a signed integer number.
Parameters

| in  | v   | the new value |

Returns

non-zero if the new value is different than the current one

See also

Fl_Input_::value(const char* str), Fl_Input_::ivalue()

34.75.3.60 word_end()

int Fl_Input_::word_end (int i) const [protected]

Finds the end of a word.
Returns the index after the last byte of a word. If the index is already at the end of a word, it will find the end of the following word, so if you call it repeatedly you will move forwards to the end of the text.
Note that this is inconsistent with line_end().

Parameters

| in  | i   | starting index for the search |

Returns

end of the word

34.75.3.61 word_start()

int Fl_Input_::word_start (int i) const [protected]

Finds the start of a word.
Returns the index of the first byte of a word. If the index is already at the beginning of a word, it will find the beginning of the previous word, so if you call it repeatedly you will move backwards to the beginning of the text.
Note that this is inconsistent with line_start().

Parameters

| in  | i   | starting index for the search |

Returns

start of the word, or previous word

34.75.3.62 wrap() [1/2]

int Fl_Input_::wrap ( ) const [inline]

Gets the word wrapping state of the input field.
Word wrap is only functional with multi-line input fields.
34.75.3.63 wrap() [2/2]
void Fl_Input_::wrap (int b) [inline]
Sets the word wrapping state of the input field.
Word wrap is only functional with multi-line input fields.
The documentation for this class was generated from the following files:

- Fl_Input_.H
- Fl_Input_.cxx

34.76 Fl_Input_Choice Class Reference
A combination of the input widget and a menu button.
Inheritance diagram for Fl_Input_Choice:

```
Fl_Widget
   ^
|   |
|   Fl_Group
   |
   |
   Fl_Input_Choice
```

Public Member Functions

- void add (const char ∗s)
  Adds an item to the menu.
- int changed () const
  Returns the combined changed() state of the input and menu button widget.
- void clear ()
  Removes all items from the menu.
- void clear_changed ()
  Clears the changed() state of both input and menu button widgets.
- Fl_Boxtype down_box () const
  Gets the box type of the menu button.
- void down_box (Fl_Boxtype b)
  Sets the box type of the menu button.
- Fl_Input_Choice (int X, int Y, int W, int H, const char ∗L=0)
  Creates a new Fl_Input_Choice widget using the given position, size, and label string.
- Fl_Input ∗ input ()
  Returns a pointer to the internal Fl_Input widget.
- const Fl_Menu_Item ∗ menu ()
  Gets the Fl_Menu_Item array used for the menu.
- void menu (const Fl_Menu_Item ∗m)
  Sets the Fl_Menu_Item array used for the menu.
- Fl_Menu_Button ∗ menubutton ()
  Returns a pointer to the internal Fl_Menu_Button widget.
- void resize (int X, int Y, int W, int H) FL_OVERRIDE
  Resizes the Fl_Input_Choice widget.
- void set_changed ()
  Sets the changed() state of both input and menu button widgets to the specified value.
- Fl_Color textcolor () const
Gets the Fl_Input text field’s text color.

- `void` `textcolor` (Fl_Color `c`)

  Sets the Fl_Input text field's text color to `c`.

- `Fl_Font` `textfont` () const

  Gets the Fl_Input text field's font style.

- `void` `textfont` (Fl_Font `f`)

  Sets the Fl_Input text field's font style to `f`.

- `Fl_Fontsize` `textsize` () const

  Gets the Fl_Input text field's font size.

- `void` `textsize` (Fl_Fontsize `s`)

  Sets the Fl_Input text field's font size to `s`.

- `int` `update_menubutton` ()

  Updates the menubutton with the string value in Fl_Input.

- `const char ∗` `value` () const

  Returns the Fl_Input text field's current contents.

- `void` `value` (const char ∗`val`)

  Sets the Fl_Input text field's contents to `val`.

- `void` `value` (int `val`)

  Chooses item# `val` in the menu, and sets the Fl_Input text field to that value.

Protected Member Functions

- `virtual int` `inp_h` () const

  See `inp_x()` for info.

- `virtual int` `inp_w` () const

  See `inp_x()` for info.

- `virtual int` `inp_x` () const

  The methods `inp_x()`, `inp_y()`, `inp_w()` and `inp_h()` return the desired position and size of the internal Fl_Input widget.

- `virtual int` `inp_y` () const

  See `inp_x()` for info.

- `virtual int` `menu_h` () const

  See `menu_x()` for info.

- `virtual int` `menu_w` () const

  See `menu_x()` for info.

- `virtual int` `menu_x` () const

  The methods `menu_x()`, `menu_y()`, `menu_w()` and `menu_h()` return the desired position and size of the internal Fl_Menu_Button widget.

- `virtual int` `menu_y` () const

  See `menu_x()` for info.

Additional Inherited Members

34.76.1 Detailed Description

A combination of the input widget and a menu button.

![Fl_Input_Choice widget](image)
The user can either type into the input area, or use the menu button chooser on the right to choose an item which loads the input area with the selected text.

The application can directly access both the internal Fl_Input and Fl_Menu_Button widgets respectively using the input() and menubutton() accessor methods.

The default behavior is to invoke the Fl_Input_Choice::callback() if the user changes the input field’s contents, either by typing, pasting, or clicking a different item in the choice menu. The callback can determine if an item was picked vs. typing into the input field by checking the value of menubutton()->changed(), which will be:

- 1: the user picked a different item in the choice menu
- 0: the user typed or pasted directly into the input field

Example Use of Fl_Input_Choice

```c
#include <stdio.h>
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Input_Choice.H>

// Fl_Input_Choice callback()
void choice_cb(Fl_Widget *w, void *userdata) {
    Fl_Input_Choice *choice = (Fl_Input_Choice*)w;
    printf("*** Choice Callback:\n");
    printf(" widget’s text value='%s'", choice->value()); // normally all you need
    // Access the menu via menubutton()
    const Fl_Menu_Item *item = choice->menubutton()->mvalue();
    printf(" item label()='%s'", item ? item->label() : "(No item)" Nositem);
    printf(" item value()=%d", choice->menubutton()->value());
    printf(" input value()='%s'", choice->input()->value());
    printf(" The user %s\n", choice->menubutton()->changed() ? "picked a menu item": "typed text");
}

int main() {
    Fl_Double_Window win(200,100,"Input Choice");
    win.begin();
    Fl_Input_Choice choice(10,10,100,30);
    choice.callback(choice_cb, 0);
    choice.add("Red");
    choice.add("Orange");
    choice.add("Yellow");
    //choice.value("Red"); // uncomment to make "Red" default
    win.end();
    win.show();
    return Fl::run();
}
```

Subclassing Example

One can subclass Fl_Input_Choice to override the virtual methods inp_x/y/w/h() and menu_x/y/w/h() to take control of the internal Fl_Input and Fl_Menu_Button widget positioning. In this example, input and menubutton’s positions are swapped:

```c
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Input_Choice.H>

class MyInputChoice : public Fl_Input_Choice {
protected:
    virtual int inp_x() const { return x() + Fl::box_dx(box()) + menu_w(); } // override to reposition
    virtual int menu_x() const { return x() + Fl::box_dx(box()) + menu_w(); } // override to reposition

public:
    MyInputChoice(int X,int Y,int W,int H,const char*L=0) : Fl_Input_Choice(X,Y,W,H,L) {
        resize(X,Y,W,H); // necessary for ctor to trigger our overrides
    }
};

int main(int argc, char **argv) {
    Fl_Double_Window *win = new Fl_Double_Window(400,300);
    MyInputChoice *mychoice = new MyInputChoice(150,40,150,25,"Right Align Input");
    mychoice->add("Aaa");
    mychoice->add("Bbb");
    mychoice->add("Ccc");
    win->end();
    win->resizable(w);
    win->show();
    return Fl::run();
}
```
34.76.2.1 Fl_Input_Choice()

Fl_Input_Choice::Fl_Input_Choice (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0 )

Creates a new Fl_Input_Choice widget using the given position, size, and label string.  
Inherited destructor destroys the widget and any values associated with it.

34.76.3 Member Function Documentation

34.76.3.1 add()

void Fl_Input_Choice::add (  
    const char * s ) [inline]

Adds an item to the menu.  
When any item is selected, the Fl_Input_Choice callback() is invoked, which can do something with the selected  
item.  
You can access the more complex Fl_Menu_Button::add() methods (setting item-specific callbacks, userdata, etc),  
via menubutton(). Example:  
Fl_Input_Choice *choice = new Fl_Input_Choice(100,10,120,25,"Fonts");  
Fl_Menu_Button *mb = choice->menubutton(); // use Fl_Input_Choice’s Fl_Menu_Button  
mb->add("Helvetica", 0, MyFont_CB, (void*)mydata); // use Fl_Menu_Button’s add() methods  
mb->add("Courier", 0, MyFont_CB, (void*)mydata);  
mb->add("More..", 0, FontDialog_CB, (void*)mydata);

34.76.3.2 inp_x()

virtual int Fl_Input_Choice::inp_x ( ) const [inline], [protected], [virtual]  
The methods inp_x(), inp_y(), inp_w() and inp_h() return the desired position and size of the internal Fl_Input widget.  
These can be overridden by a subclass to redefine positioning. See code example in the Description for subclassing  
details.

34.76.3.3 input()

Fl_Input * Fl_Input_Choice::input ( ) [inline]  
Returns a pointer to the internal Fl_Input widget.  
This can be used to directly access all of the Fl_Input widget’s methods.

34.76.3.4 menu_x()

virtual int Fl_Input_Choice::menu_x ( ) const [inline], [protected], [virtual]  
The methods menu_x(), menu_y(), menu_w() and menu_h() return the desired position and size of the internal  
Fl_Menu_Button widget.  
These can be overridden by a subclass to redefine positioning. See code example in the Description for subclassing  
details.

34.76.3.5 menubutton()

Fl_Menu_Button * Fl_Input_Choice::menubutton ( ) [inline]  
Returns a pointer to the internal Fl_Menu_Button widget.  
This can be used to access any of the methods of the menu button, e.g.  
Fl_Input_Choice *choice = new Fl_Input_Choice(100,10,120,25,"Choice:“);  
[...]  
// Print all the items in the choice menu  
for ( int t=0; t<choice->menubutton()->size(); t++ ) {  
    const Fl_Menu_Item &item = choice->menubutton()->menu()[t];  
    printf("item %d -- label=%s\n", t, item.label() ? item.label() : "(Null)");
### 34.76.3.6 resize()

```cpp
void Fl_Input_Choice::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Resizes the Fl_Input_Choice widget.
Reimplemented from Fl_Group.

### 34.76.3.7 update_menubutton()

```cpp
int Fl_Input_Choice::update_menubutton ( )
```

Updates the menubutton with the string value in Fl_Input.
If the string value currently in Fl_Input matches one of the menu items in menubutton(), that menu item will become
the current item selected.
Call this method after setting value(const char*) if you need the menubutton() to be synchronized with the Fl_Input
field.

```cpp
// Add items
choice->add(".25");
choice->add(".50");
choice->add("1.0");
choice->add("2.0");
choice->add("4.0");
choice->value("1.0"); // sets Fl_Input to "1.0"
choice->update_menubutton(); // cause menubutton to reflect this value too
// (returns 1 if match was found, 0 if not)
// Verify menubutton()'s value.
printf("menu button choice index=%d, value=%s\n",
    choice->menubutton()->value(), // would be -1 if update not done
    choice->menubutton()->text()); // would be NULL if update not done
```

Returns

1 if a matching menuitem was found and value set, 0 if not.

Version

1.4.0

### 34.76.3.8 value() [1/2]

```cpp
void Fl_Input_Choice::value ( const char * val ) [inline]
```

Sets the Fl_Input text field's contents to val.
Note it is possible to set the value() to one that is not in the menubutton's list of choices.
Setting the value() does NOT affect the menubutton's selection. If that's needed, call update_menubutton() after
setting value().

See also

void value(int val), update_menubutton()

### 34.76.3.9 value() [2/2]

```cpp
void Fl_Input_Choice::value ( int val )
```

Chooses item# val in the menu, and sets the Fl_Input text field to that value.
Any previous text is cleared.
The documentation for this class was generated from the following files:

- Fl_Input Choice.H
- Fl__Input Choice.cxx

34.77 Fl_Int_Input Class Reference

The Fl_Int_Input class is a subclass of Fl_Input that only allows the user to type decimal digits (or hex numbers of the form 0xaef).

```cpp
#include <Fl_Int_Input.H>
```

Inheritance diagram for Fl_Int_Input:

```
Fl_Widget
   |           
Fl_Input_
   |           
Fl_Input
   |           
Fl_Int_Input
```

Public Member Functions

- **Fl_Int_Input** (int X, int Y, int W, int H, const char *l = 0)

  Creates a new Fl_Int_Input widget using the given position, size, and label string.

Additional Inherited Members

34.77.1 Detailed Description

The Fl_Int_Input class is a subclass of Fl_Input that only allows the user to type decimal digits (or hex numbers of the form 0xaef).

34.77.2 Constructor & Destructor Documentation

34.77.2.1 Fl_Int_Input()

```cpp
Fl_Int_Input::Fl_Int_Input ( 
    int X, 
    int Y, 
    int W, 
    int H, 
    const char * l = 0 )
```

Creates a new Fl_Int_Input widget using the given position, size, and label string.

The default boxtype is FL_DOWN_BOX.

Inherited destructor destroys the widget and any value associated with it.

The documentation for this class was generated from the following files:

- Fl_Int_Input.H
- Fl__Input.cxx
34.78 Fl_JPEG_Image Class Reference

The Fl_JPEG_Image class supports loading, caching, and drawing of Joint Photographic Experts Group (JPEG) File Interchange Format (JFIF) images.

#include <Fl_JPEG_Image.H>

Inheritance diagram for Fl_JPEG_Image:

```
Fl_Image
|    |
|    |
Fl_RGB_Image
|    |
|    |
Fl_JPEG_Image
```

Public Member Functions

- **Fl_JPEG_Image (const char ∗ filename)**
  
  The constructor loads the JPEG image from the given jpeg filename.

- **Fl_JPEG_Image (const char ∗ name, const unsigned char ∗ data, int data_length=-1)**
  
  The constructor loads the JPEG image from memory.

Protected Member Functions

- **void load_jpg_ (const char ∗ filename, const char ∗ sharename, const unsigned char ∗ data, int data_length=-1)**

Additional Inherited Members

34.78.1 Detailed Description

The Fl_JPEG_Image class supports loading, caching, and drawing of Joint Photographic Experts Group (JPEG) File Interchange Format (JFIF) images.

The class supports grayscale and color (RGB) JPEG image files.

34.78.2 Constructor & Destructor Documentation

34.78.2.1 Fl_JPEG_Image() [1/2]

```
Fl_JPEG_Image::Fl_JPEG_Image ( 
    const char ∗ filename )
```

The constructor loads the JPEG image from the given jpeg filename.

The inherited destructor frees all memory and server resources that are used by the image.

Use Fl_Image::fail() to check if Fl_JPEG_Image failed to load. fail() returns ERR_FILE_ACCESS if the file could not be opened or read, ERR_FORMAT if the JPEG format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason. If the image has loaded correctly, w(), h(), and d() should return values greater than zero.

Parameters

```
in  filename  a full path and name pointing to a valid jpeg file.
```
Fl_JPEG_Image::Fl_JPEG_Image(const char *imagename, const unsigned char *data)

### 34.78.2.2 Fl_JPEG_Image()

Fl_JPEG_Image::Fl_JPEG_Image {
  const char * name,
  const unsigned char * data,
  int data_length = -1
}

The constructor loads the JPEG image from memory. Construct an image from a block of memory inside the application. Fluid offers "binary Data" chunks as a great way to add image data into the C++ source code. name_png can be NULL. If a name is given, the image is added to the list of shared images (see: Fl_Shared_Image) and will be available by that name.

The inherited destructor frees all memory and server resources that are used by the image. Use Fl_Image::fail() to check if Fl_JPEG_Image failed to load. fail() returns ERR_FILE_ACCESS if the file could not be opened or read, ERR_FORMAT if the JPEG format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason. If the image has loaded correctly, w(), h(), and d() should return values greater than zero.

**Parameters**

<table>
<thead>
<tr>
<th>name</th>
<th>A unique name or NULL</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>A pointer to the memory location of the JPEG image</td>
</tr>
<tr>
<td>data_length</td>
<td>optional length of data. This will protect memory outside of the data array from illegal read operations</td>
</tr>
</tbody>
</table>

See also

Fl_JPEG_Image::Fl_JPEG_Image(const char *filename)

Fl_Shared_Image

The documentation for this class was generated from the following files:

- Fl_JPEG_Image.H
- Fl_JPEG_Image.cxx

### 34.79 Fl_Label Struct Reference

This struct stores all information for a text or mixed graphics label.

```cpp
#include <Fl_Widget.H>
```

**Public Member Functions**

- **void draw** (int, int, int, int, Fl_Align) const
  
  Draws the label aligned to the given box.

- **void measure** (int &w, int &h) const
  
  Measures the size of the label.

**Public Attributes**

- **Fl_Align align_**
  
  alignment of label

- **Fl_Color color**
  
  text color
34.79.1 Detailed Description

This struct stores all information for a text or mixed graphics label.

**Todo** There is an aspiration that the `Fl_Label` type will become a widget by itself. That way we will be avoiding a lot of code duplication by handling labels in a similar fashion to widgets containing text. We also provide an easy interface for very complex labels, containing html or vector graphics. However, this re-factoring is not in place in this release.

34.79.2 Member Function Documentation

34.79.2.1 draw()

```c
void Fl_Label::draw (  
    int X,  
    int Y,  
    int W,  
    int H,  
    Fl_Align align ) const
```

Draws the label aligned to the given box.

Draws a label with arbitrary alignment in an arbitrary box.

34.79.2.2 measure()

```c
void Fl_Label::measure (  
    int & W,  
    int & H ) const
```

Measures the size of the label.

**Parameters**

| in,out | W,H | : this is the requested size for the label text plus image; on return, this will contain the size needed to fit the label |

34.79.3 Member Data Documentation

34.79.3.1 type

```c
uchar Fl_Label::type
```

Generated by Doxygen
type of label.

See also

- Fl_Labeltype

The documentation for this struct was generated from the following files:

- Fl_Widget.H
- fl_labeltype.cxx

### 34.80 Fl_Light_Button Class Reference

This subclass displays the "on" state by turning on a light, rather than drawing pushed in.

```cpp
#include <Fl_Light_Button.H>
```

Inheritance diagram for Fl_Light_Button:

![Inheritance Diagram](image)

#### Public Member Functions

- **Fl_Light_Button (int x, int y, int w, int h, const char ∗l=0)**
  
  Creates a new Fl_Light_Button widget using the given position, size, and label string.

- **int handle (int) FL_OVERRIDE**
  
  Handles the specified event.

#### Protected Member Functions

- **void draw () FL_OVERRIDE**
  
  Draws the widget.

#### Additional Inherited Members

### 34.80.1 Detailed Description

This subclass displays the "on" state by turning on a light, rather than drawing pushed in. The shape of the "light" is initially set to FL_DOWN_BOX. The color of the light when on is controlled with `selection_color()`, which defaults to FL_YELLOW.

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for `type()` and `when()`.

![Figure 34.27 Fl_Light_Button](image)
34.80.2 Constructor & Destructor Documentation

34.80.2.1 Fl_Light_Button()

Fl_Light_Button::Fl_Light_Button (  
  int X, 
  int Y, 
  int W, 
  int H, 
  const char * l = 0  )  

Creates a new Fl_Light_Button widget using the given position, size, and label string.
The default box type is FL_UP_BOX and the default down box type down_box() is FL_NO_BOX (0).
The selection_color() sets the color of the "light". Default is FL_YELLOW.
The default label alignment is 'FL_ALIGN_LEFT|FL_ALIGN_INSIDE' so the label is drawn inside the button area right of the "light".

Note  
Do not change the default box types of Fl_Light_Button. The box types determine how the button is drawn. If you change the down_box() type the drawing behavior is undefined.

34.80.3 Member Function Documentation

34.80.3.1 draw()

void Fl_Light_Button::draw ( ) [protected], [virtual]  

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
Reimplemented from Fl_Button.

34.80.3.2 handle()

int Fl_Light_Button::handle (  
  int event ) [virtual]  

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in | event | the kind of event received |

Generated by Doxygen
Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the event was not used or understood</td>
</tr>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

Fl_Event

Reimplemented from Fl_Button.

The documentation for this class was generated from the following files:

- Fl_Light_Button.H
- Fl_Light_Button.cxx

### 34.81 Fl_Line_Dial Class Reference

Inheritance diagram for Fl_Line_Dial:

```
Fl_Widget
  Fl_Valuator
    Fl_Dial
      Fl_Line_Dial
```

**Public Member Functions**

- Fl_Line_Dial (int X, int Y, int W, int H, const char ∗L=0)

**Additional Inherited Members**

The documentation for this class was generated from the following files:

- Fl_Line_Dial.H
- Fl_Dial.cxx

### 34.82 Fl_Mac_App_Menu Class Reference

**Static Public Member Functions**

- static void custom_application_menu_items (const Fl_Menu_Item ∗m)
  
  Adds custom menu item(s) to the application menu of the system menu bar.

**Static Public Attributes**

- static const char ∗about
  
  Localizable text for the “About xxx” application menu item.

- static const char ∗hide
  
  Localizable text for the “Hide xxx” application menu item.

- static const char ∗hide_others
  
  Localizable text for the “Hide Others” application menu item.
34.82.1 Member Function Documentation

34.82.1.1 custom_application_menu_items()

static void Fl_Mac_App_Menu::custom_application_menu_items ( const Fl_Menu_Item ∗ m ) [static]

Adds custom menu item(s) to the application menu of the system menu bar. They are positioned after the "Print Front Window / Toggle printing of titlebar" items, or at their place if they were removed with Fl_Mac_App_Menu::print = "".

Parameters

m zero-ending array of Fl_Menu_Item's.

34.82.2 Member Data Documentation

34.82.2.1 print

const char ∗ Fl_Mac_App_Menu::print [static]

Localizable text for the "Print Front Window" application menu item. This menu item and next one won't be displayed if Fl_Mac_App_Menu::print is set to an empty string. The documentation for this class was generated from the following file:

• mac.H

34.83 Fl_Menu_ Class Reference

Base class of all widgets that have a menu in FLTK.

#include <Fl_Menu_.H>

Inheritance diagram for Fl_Menu_:
Public Member Functions

- **int add (const char *)**
  This is a Forms (and SGI GL library) compatible add function, it adds many menu items, with `|` separating the menu items, and tab separating the menu item names from an optional shortcut string.

- **int add (const char *, int shortcut, Fl_Callback *, void *, int=0)**
  Adds a new menu item.

- **int add (const char *a, const char *b, Fl_Callback *c, void *d=0, int e=0)**
  See int Fl_Menu_::add(const char* label, int shortcut, Fl_Callback*, void *user_data=0, int flags=0)

- **void clear ()**
  Same as menu(NULL), set the array pointer to null, indicating a zero-length menu.

- **int clear_submenu (int index)**
  Clears the specified submenu pointed to by index of all menu items.

- **void copy (const Fl_Menu_Item *, void *user_data=0)**
  Sets the menu array pointer with a copy of m that will be automatically deleted.

- **Fl_Boxtype down_box () const**
  This box type is used to surround the currently-selected items in the menus.

- **void down_box (Fl_Boxtype b)**
  Sets the box type used to surround the currently-selected items in the menus.

- **Fl_Color down_color () const**
  For back compatibility, same as selection_color()

- **void down_color (unsigned c)**
  For back compatibility, same as selection_color()

- **int find_index (const char *) const**
  Find the menu item index for a given menu pathname, such as "Edit/Copy".

- **int find_index (const Fl_Menu_Item *) const**
  Find the index into the menu array for a given item.

- **int find_index (Fl_Callback *) const**
  Find the index into the menu array for a given callback cb.

- **const Fl_Menu_Item * find_item (long)**
  Find the menu item for the given user argument v.

- **const Fl_Menu_Item * find_item_with_argument (void *user_data = 0)**
  Find the menu item for the given user data v.

- **Fl_Menu_ (int, int, int, int, const char * = 0)**
  Creates a new Fl_Menu_ widget using the given position, size, and label string.

- **void global ()**
  Make the shortcuts for this menu work no matter what window has the focus when you type it.
• int insert (int index, const char *, int shortcut, Fl_Callback *, void *=0, int e=0)
  Inserts a new menu item at the specified index position.

• int insert (int index, const char *a, const char *b, Fl_Callback *c, void *=d=0, int e=0)
  See int Fl_Menu_::insert(const char* label, int shortcut, Fl_Callback*, void *user_data=0, int flags=0)

• int item_pathname (char *name, int namelen, const Fl_Menu_Item *finditem=0) const
  Get the menu 'pathname' for the specified menuitem.

• const Fl_Menu_Item * menu () const
  Returns a pointer to the array of Fl_Menu_Items.

• void menu (const Fl_Menu_Item *m)
  Sets the menu array pointer directly.

• Fl_Boxtype menu_box () const
  Get the box type for the menu popup windows.

• void menu_box (Fl_Boxtype b)
  Set the box type for the menu popup windows.

• const Fl_Menu_Item * menu_end ()
  Finishes menu modifications and returns menu().

• int mode (int i) const
  Gets the flags of item i.

• void mode (int i, int fl)
  Sets the flags of item i.

• const Fl_Menu_Item * mvalue () const
  Returns a pointer to the last menu item that was picked.

• const Fl_Menu_Item * picked (const Fl_Menu_Item *)
  When user picks a menu item, call this.

• const Fl_Menu_Item * prev_mvalue () const
  Returns a pointer to the menu item that was picked before the current one was picked.

• void remove (int)
  Deletes item i from the menu.

• void replace (int, const char *)
  Changes the text of item i.

• void setonly (Fl_Menu_Item *item)
  Turns the radio item "on" for the menu item and turns "off" adjacent radio items of the same group.

• void shortcut (int i, int s)
  Changes the shortcut of item i to s.

• int size () const
  This returns the number of Fl_Menu_Item structures that make up the menu, correctly counting submenus.

• void size (int W, int H)
  Fl_Menu_Item * test_shortcut ()
  Returns the menu item with the entered shortcut (key value).

• const char * text () const
  Returns the title of the last item chosen.

• const char * text (int i) const
  Returns the title of item i.

• FL_Color textcolor () const
  Get the current color of menu item labels.

• void textcolor (FL_Color c)
  Sets the current color of menu item labels.

• FL_Font textfont () const
  Gets the current font of menu item labels.

• void textfont (FL_Font c)
  Sets the current font of menu item labels.
• **Fl_Fontsize textsize () const**  
  Gets the font size of menu item labels.

• **void textsize (Fl_Fontsize c)**  
  Sets the font size of menu item labels.

• **int value () const**  
  Returns the index into menu() of the last item chosen by the user.

• **int value (const Fl_Menu_Item *)**  
  The value is the index into menu() of the last item chosen by the user.

• **int value (int i)**  
  The value is the index into menu() of the last item chosen by the user.

### Protected Member Functions

• **int item_pathname_ (char *name, int namelen, const Fl_Menu_Item *finditem, const Fl_Menu_Item *menu=0) const**

### Protected Attributes

• uchar alloc
• uchar down_box_
• Fl_Boxtype menu_box_
• Fl_Color textcolor_
• Fl_Font textfont_
• Fl_Fontsize textsize_

### Additional Inherited Members

#### 34.83.1 Detailed Description

Base class of all widgets that have a menu in FLTK.  
Currently FLTK provides you with Fl_Menu_Button, Fl_Menu_Bar, and Fl_Choice.  
The class contains a pointer to an array of structures of type Fl_Menu_Item. The array may either be supplied directly by the user program, or it may be "private": a dynamically allocated array managed by the Fl_Menu_.  
When the user clicks a menu item, value() is set to that item and then:

• If the Fl_Menu_Item has a callback set, that callback is invoked with any userdata configured for it. (The Fl_Menu_item's callback is NOT invoked.)

• For any Fl_Menu_Items that don't have a callback set, the Fl_Menu_item's callback is invoked with any userdata configured for it. The callback can determine which item was picked using value(), mvalue(), item_pathname(), etc.

The line spacing between menu items can be controlled with the global setting Fl::menu_linespacing().

See also  
Fl_Widget::shortcut_label(int)

#### 34.83.2 Constructor & Destructor Documentation
34.83.2.1  Fl_Menu_()

Fl_Menu_::Fl_Menu_ (int X, int Y, int W, int H, const char * l = 0 )

Creates a new Fl_Menu_ widget using the given position, size, and label string.
menu() is initialized to null.

34.83.3  Member Function Documentation

34.83.3.1  add() [1/2]

int Fl_Menu_::add (const char * str)

This is a Forms (and SGI GL library) compatible add function, it adds many menu items, with '|' separating the menu items, and tab separating the menu item names from an optional shortcut string.
The passed string is split at any '|' characters and then add(s,0,0,0,0) is done with each section. This is often useful
if you are just using the value, and is compatible with Forms and other GL programs. The section strings use the
same special characters as described for the long version of add().
No items must be added to a menu during a callback to the same menu.

Parameters

| str | string containing multiple menu labels as described above |

Returns

the index into the menu() array, where the entry was added

34.83.3.2  add() [2/2]

int Fl_Menu_::add (const char * label, int shortcut, Fl_Callback * callback, void * userdata = 0, int flags = 0 )

Adds a new menu item.

Parameters

| in  | label | The text label for the menu item. |
| in  | shortcut | Optional keyboard shortcut that can be an int or string: (FL_CTRL+'a') or "^a". Default 0 if none. |
| in  | callback | Optional callback invoked when user clicks the item. Default 0 if none. |
| in  | userdata | Optional user data passed as an argument to the callback. Default 0 if none. |
| in  | flags | Optional flags that control the type of menu item; see below. Default is 0 for none. |
Returns

The index into the menu() array, where the entry was added.

Description

If the menu array was directly set with menu(x), then copy() is done to make a private array.

Since this method can change the internal menu array, any menu item pointers or indices the application may have cached can become stale, and should be recalculated/refreshed.

A menu item's callback must not add() items to its parent menu during the callback.

Due to backwards compatibility and historical restrictions we recommend to use either

- static menu arrays that are not extended during runtime or
- dynamic, extendable menu item arrays that are entirely created by using add() or insert().

This ensures that all menu arrays and strings are copied to internal storage and released when required.

Note

If you create menus from static Fl_Menu_Item arrays and add() or insert() more menu items later, then the menu array is copied to local storage but some local (static) strings may appear to "leak memory". This is a known issue and discouraged usage (see description above) but the impact on memory usage should typically be small.

Detailed Description of Parameters

label

The menu item's label. This argument is required and must not be NULL.

The characters "&", "/", ",", and ",_" are treated as special characters in the label string. The "&" character specifies that the following character is an accelerator and will be underlined. The "_" character is used to escape the next character in the string. Labels starting with the ",_" character cause a divider to be placed after that menu item.

A label of the form "File/Quit" will create the submenu "File" with a menu item called "Quit".

The label string is copied to new memory and can be freed. The other arguments (including the shortcut) are copied into the menu item unchanged.

If an item exists already with that name then it is replaced with this new one. Otherwise this new one is added to the end of the correct menu or submenu. The return value is the offset into the array that the new entry was placed at.

shortcut

The keyboard shortcut for this menu item.

This parameter is optional, and defaults to 0 to indicate no shortcut.
The shortcut can either be a raw integer value (eg. `FL_CTRL+'A') or a string (eg. `"^c" or `"^97").

Raw integer shortcuts can be a combination of keyboard chars (eg. 'A') and optional keyboard modifiers (see `Fl::event_state()`, e.g. `FL_SHIFT`, etc). In addition, `FL_COMMAND` can be used to denote `FL_META` under Mac OS X and `FL_CTRL` under other platforms.

String shortcuts can be specified in one of two ways:

```
[#+^]<ascii_value>  e.g. "97", "^97", "+97", "#97"
[#+^]<ascii_char>   e.g. "a", "^a", "+a", "#a"
```

.. where `<ascii_value>` is a decimal value representing an ASCII character (eg. 97 is the ascii code for 'a'), and the optional prefixes enhance the value that follows. Multiple prefixes must appear in the order below.

- `#` - Alt
- `+` - Shift
- `^` - Control

Internally, the text shortcuts are converted to integer values using `fl_oldShortcut(const char*)`.

**callback**

The callback to invoke when this menu item is selected.

This parameter is optional, and defaults to 0 for no callback.

**userdata**

The callback’s 'user data' that is passed to the callback.

This parameter is optional, and defaults to 0.

**flags**

These are bit flags to define what kind of menu item this is.

This parameter is optional, and defaults to 0 to define a 'regular' menu item.

These flags can be 'OR'ed together:

- `FL_MENU_INACTIVE` // Deactivate menu item (gray out)
- `FL_MENU_TOGGLE` // Item is a checkbox toggle (shows checkbox for on/off state)
- `FL_MENU_VALUE` // The on/off state for checkbox/radio buttons (if set, state is 'on')
- `FL_MENU_RADIO` // Item is a radio button (one checkbox of many can be on)
- `FL_MENU_INVISIBLE` // Item will not show up (shortcut will work)
- `FL_SUBMENU_POINTER` // Indicates `user_data()` is a pointer to another menu array
- `FL_SUBMENU` // This item is a submenu to other items
- `FL_MENU_DIVIDER` // Creates divider line below this item. Also ends a group of radio buttons.
All other bits in 'flags' are reserved and must not be used.

If FL_SUBMENU is set in an item's flags, then actually two items are added:

- the first item is the menu item (submenu title), as expected, and
- the second item is the submenu terminating item with the label and all other members set to 0.

If you add submenus with the 'path' technique, then the corresponding submenu terminators (maybe more than one) are added as well.

Todo: Raw integer shortcut needs examples. Dependent on responses to https://www.fltk.org/newsgroups.php?g=fltk.coredev+v:10086 and results of STR#2344

34.83.3.3 clear()

void Fl_Menu_::clear ( )

Same as menu(NULL), set the array pointer to null, indicating a zero-length menu. Menus must not be cleared during a callback to the same menu.

34.83.3.4 clear_submenu()

int Fl_Menu_::clear_submenu ( int index )

Clears the specified submenu pointed to by index of all menu items. This method is useful for clearing a submenu so that it can be re-populated with new items. Example: a "File/Recent Files/..." submenu that shows the last few files that have been opened. The specified index must point to a submenu. The submenu is cleared with remove(). If the menu array was directly set with menu(x), then copy() is done to make a private array.

Warning: Since this method can change the internal menu array, any menu item pointers or indices the application may have cached can become stale, and should be recalculated-refreshed.

Example:

```c
int index = menubar->find_index("File/Recent"); // get index of "File/Recent" submenu
if ( index != -1 ) menubar->clear_submenu(index); // clear the submenu
menubar->add("File/Recent/Aaa");
menubar->add("File/Recent/Bbb");
[..]
```

Parameters

| index | The index of the submenu to be cleared |

Returns

0 on success, -1 if the index is out of range or not a submenu

See also

remove(int)

34.83.3.5 copy()

void Fl_Menu_::copy ( )
Sets the menu array pointer with a copy of m that will be automatically deleted. If userdata ud is not NULL, then all user data pointers are changed in the menus as well. See void Fl_Menu_::menu(const Fl_Menu_Item* m).

### 34.83.3.6 down_box() [1/2]

**Fl_Boxtype Fl_Menu_::down_box()** const  [inline]

This box type is used to surround the currently-selected items in the menus. If this is FL_NO_BOX then it acts like FL_THIN_UP_BOX and selection_color() acts like FL_WHITE, for back compatibility.

### 34.83.3.7 down_box() [2/2]

**void Fl_Menu_::down_box(Fl_Boxtype b)**  [inline]

Sets the box type used to surround the currently-selected items in the menus.

### 34.83.3.8 find_index() [1/3]

**int Fl_Menu_::find_index(const char* pathname)** const

Find the menu item index for a given menu pathname, such as "Edit/Copy". This method finds a menu item’s index position for the given menu pathname, also traversing submenus, but not submenu pointers (FL_SUBMENU_POINTER). To get the menu item pointer for a pathname, use find_item()

**Parameters**

| in   | pathname | The path and name of the menu item to find |

**Returns**

The index of the matching item, or -1 if not found.

**See also**

item_pathname()

### 34.83.3.9 find_index() [2/3]

**int Fl_Menu_::find_index(const Fl_Menu_Item* item)** const

Find the index into the menu array for a given item. A way to convert a menu item pointer into an index. Does not handle items that are in submenu pointers (FL_SUBMENU_POINTER). -1 is returned if the item is not in this menu or is part of an FL_SUBMENU_POINTER submenu. Current implementation is fast and not expensive.

```c
// Convert an index-to-item
int index = 12;
const Fl_Menu_Item* item = mymenu->menu() + index;
// Convert an item-to-index
int index = mymenu->find_index(item);
if (index == -1) { ..error.. }
```
Parameters

in item The item to be found

Returns

The index of the item, or -1 if not found.

See also

menu()

34.83.3.10 find_index() [3/3]

int Fl_Menu_::find_index ( Fl_Callback ∗ cb ) const

Find the index into the menu array for a given callback cb.
This method finds a menu item's index position, also traversing submenus, but not submenu pointers (FL_←
SUBMENU_POINTER). This is useful if an application uses internationalisation and a menu item can not be found
using its label. This search is also much faster.

Parameters

cb Find the first item with this callback

Returns

The index of the item with the specific callback, or -1 if not found

See also

find_index(const char ∗)

34.83.3.11 find_item() [1/2]

const Fl_Menu_Item ∗ Fl_Menu_::find_item ( const char ∗ pathname )

Find the menu item for a given menu pathname, such as "Edit/Copy".
This method finds a menu item in the menu array, also traversing submenus, but not submenu pointers (FL_←
SUBMENU_POINTER).
To get the menu item's index, use find_index(const char ∗)

Example:

Fl_Menu_Bar *menubar = new Fl_Menu_Bar(..);
menubar->add("File/Open");
menubar->add("File/Save");
menubar->add("Edit/Copy");
// [..]
Fl_Menu_Item ∗item;
if ( ( item = (Fl_Menu_Item*)menubar->find_item("File/Open") ) != NULL ) {
    item->labelcolor(FL_RED);
}
if ( ( item = (Fl_Menu_Item*)menubar->find_item("Edit/Copy") ) != NULL ) {
    item->labelcolor(FL_GREEN);
}

Parameters

pathname The path and name of the menu item
Returns
The item found, or NULL if not found

See also
find_index(const char*), find_item(Fl_Callback*), item_pathname()

34.83.3.12 find_item() [2/2]

const Fl_Menu_Item * Fl_Menu_::find_item (Fl_Callback * cb)
Find the menu item for the given callback cb.
This method finds a menu item in a menu array, also traversing submenus, but not submenu pointers. This is useful
if an application uses internationalisation and a menu item can not be found using its label. This search is also
much faster.

Parameters
  in  cb  find the first item with this callback

Returns
The item found, or NULL if not found

See also
find_item(const char*)

34.83.3.13 find_item_with_argument()

const Fl_Menu_Item * Fl_Menu_::find_item_with_argument (long v)
Find the menu item for the given user argument v.

Parameters
  in  v  find the first item with this user argument

Returns
The item found, or NULL if not found

See also
find_item(const char*)

34.83.3.14 find_item_with_user_data()

const Fl_Menu_Item * Fl_Menu_::find_item_with_user_data (void * v)
Find the menu item for the given user data v.
Parameters

| in | index | find the first item with this user data |

Returns

The item found, or NULL if not found

See also

find_item(const char*)

34.83.3.15  global()

void Fl_Menu_::global ( )

Make the shortcuts for this menu work no matter what window has the focus when you type it.
This is done by using Fl::add_handler(). This Fl_Menu_ widget does not have to be visible (ie the window it is in can be hidden, or it does not have to be put in a window at all).
Currently there can be only one global() menu. Setting a new one will replace the old one. There is no way to remove the global() setting (so don't destroy the widget!)

34.83.3.16  insert()

int Fl_Menu_::insert ( int index,
   const char * label,
   int shortcut,
   Fl_Callback * callback,
   void * userdata = 0,
   int flags = 0 )

Inserts a new menu item at the specified index position.
If index is -1, the menu item is appended; same behavior as add().
To properly insert a menu item, label must be the name of the item (eg. "Quit"), and not a 'menu pathname' (eg. "File/Quit"). If a menu pathname is specified, the value of index is ignored, the new item's position defined by the pathname.
For more details, see add(). Except for the index parameter, add() has more detailed information on parameters and behavior, and is functionally equivalent.

Parameters

| in | index | The menu array’s index position where the new item is inserted. If -1, behavior is the same as add(). |

| in | label | The text label for the menu item. If the label is a menu pathname, index is ignored, and the pathname indicates the position of the new item. |

| in | shortcut | Optional keyboard shortcut. Can be an int (FL_CTRL+'a') or a string ("\x1b a"). Default is 0. |

| in | callback | Optional callback invoked when user clicks the item. Default 0 if none. |

| in | userdata | Optional user data passed as an argument to the callback. Default 0 if none. |

| in | flags | Optional flags that control the type of menu item; see add() for more info. Default is 0 for none. |

Returns

The index into the menu() array, where the entry was added.
34.83 Fl_Menu_ Class Reference

See also
add()

34.83.3.17 item_pathname()

int Fl_Menu_::item_pathname (  
  char * name,  
  int namelen,  
  const Fl_Menu_Item * finditem = 0 ) const

Get the menu 'pathname' for the specified menuitem.
If finditem==NULL, mvalue() is used (the most recently picked menuitem).

Example:
Fl_Menu_Bar *menubar = 0;
void my_menu_callback(Fl_Widget*,void*) {  
  char name[80];  
  if ( menubar->item_pathname(name, sizeof(name)-1) == 0 ) { // recently picked item
    if ( strcmp(name, "File/&Open") == 0 ) { .. } // open invoked
    if ( strcmp(name, "File/&Save") == 0 ) { .. } // save invoked
    if ( strcmp(name, "Edit/&Copy") == 0 ) { .. } // copy invoked
  }
}

Returns
- 0 : OK (name has menuitem's pathname)
- -1 : item not found (name="")
- -2 : 'name' not large enough (name="")

See also
find_item()

34.83.3.18 menu() [1/2]

const Fl_Menu_Item * Fl_Menu_::menu ( ) const [inline]

Returns a pointer to the array of Fl_Menu_Items.
This will either be the value passed to menu(value) or the private copy or an internal (temporary) location (see note below).

Note
- Implementation details - may be changed in the future. All modifications of the menu array are done by copying the entire menu array to an internal storage for optimization of memory allocations, for instance when using add() or insert(). While this is done, menu() returns the pointer to this internal location. The entire menu will be copied back to private storage when needed, i.e. when another Fl_Menu_ is modified. You can force this reallocation after you're done with all menu modifications by calling Fl_Menu_::menu_end() to make sure menu() returns a permanent pointer to private storage (until the menu is modified again). Note also that some menu methods (e.g. Fl_Menu_Button::popup()) call menu_end() internally to ensure a consistent menu array while the menu is open.
See also

- `size()` – returns the size of the `Fl_Menu_Item` array.
- `menu_end()` – finish menu modifications (optional)

**Example:** How to walk the array:

```c
for ( int t=0; t<menubar->size(); t++ ) { // walk array of items
  const Fl_Menu_Item &item = menubar->menu()[t]; // get each item
  fprintf(stderr, "item #%d -- label=%s, value=%s type=%s\n",
    t, 
    item.label() ? item.label() : "(Null)", // menu terminators have NULL labels
    (item.flags & FL_MENU_VALUE) ? "set" : "clear", // value of toggle or radio items
    (item.flags & FL_SUBMENU) ? "Submenu" : "Item"); // see if item is a submenu or actual item
}
```

### 34.83.3.19 menu() [2/2]

```c
void Fl_Menu_::menu ( const Fl_Menu_Item * m )
```

Sets the menu array pointer directly.

- If the old menu is private it is deleted. NULL is allowed and acts the same as a zero-length menu. If you try to modify the array (with `add()`, `replace()`, or `remove()`) a private copy is automatically done.

### 34.83.3.20 menu_box() [1/2]

```c
Fl_Boxtype Fl_Menu_::menu_box ( ) const [inline]
```

Get the box type for the menu popup windows.

Returns

- the box type, or `FL_NO_BOX` if `Fl_Menu_::box()` is to be used instead

### 34.83.3.21 menu_box() [2/2]

```c
void Fl_Menu_::menu_box ( Fl_Boxtype b ) [inline]
```

Set the box type for the menu popup windows.

- If `menu_box` set to `FL_NO_BOX`, the menu window will use `Fl_Menu_::box()` instead.

**Parameters**

| in | `b` | new box type or `FL_NO_BOX` |

### 34.83.3.22 menu_end()

```c
const Fl_Menu_Item * Fl_Menu_::menu_end ( )
```

Finishes menu modifications and returns `menu()`. Call `menu_end()` after using `add()`, `insert()`, `remove()`, or any other methods that may change the menu array if you want to access the menu array anytime later with `menu()`. This should be called only once after the last menu modification for performance reasons.

Does nothing if the menu array is already in a private location.

Some methods like `Fl_Menu_Button::popup()` call this method before their menu is opened.

**Note**

- After menu changes like `add()`, `insert()`, etc. `menu()` would return a pointer to a temporary internal menu array that may be relocated at unexpected times. This is due to performance considerations and may be changed w/o further notice.
Since

1.4.0

Returns

New Fl_Menu_Item array pointer.

See also

Fl_Menu_::menu()

### 34.83.3.23 mode() [1/2]

```cpp
int Fl_Menu_::mode (int i) const [inline]
```

 Gets the flags of item i.
For a list of the flags, see Fl_Menu_Item.

### 34.83.3.24 mode() [2/2]

```cpp
void Fl_Menu_::mode (int i, int fl) [inline]
```

 Sets the flags of item i.
For a list of the flags, see Fl_Menu_Item.

### 34.83.3.25 mvalue()

```cpp
const Fl_Menu_Item * Fl_Menu_::mvalue ( ) const [inline]
```

Returns a pointer to the last menu item that was picked.

### 34.83.3.26 picked()

```cpp
const Fl_Menu_Item * Fl_Menu_::picked (const Fl_Menu_Item * v)
```

When user picks a menu item, call this.
It will do the callback. Unfortunately this also casts away const for the checkboxes, but this was necessary so
non-checkbox menus can really be declared const...

### 34.83.3.27 prev_mvalue()

```cpp
const Fl_Menu_Item * Fl_Menu_::prev_mvalue ( ) const [inline]
```

Returns a pointer to the menu item that was picked before the current one was picked.
This call gives devs additional details how a user changed a choice in the Fl_Choice widget.

### 34.83.3.28 remove()

```cpp
void Fl_Menu_::remove (int i)
```

Deletes item i from the menu.
If the menu array was directly set with menu(x) then copy() is done to make a private array.
No items must be removed from a menu during a callback to the same menu.
Parameters

$i$ | index into menu array

### 34.83.3.29 replace()

```c
void Fl_Menu_::replace (  
    int $i$,  
    const char * $str$ )
```

Changes the text of item $i$.
This is the only way to get slash into an add()ed menu item. If the menu array was directly set with menu(x) then copy() is done to make a private array.

Parameters

$i$ | index into menu array
$str$ | new label for menu item at index $i$

### 34.83.3.30 size()

```c
int Fl_Menu_::size ( ) const
```

This returns the number of Fl_Menu_Item structures that make up the menu, correctly counting submenus. This includes the "terminator" item at the end. To copy a menu array you need to copy size() * sizeoff(Fl_Menu_Item) bytes. If the menu is NULL this returns zero (an empty menu will return 1).

### 34.83.3.31 test_shortcut()

```c
const Fl_Menu_Item * Fl_Menu_::test_shortcut ( ) [inline]
```

Returns the menu item with the entered shortcut (key value). This searches the complete menu() for a shortcut that matches the entered key value. It must be called for a FL_KEYBOARD or FL_SHORTCUT event. If a match is found, the menu's callback will be called.

Returns

matched Fl_Menu_Item or NULL.

### 34.83.3.32 text() [1/2]

```c
const char * Fl_Menu_::text ( ) const [inline]
```

Returns the title of the last item chosen.

### 34.83.3.33 text() [2/2]

```c
const char * Fl_Menu_::text (  
    int $i$ ) const [inline]
```

Returns the title of item $i$. 
34.83.3.34  textcolor()

`Fl_Color Fl_Menu_::textcolor ( ) const [inline]`
Get the current color of menu item labels.

34.83.3.35  textfont() [1/2]

`Fl_Font Fl_Menu_::textfont ( ) const [inline]`
Gets the current font of menu item labels.

34.83.3.36  textfont() [2/2]

`void Fl_Menu_::textfont ( Fl_Font c ) [inline]`
Sets the current font of menu item labels.

34.83.3.37  textsize() [1/2]

`Fl_Fontsize Fl_Menu_::textsize ( ) const [inline]`
Gets the font size of menu item labels.

34.83.3.38  textsize() [2/2]

`void Fl_Menu_::textsize ( Fl_Fontsize c ) [inline]`
Sets the font size of menu item labels.

34.83.3.39  value() [1/3]

`int Fl_Menu_::value ( ) const [inline]`
Returns the index into menu() of the last item chosen by the user.
It is zero initially.

34.83.3.40  value() [2/3]

`int Fl_Menu_::value ( const Fl_Menu_Item * m )`
The value is the index into menu() of the last item chosen by the user.
It is zero initially. You can set it as an integer, or set it with a pointer to a menu item. The set routines return non-zero
if the new value is different than the old one.

34.83.3.41  value() [3/3]

`int Fl_Menu_::value ( int i ) [inline]`
The value is the index into menu() of the last item chosen by the user.
It is zero initially. You can set it as an integer, or set it with a pointer to a menu item. The set routines return non-zero
if the new value is different than the old one.
The documentation for this class was generated from the following files:
34.84 Fl_Menu_Bar Class Reference

This widget provides a standard menubar interface.

```cpp
#include <Fl_Menu_Bar.H>
```

Inheritance diagram for Fl_Menu_Bar:

```
Fl_Widget
  └── Fl_Menu_
      └── Fl_Menu_Bar
          └── Fl_Sys_Menu_Bar
```

Public Member Functions

- `Fl_Menu_Bar (int X, int Y, int W, int H, const char *l=0)`
  Creates a new `Fl_Menu_Bar` widget using the given position, size, and label string.
- `int handle (int)` FL_OVERRIDE
  Handles the specified event.
- `virtual void update ()`
  Updates the menu bar after any change to its items.

Protected Member Functions

- `void draw ()` FL_OVERRIDE
  Draws the widget.

Friends

- `class Fl_Sys_Menu_Bar_Driver`

Additional Inherited Members

34.84.1 Detailed Description

This widget provides a standard menubar interface. Usually you will put this widget along the top edge of your window. The height of the widget should be 30 for the menu titles to draw correctly with the default font.

The items on the bar and the menus they bring up are defined by a single `Fl_Menu_Item` array. Because a `Fl_Menu_Item` array defines a hierarchy, the top level menu defines the items in the menubar, while the submenus define the pull-down menus. Sub-sub menus and lower pop up to the right of the submenus.

![Figure 34.28 menubar](image-url)
If there is an item in the top menu that is not a title of a submenu, then it acts like a "button" in the menubar. Clicking on it will pick it.
When the user clicks a menu item, value() is set to that item and then:

- The item's callback is done if one has been set; the Fl_Menu_Bar is passed as the Fl_Widget* argument, along with any userdata configured for the callback.
- If the item does not have a callback, the Fl_Menu_Bar's callback is done instead, along with any userdata configured for the callback. The callback can determine which item was picked using value(), mvalue(), item_pathname(), etc.

Submenus will also pop up in response to shortcuts indicated by putting a '&' character in the name field of the menu item. If you put a '&' character in a top-level "button" then the shortcut picks it. The '&' character in submenus is ignored until the menu is popped up.
Typing the shortcut() of any of the menu items will cause callbacks exactly the same as when you pick the item with the mouse.

34.84.2 Constructor & Destructor Documentation

34.84.2.1 Fl_Menu_Bar()

Fl_Menu_Bar::Fl_Menu_Bar (  
    int X, 
    int Y, 
    int W, 
    int H, 
    const char * l = 0 )

Creates a new Fl_Menu_Bar widget using the given position, size, and label string. The default boxtype is FL_UP_BOX.
The constructor sets menu() to NULL. See Fl_Menu_ for the methods to set or change the menu.
lablesze(), labelfont(), and labelcolor() are used to control how the menubar items are drawn. They are initialized from the Fl_Menu static variables, but you can change them if desired.
label() is ignored unless you change align() to put it outside the menubar.
The destructor removes the Fl_Menu_Bar widget and all of its menu items.

34.84.3 Member Function Documentation

34.84.3.1 draw()

void Fl_Menu_Bar::draw ( ) [protected], [virtual]

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()

Implements Fl_Widget.
Reimplemented in Fl_Sys_Menu_Bar.

34.84.3.2 handle()

int Fl_Menu_Bar::handle (  
    int event ) [virtual]
Handles the specified event. You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in event | the kind of event received |

Return values

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

See also

Fl_Event

Reimplemented from Fl_Widget.

34.84.3.3 update()

c\texttt{virtual void Fl\_Menu\_Bar::update ( ) [inline], [virtual]}

Updates the menu bar after any change to its items. This is useful when the menu bar can be an Fl\_Sys\_Menu\_Bar object. Reimplemented in Fl\_Sys\_Menu\_Bar.
The documentation for this class was generated from the following files:

- Fl\_Menu\_Bar.H
- Fl\_Menu\_Bar.cxx

34.85 Fl\_Menu\_Button Class Reference

This is a button that when pushed pops up a menu (or hierarchy of menus) defined by an array of Fl\_Menu\_Item objects.

#include <Fl\_Menu\_Button.H>

Inheritance diagram for Fl\_Menu\_Button:

```
Fl\_Widget

| Fl\_Menu
|
| Fl\_Menu\_Button
```

Generated by Doxygen
Public Types

- enum popup_buttons {
  POPUP1 = 1, POPUP2, POPUP12, POPUP3, POPUP13, POPUP23, POPUP123
}

  indicate what mouse buttons pop up the menu.

Public Member Functions

- Fl_Menu_Button (int, int, int, int, const char ∗=0)
  Creates a new Fl_Menu_Button widget using the given position, size, and label string.
- int handle (int) FL_OVERRIDE
  Handles the specified event.
- const Fl_Menu_Item ∗ popup ()
  Act exactly as though the user clicked the button or typed the shortcut key.

Protected Member Functions

- void draw () FL_OVERRIDE
  Draws the widget.

Static Protected Attributes

- static Fl_Menu_Button ∗ pressed_menu_button_ = NULL

Additional Inherited Members

34.85.1 Detailed Description

This is a button that when pushed pops up a menu (or hierarchy of menus) defined by an array of Fl_Menu_Item objects.

![Figure 34.29 menu_button](image)

Normally any mouse button will pop up a menu and it is lined up below the button as shown in the picture. However an Fl_Menu_Button may also control a pop-up menu. This is done by setting the type(). If type() is zero a normal menu button is produced. If it is nonzero then this is a pop-up menu. The bits in type() indicate what mouse buttons pop up the menu (see Fl_Menu_Button::popup_buttons).

The menu will also pop up in response to shortcuts indicated by putting a ‘&’ character in the label().
Typing the `shortcut()` of any of the menu items will cause callbacks exactly the same as when you pick the item with
the mouse. The `&` character in menu item names are only looked at when the menu is popped up, however.
When the user clicks a menu item, `value()` is set to that item and then:

- The item's callback is done if one has been set; the `Fl_Menu_Button` is passed as the `Fl_Widget` argument,
  along with any userdata configured for the callback.
- If the item does not have a callback, the `Fl_Menu_Button`'s callback is done instead, along with any
  userdata configured for it. The callback can determine which item was picked using `value()`, `mvalue()`,
  `item_pathname()`, etc.

### 34.85.2 Member Enumeration Documentation

#### 34.85.2.1 popup_buttons

`enum Fl_Menu_Button::popup_buttons` indicate what mouse buttons pop up the menu.
Values for `type()` used to indicate what mouse buttons pop up the menu. `Fl_Menu_Button::POPUP3` is usually what
you want.

**Enumerator**

<table>
<thead>
<tr>
<th>Enumerant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPUP1</td>
<td>pops up with the mouse 1st button.</td>
</tr>
<tr>
<td>POPUP2</td>
<td>pops up with the mouse 2nd button.</td>
</tr>
<tr>
<td>POPUP12</td>
<td>pops up with the mouse 1st or 2nd buttons.</td>
</tr>
<tr>
<td>POPUP3</td>
<td>pops up with the mouse 3rd button.</td>
</tr>
<tr>
<td>POPUP13</td>
<td>pops up with the mouse 1st or 3rd buttons.</td>
</tr>
<tr>
<td>POPUP23</td>
<td>pops up with the mouse 2nd or 3rd buttons.</td>
</tr>
<tr>
<td>POPUP123</td>
<td>pops up with any mouse button.</td>
</tr>
</tbody>
</table>

### 34.85.3 Constructor & Destructor Documentation

#### 34.85.3.1 Fl_Menu_Button()

`Fl_Menu_Button::Fl_Menu_Button (int X, int Y, int W, int H, const char * l = 0)`

Creates a new `Fl_Menu_Button` widget using the given position, size, and label string.
The default boxtype is `FL_UP_BOX`.
The constructor sets `menu()` to NULL. See `Fl_Menu_` for the methods to set or change the menu.

### 34.85.4 Member Function Documentation

#### 34.85.4.1 draw()

`void Fl_Menu_Button::draw ( ) [protected], [virtual]` Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own draw() method*, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements `Fl_Widget`.

### 34.85.4.2 handle()

```cpp
int Fl_Menu_Button::handle (int event) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited `handle()` method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your `handle()` method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may “ring the bell” or show another visual indication or drop the event silently. In such a case you must not call the `handle()` method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't do anything with it.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>event</th>
<th>the kind of event received</th>
</tr>
</thead>
</table>

**Return values**

<table>
<thead>
<tr>
<th>0</th>
<th>if the event was not used or understood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

**See also**

`Fl_Event`

Reimplemented from `Fl_Widget`.

### 34.85.4.3 popup()

```cpp
const Fl_Menu_Item * Fl_Menu_Button::popup ( )
```

Act exactly as though the user clicked the button or typed the shortcut key. The menu appears, it waits for the user to pick an item, and if they pick one it sets `value()` and does the callback or sets `changed()` as described above. The menu item is returned or NULL if the user dismisses the menu.

**Note**

Since FLTK 1.4.0 `Fl_Menu::menu_end()` is called before the menu pops up to make sure the menu array is located in private storage.
34.86  Fl_Menu_Item Struct Reference

The Fl_Menu_Item structure defines a single menu item that is used by the Fl_Menu_ class.
#include <Fl_Menu_Item.H>

Public Member Functions

- void activate ()
  Allows a menu item to be picked.

- int active () const
  Gets whether or not the item can be picked.

- int activevisible () const
  Returns non 0 if FL_INACTIVE and FL_INVISIBLE are cleared, 0 otherwise.

- int add (const char ∗, int shortcut, Fl_Callback ∗, void ∗=0, int=0)
  Adds a menu item.

- int add (const char ∗a, const char ∗b, Fl_Callback ∗c, void ∗d=0, int e=0)
  See int add(const char ∗, int shortcut, Fl_Callback∗, void∗, int)

- long argument () const
  Gets the user_data() argument that is sent to the callback function.

- void argument (long v)
  Sets the user_data() argument that is sent to the callback function.

- Fl_Callback_p callback () const
  Returns the callback function that is set for the menu item.

- void callback (Fl_Callback ∗c)
  Sets the menu item’s callback function.

- void callback (Fl_Callback ∗c, void ∗p)
  Sets the menu item’s callback function and userdata() argument.

- void callback (Fl_Callback0 ∗c)
  Sets the menu item’s callback function.

- void callback (Fl_Callback1 ∗c, long p=0)
  Sets the menu item’s callback function and userdata() argument.

- void check ()
  Back compatibility only.

- int checkbox () const
  Returns true if a checkbox will be drawn next to this item.

- int checked () const
  Back compatibility only.

- void clear ()
  Turns the check or radio item “off” for the menu item.

- void deactivate ()
  Prevents a menu item from being picked.

- void do_callback (Fl_Widget ∗o) const
  Calls the Fl_Menu_Item item’s callback, and provides the Fl_Widget argument.

- void do_callback (Fl_Widget ∗o, long arg) const

See also

Fl_Menu_::menu_end()
Calls the Fl_Menu_Item item's callback, and provides the Fl_Widget argument.

- void do_callback (Fl_Widget *o, void *arg) const
  Calls the Fl_Menu_Item item's callback, and provides the Fl_Widget argument.

- void draw (int x, int y, int w, int h, const Fl_Menu_* *, int t=0) const
  Draws the menu item in bounding box x,y,w,h, optionally selects the item.

- const Fl_Menu_Item * findShortcut (int *ip=0, const bool require_alt=false) const
  Search only the top level menu for a shortcut.

- Fl_Menu_Item * first ()
  Returns the first menu item, same as next(0).

- const Fl_Menu_Item * first () const
  Returns the first menu item, same as next(0).

- void hide ()
  Hides an item in the menu.

- void image (Fl_Image &image)
  Compatibility API for FLUID, same as image.label(this).

- void image (Fl_Image *image)
  Compatibility API for FLUID, same as image->label(this).

- int insert (int, const char *, int, Fl_Callback *, void *, int=0)
  Inserts an item at position index.

- const char * label () const
  Returns the title of the item.

- void label (const char *a)
  See const char * Fl_Menu_Item::label() const

- void label (Fl_Labeltype a, const char *b)
  See const char * Fl_Menu_Item::label() const

- Fl_Color labelcolor () const
  Gets the menu item's label color.

- void labelcolor (Fl_Color a)
  Sets the menu item's label color.

- Fl_Font labelfont () const
  Gets the menu item's label font.

- void labelfont (Fl_Font a)
  Sets the menu item's label font.

- Fl_Fontsize labelsize () const
  Gets the label font pixel size/height.

- void labelsize (Fl_Fontsize a)
  Sets the label font pixel size/height.

- Fl_Labeltype labeltype () const
  Returns the menu item's labeltype.

- void labeltype (Fl_Labeltype a)
  Sets the menu item's labeltype.

- int measure (int *h, const Fl_Menu_* *) const
  Measures width of label, including effect of & characters.

- Fl_Menu_Item * next (int i=1)
  Advances a pointer by n items through a menu array, skipping the contents of submenus and invisible items.

- const Fl_Menu_Item * next (int=1) const
  Advance a pointer by n items through a menu array, skipping the contents of submenus and invisible items.

- const Fl_Menu_Item * popup (int X, int Y, const char *title=0, const Fl_Menu_Item *picked=0, const Fl_Menu_* *=0) const
This method is called by widgets that want to display menus.

- **const Fl_Menu_Item */ pulldown (int X, int Y, int W, int H, const Fl_Menu_Item */ picked=0, const Fl_Menu Item */ title=0, int menubar=0) const**

  Pulldown() is similar to popup(), but a rectangle is provided to position the menu.

- **int radio () const**

  Returns true if this item is a radio item.

- **void set ()**

  Turns the check or radio item "on" for the menu item.

- **void setonly (Fl_Menu_Item const */ first=NULL)**

  Turns the radio item "on" for the menu item and turns "off" adjacent radio items set.

- **int shortcut () const**

  Gets what key combination shortcut will trigger the menu item.

- **void shortcut (int s)**

  Sets exactly what key combination will trigger the menu item.

- **void show ()**

  Makes an item visible in the menu.

- **int size () const**

  Size of the menu starting from this menu item.

- **int submenu () const**

  Returns true if either FL_SUBMENU or FL_SUBMENU_POINTER is on in the flags.

- **const Fl_Menu_Item */ test_shortcut () const**

  This is designed to be called by a widgets handle() method in response to a FL_SHORTCUT event.

- **void uncheck ()**

  Back compatibility only.

- **void */ user_data () const**

  Gets the user_data() argument that is sent to the callback function.

- **void user_data (void */ v)**

  Sets the user_data() argument that is sent to the callback function.

- **int value () const**

  Returns the current value of the check or radio item.

- **void value (int v)**

  Sets the current value of the check or radio item.

- **int visible () const**

  Gets the visibility of an item.

### Public Attributes

- **Fl_Callback */ callback_**

  menu item callback

- **int flags**

  menu item flags like FL_MENU_TOGGLE, FL_MENU_RADIO

- **Fl_Color labelcolor_**

  menu item text color

- **Fl_Font labelfont_**

  which font for this menu item text

- **Fl_Fontsize labelsize_**

  size of menu item text

- **uchar labeltype_**

  how the menu item text looks like

- **int shortcut_**

  menu item shortcut
• const char *text
  menu item text, returned by label()

• void *user_data_
  menu item user_data for the menu’s callback

34.86.1 Detailed Description

The **Fl_Menu_Item** structure defines a single menu item that is used by the **Fl_Menu_** class.

```c
struct Fl_Menu_Item {
    const char* text; // label()
    int shortcut_;    // Item is a checkbox toggle (shows checkbox for on/off state)
    Fl_Callback* callback_;  // Item is a radio button (one checkbox of many can be on)
    void* user_data_;      // Item will not show up (shortcut will work)
    uchar labeltype_;      // Indicates user_data() is a pointer to another menu array
    uchar labelfont_;      // This item is a submenu to other items
    uchar labelsize_;      // Creates divider line below this item. Also ends a group of radio buttons.
    uchar labelcolor_;     // FL_MENU_HORIZONTAL = 0x100, // ??? -- reserved, internal (do not use)
    int flags;             // These bits are reserved for internal or future usage (do not use)
    uchar FL_MENU_INACTIVE = 1, // Deactivate menu item (gray out)
    uchar FL_MENU_TOGGLE = 2, // The on/off state for checkbox/radio buttons (if set, state is 'on')
    uchar FL_MENU_RADIO = 4, // Item is a radio button (one checkbox of many can be on)
    uchar FL_MENU_INVISIBLE = 0x10, // Indicating user_data() is a pointer to another menu array
    uchar FL_SUBMENU_POINTER = 0x20, // This item is a submenu to other items
    uchar FL_SUBMENU = 0x40, // Creates divider line below this item. Also ends a group of radio buttons.
    uchar FL_MENU_HORIZONTAL = 0x100, // ??? -- reserved, internal (do not use)
    uchar FL_MENU_RESERVED = 0xffffff00 // These bits are reserved for internal or future usage (do not use)
};
```

Typically menu items are statically defined; for example:

```c
Fl_Menu_Item popup[] = {
    {"alpha", FL_ALT+'a', the_cb, (void*)1},
    {"beta", FL_ALT+'b', the_cb, (void*)2},
    {"gamma", FL_ALT+'c', the_cb, (void*)3, FL_MENU_DIVIDER},
    {"strange", 0, strange_cb},
    {"charm", 0, charm_cb},
    {"truth", 0, truth_cb},
    {"beauty", 0, beauty_cb},
    {"submenu", 0, 0, 0, FL_SUBMENU},
    {"one"},
    {"two"},
    {"three"},
    {"inactive", FL_ALT+'i', 0, 0, FL_MENU_INACTIVE|FL_MENU_DIVIDER},
    {"invisible", FL_ALT+'i', 0, 0, FL_MENU_INVISIBLE},
    {"check", FL_ALT+'c', 0, 0, FL_MENU_TOGGLE|FL_MENU_VALUE},
    {"box", FL_ALT+'b', 0, 0, FL_MENU_TOGGLE},
    {0}};
```
A submenu title is identified by the bit FL_SUBMENU in the flags field, and ends with a label() that is NULL. You can nest menus to any depth. A pointer to the first item in the submenu can be treated as an Fl_Menu array itself. It is also possible to make separate submenu arrays with FL_SUBMENU_POINTER flags.

You should use the method functions to access structure members and not access them directly to avoid compatibility problems with future releases of FLTK.

Note

Adding menu items with insert(), add(), or any of its overloaded variants copies the entire menu to internal storage. Using the memory of a static menu array after that would access unused (but not released) memory and thus have no effect.

### 34.86.2 Member Function Documentation

#### 34.86.2.1 add()

```cpp
int Fl_Menu_Item::add (const char * mytext, int sc, Fl_Callback * cb, void * data = 0, int myflags = 0 )
```

Adds a menu item.
The text is split at '/' characters to automatically produce submenus (actually a totally unnecessary feature as you can now add submenu titles directly by setting FL_SUBMENU in the flags).
34.86 Fl_Menu_Item Struct Reference

Returns

the index into the menu() array, where the entry was added

See also

Fl_Menu_Item::insert(int, const char*, int, Fl_Callback*, void*, int)

34.86.2.2 argument() [1/2]

long Fl_Menu_Item::argument ( ) const [inline]

Gets the user_data() argument that is sent to the callback function.
For convenience you can also define the callback as taking a long argument. This method casts the stored user-
data() argument to long and returns it as a long value.

34.86.2.3 argument() [2/2]

void Fl_Menu_Item::argument (long v) [inline]

Sets the user_data() argument that is sent to the callback function.
For convenience you can also define the callback as taking a long argument. This method casts the given argument
v to void* and stores it in the menu item's userdata() member. This may not be portable to some machines.

34.86.2.4 callback() [1/5]

Fl_Callback_p Fl_Menu_Item::callback ( ) const [inline]

Returns the callback function that is set for the menu item.
Each item has space for a callback function and an argument for that function. Due to back compatibility, the
Fl_Menu_Item itself is not passed to the callback, instead you have to get it by calling ((Fl_Menu_+)*w)->mvalue()
where w is the widget argument.

34.86.2.5 callback() [2/5]

void Fl_Menu_Item::callback (Fl_Callback * c) [inline]

Sets the menu item's callback function.
This method does not set the userdata() argument.

See also

Fl_Callback_p Fl_MenuItem::callback() const

34.86.2.6 callback() [3/5]

void Fl_Menu_Item::callback (Fl_Callback * c, void * p) [inline]

Sets the menu item's callback function and userdata() argument.

See also

Fl_Callback_p Fl_MenuItem::callback() const
34.86.2.7 callback() [4/5]

void Fl_Menu_Item::callback (  
    Fl_Callback0 * c ) [inline]

Sets the menu item's callback function.  
This method does not set the userdata() argument.
See also

    Fl_Callback_p Fl_MenuItem::callback() const

34.86.2.8 callback() [5/5]

void Fl_Menu_Item::callback (  
    Fl_Callback1 * c,  
    long p = 0 ) [inline]

Sets the menu item's callback function and userdata() argument.  
The argument is cast to void* and stored as the userdata() for the menu item's callback function.
See also

    Fl_Callback_p Fl_MenuItem::callback() const

34.86.2.9 check()

void Fl_Menu_Item::check ( ) [inline]

Back compatibility only.

**Deprecated** Please use Fl_Menu_Item::set() instead. This method will be removed in FLTK 1.5.0 or later.

See also

    set()

34.86.2.10 checkbox()

int Fl_Menu_Item::checkbox ( ) const [inline]

Returns true if a checkbox will be drawn next to this item.  
This is true if FL_MENU_TOGGLE or FL_MENU_RADIO is set in the flags.

34.86.2.11 checked()

int Fl_Menu_Item::checked ( ) const [inline]

Back compatibility only.

**Deprecated** Please use Fl_Menu_Item::value() instead. This method will be removed in FLTK 1.5.0 or later.

See also

    value()

34.86.2.12 deactivate()

void Fl_Menu_Item::deactivate ( ) [inline]

Prevents a menu item from being picked.  
Note that this will also cause the menu item to appear grayed-out.
34.86.2.13 do_callback() [1/3]

void Fl_Menu_Item::do_callback (  
    Fl_Widget * o ) const [inline]

Calls the Fl_Menu_Item item's callback, and provides the Fl_Widget argument.  
The callback is called with the stored user_data() as its second argument.  You must first check that callback() is  
non-zero before calling this.

34.86.2.14 do_callback() [2/3]

void Fl_Menu_Item::do_callback (  
    Fl_Widget * o,  
    long arg ) const [inline]

Calls the Fl_Menu_Item item's callback, and provides the Fl_Widget argument.  
This call overrides the callback's second argument with the given value arg.  long arg is cast to void* when calling  
the callback.  You must first check that callback() is non-zero before calling this.

34.86.2.15 do_callback() [3/3]

void Fl_Menu_Item::do_callback (  
    Fl_Widget * o,  
    void * arg ) const [inline]

Calls the Fl_Menu_Item item's callback, and provides the Fl_Widget argument.  
This call overrides the callback's second argument with the given value arg.  You must first check that callback() is  
non-zero before calling this.

34.86.2.16 find_shortcut()

const Fl_Menu_Item * Fl_Menu_Item::find_shortcut (  
    int * ip = 0,  
    const bool require_alt = false ) const

Search only the top level menu for a shortcut.  
Either &x in the label or the shortcut fields are used.  
This tests the current event, which must be an FL_KEYBOARD or FL_SHORTCUT, against a shortcut value.

Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ip</td>
<td>returns the index of the item, if ip is not NULL.</td>
</tr>
<tr>
<td>require_alt</td>
<td>if true: match only if Alt key is pressed.</td>
</tr>
</tbody>
</table>

Returns

found Fl_Menu_Item or NULL

34.86.2.17 image() [1/2]

void Fl_Menu_Item::image (  
    Fl_Image & image ) [inline]

Compatibility API for FLUID, same as image.label(this).

Note

This method is intended for internal use by fluid and may not do what you expect.

34.86.2.18 image() [2/2]

void Fl_Menu_Item::image (  
    Fl_Image * image ) [inline]
Compatibility API for FLUID, same as image->label(this).

Note
This method is intended for internal use by fluid and may not do what you expect.

34.86.2.19 insert()

```c
int Fl_Menu_Item::insert (  
    int index,  
    const char * mytext,  
    int sc,  
    Fl_Callback * cb,  
    void * data = 0,  
    int myflags = 0 )
```

Inserts an item at position `index`.
If `index` is -1, the item is added the same way as `Fl_Menu_Item::add()`.
If 'mytext' contains any un-escaped front slashes (/), it's assumed a menu pathname is being specified, and the
value of `index` will be ignored.
In all other aspects, the behavior of `insert()` is the same as `add()`.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>index</th>
<th>insert new items here</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>mytext</td>
<td>new label string, details see above</td>
</tr>
<tr>
<td>in</td>
<td>sc</td>
<td>keyboard shortcut for new item</td>
</tr>
<tr>
<td>in</td>
<td>cb</td>
<td>callback function for new item</td>
</tr>
<tr>
<td>in</td>
<td>data</td>
<td>user data for new item</td>
</tr>
<tr>
<td>in</td>
<td>myflags</td>
<td>menu flags as described in Fl_Menu_Item</td>
</tr>
</tbody>
</table>

Returns
the index into the menu() array, where the entry was added

34.86.2.20 label()

```c
const char * Fl_Menu_Item::label ( ) const [inline]
```

Returns the title of the item.
A NULL here indicates the end of the menu (or of a submenu). A 'MP in the item will print an underscore under the
next letter, and if the menu is popped up that letter will be a "shortcut" to pick that item. To get a real 'MP put two in a
row.

34.86.2.21 labelcolor() [1/2]

```c
Fl_Color Fl_Menu_Item::labelcolor ( ) const [inline]
```

Gets the menu item's label color.
This color is passed to the labeltype routine, and is typically the color of the label text. This defaults to FL_BLACK.
If this color is not black fltk will not use overlay bitplanes to draw the menu - this is so that images put in the menu
draw correctly.

34.86.2.22 labelcolor() [2/2]

```c
void Fl_Menu_Item::labelcolor (  
    Fl_Color a ) [inline]
```

Sets the menu item's label color.
34.86.2.23 **labelfont()** [1/2]

`Fl_Font Fl_Menu_Item::labelfont() const` [inline]

Gets the menu item's label font. Fonts are identified by small 8-bit indexes into a table. See the enumeration list for predefined fonts. The default value is a Helvetica font. The function Fl::set_font() can define new fonts.

34.86.2.24 **labelfont()** [2/2]

`void Fl_Menu_Item::labelfont(Fl_Font a)` [inline]

Sets the menu item's label font. Fonts are identified by small 8-bit indexes into a table. See the enumeration list for predefined fonts. The default value is a Helvetica font. The function Fl::set_font() can define new fonts.

34.86.2.25 **labeltype()** [1/2]

`Fl_Labeltype Fl_Menu_Item::labeltype() const` [inline]

Returns the menu item's labeltype. A labeltype identifies a routine that draws the label of the widget. This can be used for special effects such as emboss, or to use the label() pointer as another form of data such as a bitmap. The value FL_NORMAL_LABEL prints the label as text.

34.86.2.26 **labeltype()** [2/2]

`void Fl_Menu_Item::labeltype(Fl_Labeltype a)` [inline]

Sets the menu item's labeltype. A labeltype identifies a routine that draws the label of the widget. This can be used for special effects such as emboss, or to use the label() pointer as another form of data such as a bitmap. The value FL_NORMAL_LABEL prints the label as text.

34.86.2.27 **measure()**

`int Fl_Menu_Item::measure(int * hp, const Fl_Menu_Item * m) const`

Measures width of label, including effect of & characters. Optionally, can get height if hp is not NULL.

34.86.2.28 **next()** [1/2]

`Fl_Menu_Item * Fl_Menu_Item::next(int i = 1)` [inline]

Advances a pointer by n items through a menu array, skipping the contents of submenus and invisible items. There are two calls so that you can advance through const and non-const data.

34.86.2.29 **next()** [2/2]

`const Fl_Menu_Item * Fl_Menu_Item::next(int n = 1)` const

Advance a pointer by n items through a menu array, skipping the contents of submenus and invisible items. There are two calls so that you can advance through const and non-const data.
34.86.2.30  popup()

const Fl_Menu_Item * Fl_Menu_Item::popup (  
  int X,  
  int Y,  
  const char * title = 0,  
  const Fl_Menu_Item * picked = 0,  
  const Fl_Menu_Item * menu_button = 0 ) const

This method is called by widgets that want to display menus. The menu stays up until the user picks an item or dismisses it. The selected item (or NULL if none) is returned. This does not do the callbacks or change the state of check or radio items. The menu is positioned so the cursor is centered over the item picked. This will work even if picked is in a submenu. If picked is zero or not in the menu item table the menu is positioned with the cursor in the top-left corner.

Parameters

| in  | X,Y | the position of the mouse cursor, relative to the window that got the most recent event (usually you can pass Fl::event_x() and Fl::event_y() unchanged here). |
| in  | title | a character string title for the menu. If non-zero a small box appears above the menu with the title in it. |
| in  | picked | if this pointer is not NULL, the popup menu will appear so that the picked menu is under the mouse pointer. |
| in  | menu_button | is a pointer to an Fl_Menu_ from which the color and boxtypes for the menu are pulled. If NULL then defaults are used. |

Returns

a pointer to the menu item selected by the user, or NULL

34.86.2.31  pulldown()

const Fl_Menu_Item * Fl_Menu_Item::pulldown (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const Fl_Menu_Item * initial_item = 0,  
  const Fl_Menu_Item * pbutton = 0,  
  const Fl_Menu_Item * title = 0,  
  int menubar = 0 ) const

Pulldown() is similar to popup(), but a rectangle is provided to position the menu. The menu is made at least W wide, and the picked item initial_item is centered over the rectangle (like Fl_Choice uses). If initial_item is NULL or not found, the menu is aligned just below the rectangle (like a pulldown menu). The title and menubar arguments are used internally by the Fl_Menu_Bar widget.

34.86.2.32  radio()

int Fl_Menu_Item::radio ( ) const [inline]

Returns true if this item is a radio item. When a radio button is selected all "adjacent" radio buttons are turned off. A set of radio items is delimited by an item that has radio() false, or by an item with FL_MENU_DIVIDER turned on.

34.86.2.33  set()

void Fl_Menu_Item::set ( ) [inline]
Turns the check or radio item "on" for the menu item. Note that this does not turn off any adjacent radio items like `setonly()` does.

### Fl_Menu_Item::setonly()

```cpp
void Fl_Menu_Item::setonly (Fl_Menu_Item const * first = NULL);
```

Turns the radio item "on" for the menu item and turns "off" adjacent radio items set.

**Note**

This method is dangerous if radio items are first in the menu. Make sure that `first` is set correctly or use `Fl_Menu_Item::setonly(Fl_Menu_Item*)` instead.

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>first</code></td>
<td>start of menu array or NULL (default) if the radio group is not the first item</td>
</tr>
</tbody>
</table>

### Fl_Menu_Item::shortcut()

```cpp
void Fl_Menu_Item::shortcut (int s); [inline]
```

Sets exactly what key combination will trigger the menu item. The value is a logical 'or' of a key and a set of shift flags, for instance `FL_ALT+'a'` or `FL_ALT+FL_F+10` or just 'a'. A value of zero disables the shortcut. The key can be any value returned by `Fl::event_key()`, but will usually be an ASCII letter. Use a lower-case letter unless you require the shift key to be held down. The shift flags can be any set of values accepted by `Fl::event_state()`. If the bit is on that shift key must be pushed. Meta, Alt, Ctrl, and Shift must be off if they are not in the shift flags (zero for the other bits indicates a "don't care" setting).

### Fl_Menu_Item::size()

```cpp
int Fl_Menu_Item::size () const
```

Size of the menu starting from this menu item.

This method counts all menu items starting with this menu item, including all menu items in the same (sub)menu level, all nested submenus, and the terminating empty (0) menu item. It does **not** count menu items referred to by `FL_SUBMENU_POINTER` menu items (except the single menu item with `FL_SUBMENU_POINTER`).

All menu items counted are consecutive in memory (one array).

**Example:**

```cpp
schemechoice = new Fl_Choice(X+125,Y,140,25,"FLTK Scheme");
schemechoice->add("none");
schemechoice->add("plastic");
schemechoice->add("gtk+");
schemechoice->add("gleam");
printf("schemechoice->menu()->size() = %d\n", schemechoice->menu()->size());
```

**Output:**

```
schemechoice->menu()->size() = 5
```

### Fl_Menu_Item::submenu()

```cpp
int Fl_Menu_Item::submenu ( ) const [inline]
```

Returns true if either `FL_SUBMENU` or `FL_SUBMENU_POINTER` is on in the flags. `FL_SUBMENU` indicates an embedded submenu that goes from the next item through the next one with a NULL label(). `FL_SUBMENU_POINTER` indicates that `user_data()` is a pointer to another menu array.
34.86.2.38 test_shortcut()

```cpp
const Fl_Menu_Item * Fl_Menu_Item::test_shortcut ( ) const
```
This is designed to be called by a widgets handle() method in response to a FL_SHORTCUT event. If the current event matches one of the item's shortcuts, that item is returned. If the keystroke does not match any shortcuts then NULL is returned. This only matches the shortcut() fields, not the letters in the title preceeded by '

34.86.2.39 uncheck()

```cpp
void Fl_Menu_Item::uncheck ( ) [inline]
```
Back compatibility only.

**Deprecated** Please use Fl_Menu_Item::clear() instead. This method will be removed in FLTK 1.5.0 or later.

See also
- clear()

34.86.2.40 value()

```cpp
int Fl_Menu_Item::value ( ) const [inline]
```
Returns the current value of the check or radio item. This is zero (0) if the menu item is not checked and non-zero otherwise.

Since

1.4.0 this method returns 1 if the item is checked but you should not rely on a particular value, only zero or non-zero.

**Note**

The returned value for a checked menu item was FL_MENU_VALUE (4) before FLTK 1.4.0.

The documentation for this struct was generated from the following files:

- Fl_Menu_Item.H
- Fl_Menu.cxx
- Fl_Menu_.cxx
- Fl_Menu_add.cxx

### 34.87 Fl_Menu_Window Class Reference

The **Fl_Menu_Window** widget is a window type used for menus.

```cpp
#include <Fl_Menu_Window.H>
```

Inheritance diagram for Fl_Menu_Window:

```
Fl_Widget  
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fl_Group</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fl_Window</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fl_Single_Window</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fl_Menu_Window</td>
<td></td>
</tr>
</tbody>
</table>
```
Public Member Functions

- **Fl_Menu_Window** (int W, int H, const char *l=0)
  
  Creates a new Fl_Menu_Window widget using the given size, and label string.

- **Fl_Menu_Window** (int X, int Y, int W, int H, const char *l=0)
  
  Creates a new Fl_Menu_Window widget using the given position, size, and label string.

- **~Fl_Menu_Window** ()
  
  Destroys the window and all of its children.

Additional Inherited Members

### 34.87.1 Detailed Description

The Fl_Menu_Window widget is a window type used for menus. By default the window is drawn in the hardware overlay planes if they are available so that the menu don't force the rest of the window to redraw.

The documentation for this class was generated from the following files:

- Fl_Menu_Window.H
- Fl_Menu_Window.cxx

### 34.88 Fl_Multi_Browser Class Reference

The Fl_Multi_Browser class is a subclass of Fl_Browser which lets the user select any set of the lines.

```cpp
#include <Fl_Multi_Browser.H>
```

Inheritance diagram for Fl_Multi_Browser:

```
Fl_Widget
   |
   v
Fl_Group
   |
   v
Fl_Browser
   |
   v
Fl_Browser_
   |
   v
Fl_Multi_Browser
```

Public Member Functions

- **Fl_Multi_Browser** (int X, int Y, int W, int H, const char *L=0)
  
  Creates a new Fl_Multi_Browser widget using the given position, size, and label string.

Additional Inherited Members

### 34.88.1 Detailed Description

The Fl_Multi_Browser class is a subclass of Fl_Browser which lets the user select any set of the lines.

![Figure 34.31 Fl_Multi_Browser](image)
The user interface is Macintosh style: clicking an item turns off all the others and selects that one, dragging selects all the items the mouse moves over, and ctrl + click (Cmd+click on the Mac OS platform) toggles the items. Shift + click extends the selection until the clicked item. This is different from how forms did it. Normally the callback is done when the user releases the mouse, but you can change this with when(). See Fl_Browser for methods to add and remove lines from the browser.

### 34.88.2 Constructor & Destructor Documentation

#### 34.88.2.1 Fl_Multi_Browser()

```cpp
Fl_Multi_Browser::Fl_Multi_Browser (
    int X,
    int Y,
    int W,
    int H,
    const char ∗ L = 0 )
```

Creates a new Fl_Multi_Browser widget using the given position, size, and label string. The default boxtype is FL_DOWN_BOX. The constructor specializes Fl_Browser() by setting the type to FL_MULTI_BROWSER. The destructor destroys the widget and frees all memory that has been allocated.

The documentation for this class was generated from the following files:

- Fl_Multi_Browser.H
- Fl_Browser.cxx

### 34.89 Fl_Multi_Label Struct Reference

Allows a mixed text and/or graphics label to be applied to an Fl_Menu_Item or Fl_Widget.

```cpp
#include <Fl_Multi_Label.H>
```

**Public Member Functions**

- void label (Fl_Menu_Item ∗)
  
  This method is used to associate a Fl_Multi_Label with a Fl_Menu_Item.

- void label (Fl_Widget ∗)
  
  This method is used to associate a Fl_Multi_Label with a Fl_Widget.

**Public Attributes**

- const char ∗ labela
  
  Holds the “leftmost” of the two elements in the composite label.

- const char ∗ labelb
  
  Holds the “rightmost” of the two elements in the composite label.

- uchar typea
  
  Holds the “type” of labela.

- uchar typeb
  
  Holds the “type” of labelb.

### 34.89.1 Detailed Description

Allows a mixed text and/or graphics label to be applied to an Fl_Menu_Item or Fl_Widget.

Most regular FLTK widgets now support the ability to associate both images and text with a label but some special cases, notably the non-widget Fl_Menu_Item objects, do not. Fl_Multi_Label may be used to create menu items that have an icon and text, which would not normally be possible for an Fl_Menu_Item. For example, Fl_Multi_Label is used in the New→Code submenu in fluid, and others.
Each Fl_Multi_Label holds two elements, labela and labelb; each may hold either a text label (const char*) or an image (Fl_Image*). When displayed, labela is drawn first and labelb is drawn immediately to its right. More complex labels might be constructed by setting labelb as another Fl_Multi_Label and thus chaining up a series of label elements.

When assigning a label element to one of labela or labelb, they should be explicitly cast to (const char*) if they are not of that type already.

**Example Use: Fl_Menu_Bar**

```c
Fl_Pixmap *image = new Fl_Pixmap(...);  // image for menu item; any Fl_Image based widget
Fl_Menu_Bar *menu = new Fl_Menu_Bar(...);  // can be any Fl_Menu_oriented widget (Fl_Choice, Fl_Menu_Button...)
// Create a menu item
int i = menu->add("File/New", ...);
Fl_Menu_Item *item = (Fl_Menu_Item*)&(menu->menu()[i]);
// Create a multi label, assign it an image + text
Fl_Multi_Label *ml = new Fl_Multi_Label;
// Left side of label is an image
ml->typea = FL_IMAGE_LABEL;
ml->labela = (const char*)image;  // any Fl_Image widget: Fl_Pixmap, Fl_PNG_Image, etc..
// Right side of label is label text
ml->typeb = FL_NORMAL_LABEL;
ml->labelb = item->label();
// Assign the multilabel to the menu item
ml->label(item);
```

See also

Fl_Label and Fl_Labeltype and examples/howto-menu-with-images.cxx

### 34.89.2 Member Data Documentation

#### 34.89.2.1 labela

cast char* Fl_Multi_Label::labela

Holds the "leftmost" of the two elements in the composite label. Typically this would be assigned either a text string (const char*), a (Fl_Image*) or a (Fl_Multi_Label*).

#### 34.89.2.2 labelb

cast char* Fl_Multi_Label::labelb

Holds the "rightmost" of the two elements in the composite label. Typically this would be assigned either a text string (const char*), a (Fl_Image*) or a (Fl_Multi_Label*).

#### 34.89.2.3 typea

uchar Fl_Multi_Label::typea

Holds the "type" of labela. Typically this is set to FL_NORMAL_LABEL for a text label, FL_IMAGE_LABEL for an image (based on Fl_image) or FL_MULTI_LABEL if "chaining" multiple Fl_Multi_Label elements together.

#### 34.89.2.4 typeb

uchar Fl_Multi_Label::typeb

Holds the "type" of labelb.
Typically this is set to FL_NORMAL_LABEL for a text label, FL_IMAGE_LABEL for an image (based on Fl_image) or FL_MULTI_LABEL if "chaining" multiple Fl_Multi_Label elements together. The documentation for this struct was generated from the following files:

- Fl_Multi_Label.H
- Fl_Multi_Label.cxx

### 34.90 Fl_Multiline_Input Class Reference

This input field displays 'n' characters as new lines rather than ^J, and accepts the Return, Tab, and up and down arrow keys.

```
#include <Fl_Multiline_Input.H>
```

Inheritance diagram for Fl_Multiline_Input:

```
Fl_Widget
    |   
    v
Fl_Input_
    |   
    v
Fl_Input
    |   
    v
Fl_Multiline_Input
```

#### Public Member Functions

- `Fl_Multiline_Input (int X, int Y, int W, int H, const char *l = 0)`

  Creates a new Fl_Multiline_Input widget using the given position, size, and label string.

#### Additional Inherited Members

##### 34.90.1 Detailed Description

This input field displays 'n' characters as new lines rather than ^J, and accepts the Return, Tab, and up and down arrow keys.

This is for editing multiline text.

This is far from the nirvana of text editors, and is probably only good for small bits of text, 10 lines at most. Note that this widget does not support scrollbars or per-character color control.

If you are presenting large amounts of text and need scrollbars or full color control of characters, you probably want Fl_Text_Editor instead.

In FLTK 1.3.x, the default behavior of the 'Tab' key was changed to support consistent focus navigation. To get the older FLTK 1.1.x behavior, set Fl_Input::tab_nav() to 0. Newer programs should consider using Fl_Text_Editor.

##### 34.90.2 Constructor & Destructor Documentation

#### 34.90.2.1 Fl_Multiline_Input()

```
Fl_Multiline_Input::Fl_Multiline_Input ( 
    int X, 
    int Y, 
    int W, 
    int H, 
    const char *l = 0 )
```

Creates a new Fl_Multiline_Input widget using the given position, size, and label string.
The default boxtype is FL_DOWN_BOX.
Inherited destructor destroys the widget and any value associated with it.
The documentation for this class was generated from the following files:

- Fl_Multiline_Input.H
- Fl_Input.cxx

34.91 Fl_Multiline_Output Class Reference

This widget is a subclass of Fl_Output that displays multiple lines of text.
#include <Fl_Multiline_Output.H>
Inheritance diagram for Fl_Multiline_Output:

```
        Fl_Widget
         |        
         v        
        Fl_Input_
         |        
         v        
        Fl_Input
         |        
         v        
       Fl_Output
         |        
         v        
Fl_Multiline_Output
```

Public Member Functions

- Fl_Multiline_Output (int X, int Y, int W, int H, const char *l=0)

  Creates a new Fl_Multiline_Output widget using the given position, size, and label string.

Additional Inherited Members

34.91.1 Detailed Description

This widget is a subclass of Fl_Output that displays multiple lines of text.
It also displays tab characters as whitespace to the next column.
Note that this widget does not support scrollbars, or per-character color control.
If you are presenting large amounts of read-only text and need scrollbars, or full color control of characters, then use Fl_Text_Display. If you want to display HTML text, use Fl_Help_View.
A caret cursor (^) shows the keyboard navigation mark for keyboard selection of the output text, e.g. Arrow Keys to move the cursor, Shift + Arrow Keys to create a text selection, and 'C' to copy the selected text to the paste buffer.
The caret cursor can be disabled by disabling the widget's "visible focus" using clear_visible_focus(), inherited from the Fl_Widget base class. Doing this also disables the widget's keyboard navigation.

34.91.2 Constructor & Destructor Documentation

34.91.2.1 Fl_Multiline_Output()

Fl_Multiline_Output::Fl_Multiline_Output (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )
Creates a new Fl_Multiline_Output widget using the given position, size, and label string.
The default boxtype is FL_DOWN_BOX.
Inherited destructor destroys the widget and any value associated with it.
The documentation for this class was generated from the following files:

- Fl_Multiline_Output.H
- Fl_Input.cxx

### 34.92 Fl_Native_File_Chooser Class Reference

This class lets an FLTK application easily and consistently access the operating system's native file chooser.

```cpp
#include <Fl_Native_File_Chooser.H>
```

#### Public Types

- enum `Option` {
  - `NO_OPTIONS = 0x0000`
  - `SAVEAS_CONFIRM = 0x0001`
  - `NEW_FOLDER = 0x0002`
  - `PREVIEW = 0x0004`
  - `USE_FILTER_EXT = 0x0008`
}

- enum `Type` {
  - `BROWSE_FILE`
  - `BROWSE_DIRECTORY`
  - `BROWSE_MULTI_FILE`
  - `BROWSE_MULTI_DIRECTORY`
  - `BROWSE_SAVE_FILE`
  - `BROWSE_SAVE_DIRECTORY`
}

#### Public Member Functions

- int `count()` const
  - Returns the number of filenames (or directory names) the user selected.

- const char * `directory()` const
  - Returns the current preset directory() value.

- void `directory(const char *val)`
  - Preset the directory the browser will show when opened.

- const char * `errmsg()` const
  - Returns a system dependent error message for the last method that failed.

- const char * `filename()` const
  - Return the filename the user chose.

- const char * `filename(int i)` const
  - Return one of the filenames the user selected.

- const char * `filter()` const
  - Returns the filter string last set.

- void `filter(const char *f)`
  - Sets the filename filters used for browsing.

- int `filter_value()` const
  - Returns which filter value was last selected by the user.

- void `filter_value(int i)`
  - Sets which filter will be initially selected.

- int `filters()` const
  - Gets how many filters were available, not including "All Files".

- Fl_Native_File_Chooser (int val=BROWSE_FILE)
  - The constructor.

- int `options()` const
  - Gets the platform specific Fl_Native_File_Chooser::Option flags.

- void `options(int o)`
  - Sets the platform specific chooser options to val.

- const char * `preset_file()` const
Get the preset filename.

- void **preset_file** (const char *)
  
  Sets the default filename for the chooser.

- int **show** ()
  
  Post the chooser's dialog.

- const char * **title** () const
  
  Get the title of the file chooser's dialog window.

- void **title** (const char *)
  
  Set the title of the file chooser's dialog window.

- int **type** () const
  
  Gets the current Fl_Native_File_Chooser::Type of browser.

- void **type** (int t)
  
  Sets the current Fl_Native_File_Chooser::Type of browser.

- ~Fl_Native_File_Chooser ()
  
  Destructor.

Static Public Attributes

- static const char * **file_exists_message** = "File exists. Are you sure you want to overwrite?"
  
  Localizable message.

34.92.1 Detailed Description

This class lets an FLTK application easily and consistently access the operating system's native file chooser.

Some operating systems have very complex and specific file choosers that many users want access to specifically, instead of FLTK's default file chooser(s).

In cases where there is no native file browser, FLTK's own file browser is used instead.

To use this widget, use the following include in your code:

```cpp
#include <FL/Fl_Native_File_Chooser.H>
```

The following example shows how to pick a single file:

```cpp
// Create and post the local native file chooser
#include <FL/Fl_Native_File_Chooser.H>
[..]
Fl_Native_File_Chooser fnfc;
fnfc.title("Pick a file");
fnfc.type(Fl_Native_File_Chooser::BROWSE_FILE);
fnfc.filter("Text \*.txt\n"C Files \*.cxx,h,c");
fnfc.directory("/var/tmp"); // default directory to use
```

// Show native chooser
```
switch ( fnfc.show() ) { 
  case -1: printf("ERROR: %s\n", fnfc.errmsg()); break; // ERROR
  case 1: printf("CANCEL\n"); break; // CANCEL
  default: printf("PICKED: %s\n", fnfc.filename()); break; // FILE CHOSEN
}
```

The Fl_Native_File_Chooser widget transmits UTF-8 encoded filenames to its user. It is recommended to open files that may have non-ASCII names with the fl_fopen() or fl_open() utility functions that handle these names in a cross-platform way (whereas the standard fopen()/open() functions fail on the Windows platform to open files with a non-ASCII name).

Platform Specific Caveats

- Under X11/Wayland, what dialog opens is determined as follows:

  1. If command `zenity` is available at run-time and if Fl::option(OPTION_FNFC_USES_ZENITY) is not turned off, the `zenity`-based dialog opens. This is expected to be more appropriate than other dialog forms for sandboxed apps.

  2. Else if the app runs under the KDE desktop and if command `kdialog` is available at run-time and if the library was not built with `cmake -DOPTION_USE_KDIALOG=Off`, the `kdialog`-based dialog opens.

  3. Else if the GTK library is available at run-time on the computer and if Fl::option(OPTION_FNFC_USES_GTK) is not turned off, the GTK-styled dialog opens. Call `fl_register_images()` to add a "Preview" button to this dialog. Use the static public attributes of class Fl_File_Chooser to localize the browser.
4. Otherwise, FLTK's own dialog produced by the Fl_File_Chooser class opens. Call fl_register_images() to add a "Preview" button to it. It's best if you also call Fl_File_Icon::load_system_icons() at the start of main(), to enable the nicer looking file browser widgets. Use the static public attributes of class Fl_File_Chooser to localize the browser.

- Some operating systems support certain OS specific options; see Fl_Native_File_Chooser::options() for a list.

![Mac OS X](image1.png) ![Windows](image2.png) ![Linux + GTK](image3.png) ![Linux](image4.png)

Figure 34.33 The Fl_Native_File_Chooser on different platforms

34.92.2 Member Enumeration Documentation

34.92.2.1 Option

enum Fl_Native_File_Chooser::Option

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO_OPTIONS</td>
<td>no options enabled</td>
</tr>
<tr>
<td>SAVEAS_CONFIRM</td>
<td>Show native 'Save As' overwrite confirm dialog.</td>
</tr>
<tr>
<td>NEW_FOLDER</td>
<td>Show 'New Folder' icon (if supported)</td>
</tr>
<tr>
<td>PREVIEW</td>
<td>enable preview mode (if supported)</td>
</tr>
<tr>
<td>USE_FILTER_EXT</td>
<td>Chooser filter presets the output file extension (if supported)</td>
</tr>
</tbody>
</table>
34.92.2 Type

enum Fl_Native_File_Chooser::Type

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BROWSE_FILE</td>
<td>browse files (lets user choose one file)</td>
</tr>
<tr>
<td>BROWSE_DIRECTORY</td>
<td>browse directories (lets user choose one directory)</td>
</tr>
<tr>
<td>BROWSE_MULTI_FILE</td>
<td>browse files (lets user choose multiple files)</td>
</tr>
<tr>
<td>BROWSE_MULTI_DIRECTORY</td>
<td>browse directories (lets user choose multiple directories)</td>
</tr>
<tr>
<td>BROWSE_SAVE_FILE</td>
<td>browse to save a file</td>
</tr>
<tr>
<td>BROWSE_SAVE_DIRECTORY</td>
<td>browse to save a directory</td>
</tr>
</tbody>
</table>

34.92.3 Constructor & Destructor Documentation

34.92.3.1 Fl_Native_File_Chooser()

Fl_Native_File_Chooser::Fl_Native_File_Chooser ( 
  int val = BROWSE_FILE )

The constructor.
Internally allocates the native widgets. Optional val presets the type of browser this will be, which can also be changed with type().

34.92.3.2 ~Fl_Native_File_Chooser()

Fl_Native_File_Chooser::~Fl_Native_File_Chooser ( )

Destructor.
Deallocates any resources allocated to this widget.

34.92.4 Member Function Documentation

34.92.4.1 count()

int Fl_Native_File_Chooser::count ( ) const

Returns the number of filenames (or directory names) the user selected.

Example:
    if ( fnfc->show() == 0 ) {
        // Print all filenames user selected
        for ( int n=0; n<fnfc->count(); n++ ) {
            printf("%d) '%s'\n", n, fnfc->filename(n));
        }
    }

34.92.4.2 directory()

void Fl_Native_File_Chooser::directory ( 
    const char * val )

Preset the directory the browser will show when opened.
If val is NULL, or no directory is specified, the chooser will attempt to use the last non-cancelled folder.

34.92.4.3 errmsg()

const char * Fl_Native_File_Chooser::errmsg ( ) const

Returns a system dependent error message for the last method that failed.
This message should at least be flagged to the user in a dialog box, or to some kind of error log. Contents will be valid only for methods that document `errmsg()` will have info on failures.

### 34.92.4.4 filename () [1/2]

```cpp
const char * Fl_Native_File_Chooser::filename () const
```

Return the filename the user chose.
Use this if only expecting a single filename. If more than one filename is expected, use `filename(int)` instead. Return value may be "" if no filename was chosen (eg. user cancelled).

### 34.92.4.5 filename () [2/2]

```cpp
const char * Fl_Native_File_Chooser::filename ( int i ) const
```

Return one of the filenames the user selected.
Use `count()` to determine how many filenames the user selected.

**Example:**

```cpp
if ( fnfc->show() == 0 ) {
    // Print all filenames user selected
    for (int n=0; n<fnfc->count(); n++) {
        printf("%d) '%s'\n", n, fnfc->filename(n));
    }
}
```

### 34.92.4.6 filter () [1/2]

```cpp
const char * Fl_Native_File_Chooser::filter ( ) const
```

Returns the filter string last set.
Can be NULL if no filter was set.

### 34.92.4.7 filter () [2/2]

```cpp
void Fl_Native_File_Chooser::filter ( const char * f )
```

Sets the filename filters used for browsing.
The default is NULL, which browses all files.
The filter string can be any of:

- A single wildcard (eg. ".txt")
- Multiple wildcards (eg. ".{cxx,H}"")
- A descriptive name followed by a "\t" and a wildcard (eg. "Text Files\t+.txt")
- A list of separate wildcards with a "\n" between each (eg. ".{cxx,H}\n+.txt")
- A list of descriptive names and wildcards (eg. "C++ Files\t+.{cxx,H}Txt Files\t+.txt")

The format of each filter is a wildcard, or an optional user description followed by '\t' and the wildcard.
On most platforms, each filter is available to the user via a pulldown menu in the file chooser. The 'All Files' option is always available to the user.

### 34.92.4.8 filter_value () [1/2]

```cpp
int Fl_Native_File_Chooser::filter_value ( ) const
```

Returns which filter value was last selected by the user.
This is only valid if the chooser returns success.
34.92.4.9  filter_value() [2/2]

void Fl_Native_File_Chooser::filter_value (  
    int i  )
Sets which filter will be initially selected.
The first filter is indexed as 0. If filter_value()==filters(), then "All Files" was chosen. If filter_value() > filters(), then
a custom filter was set.

34.92.4.10  options()

void Fl_Native_File_Chooser::options (  
    int o  )
Sets the platform specific chooser options to val.
val is expected to be one or more Fl_Native_File_Chooser::Option flags ORed together. Some platforms have
OS-specific functions that can be enabled/disabled via this method.

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
<th>Win</th>
<th>Mac</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW_FOLDER</td>
<td>Shows the 'New Folder' button.</td>
<td>Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREVIEW</td>
<td>Enables the 'Preview' mode by default.</td>
<td>Ignored</td>
<td>Ignored</td>
<td>Used</td>
</tr>
<tr>
<td>SAVEAS_CONFIRM</td>
<td>Confirm dialog if BROWSE_SAVE_FILE file exists.</td>
<td>Used</td>
<td>Used</td>
<td>Used</td>
</tr>
<tr>
<td>USE_FILTER_EXT</td>
<td>Chooser filter presets the output file extension.</td>
<td>Ignored</td>
<td>Used</td>
<td>Used (GTK)</td>
</tr>
</tbody>
</table>

34.92.4.11  preset_file()

void Fl_Native_File_Chooser::preset_file (  
    const char ∗ f  )
Sets the default filename for the chooser.
Use directory() to set the default directory. Mainly used to preset the filename for save dialogs, and on most
platforms can be used for opening files as well.

34.92.4.12  show()

int Fl_Native_File_Chooser::show (  )
Post the chooser's dialog.
Blocks until dialog has been completed or cancelled.
Returns

- 0 – user picked a file
- 1 – user cancelled
- -1 – failed; errmsg() has reason

34.92.4.13  title() [1/2]

const char ∗ Fl_Native_File_Chooser::title ( ) const
Get the title of the file chooser's dialog window.
Return value may be NULL if no title was set.

34.92.4.14  title() [2/2]

void Fl_Native_File_Chooser::title (  
    const char ∗ t  )
Set the title of the file chooser's dialog window.
Can be NULL if no title desired. The default title varies according to the platform, so you are advised to set the title
explicitly.
The documentation for this class was generated from the following files:

- Fl_Native_File_Chooser.H
- Fl_Native_File_Chooser.cxx
- Fl_Native_File_Chooser_GTK.cxx

Generated by Doxygen
### 34.93 Fl_Nice_Slider Class Reference

Inheritance diagram for Fl_Nice_Slider:

```
FI_Widget
    |   
    v   
FI_Valuator
    |   
    v   
FI_Slider
    |   
    v   
FI_Nice_Slider
```

**Public Member Functions**

- `Fl_Nice_Slider(int X, int Y, int W, int H, const char *L=0)`

**Additional Inherited Members**

The documentation for this class was generated from the following files:

- Fl_Nice_Slider.H
- Fl_Slider.cxx

### 34.94 Fl_Output Class Reference

This widget displays a piece of text.

```
#include <Fl_Output.H>
```

Inheritance diagram for Fl_Output:

```
FI_Widget
    |   
    v   
FI_Input_
    |   
    v   
FI_Input
    |   
    v   
FI_Output
    |   
    v   
FI_Multiline_Output
```

**Public Member Functions**

- `Fl_Output(int X, int Y, int W, int H, const char *L=0)`
  
  Creates a new Fl_Output widget using the given position, size, and label string.

**Additional Inherited Members**

### 34.94.1 Detailed Description

This widget displays a piece of text.
When you set the `value()`, `FL_Output` does a `strcpy()` to its own storage, which is useful for program-generated values. The user may select portions of the text using the mouse and paste the contents into other fields or programs.

There is a single subclass, `FL_Multiline_Output`, which allows you to display multiple lines of text. `FL_Multiline_Output` does not provide scroll bars. If a more complete text editing widget is needed, use `FL_Text_Display` instead. The text may contain any characters except `\0`, and will correctly display anything, using `\^X` notation for unprintable control characters and `\nnn` notation for unprintable characters with the high bit set. It assumes the font can draw any characters in the ISO-Latin1 character set.

### 34.94.2 Constructor & Destructor Documentation

#### 34.94.2.1 `Fl_Output()`

```cpp
Fl_Output::Fl_Output (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )
```

Creates a new `Fl_Output` widget using the given position, size, and label string. The default boxtype is `FL_DOWN_BOX`. Inherited destructor destroys the widget and any value associated with it. The documentation for this class was generated from the following files:

- `Fl_Output.H`
- `Fl_Input.cxx`

### 34.95 `Fl_Overlay_Window` Class Reference

This window provides double buffering and also the ability to draw the "overlay" which is another picture placed on top of the main image.

```cpp
#include <Fl_Overlay_Window.H>
```

Inheritance diagram for `Fl_Overlay_Window`:
Public Member Functions

- **Fl_Overlay_Window** ∗ as_overlay_window () **FL_OVERRIDE**
  
  Return non-null if this is an **Fl_Overlay_Window** object.

- int can_do_overlay ()
  
  Returns non-zero if there's hardware overlay support.

- virtual void draw_overlay ()=0
  
  You must subclass **Fl_Overlay_Window** and provide this method.

- void flush () **FL_OVERRIDE**
  
  Forces the window to be drawn, this window is also made current and calls **draw()**.

- void hide () **FL_OVERRIDE**
  
  Makes a widget invisible.

- void redraw_overlay ()
  
  Call this to indicate that the overlay data has changed and needs to be redrawn.

- void resize (int, int, int) **FL_OVERRIDE**
  
  Changes the size or position of the widget.

- void show () **FL_OVERRIDE**
  
  Makes a widget visible.

- void show (int a, char ∗∗b)
  
  Same as **Fl_Window::show(int a, char ∗∗b)**

- ~**Fl_Overlay_Window** ()
  
  Destroys the window and all child widgets.

Protected Member Functions

- **Fl_Overlay_Window** (int W, int H, const char ∗l=0)
  
  See **Fl_Overlay_Window::Fl_Overlay_Window(int X, int Y, int W, int H, const char ∗l=0)**

- **Fl_Overlay_Window** (int X, int Y, int W, int H, const char ∗l=0)
  
  Creates a new **Fl_Overlay_Window** widget using the given position, size, and label (title) string.

Additional Inherited Members

34.95.1 Detailed Description

This window provides double buffering and also the ability to draw the "overlay" which is another picture placed on top of the main image.

The overlay is designed to be a rapidly-changing but simple graphic such as a mouse selection box. **Fl_Overlay_Window** uses the overlay planes provided by your graphics hardware if they are available.

If no hardware support is found the overlay is simulated by drawing directly into the on-screen copy of the double-buffered window, and "erased" by copying the backbuffer over it again. This means the overlay will blink if you change the image in the window.
34.95 Fl_Overlay_Window Class Reference

34.95.2 Constructor & Destructor Documentation

34.95.2.1 Fl_Overlay_Window()

Fl_Overlay_Window::Fl_Overlay_Window (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ l = 0 )  [protected]  

Creates a new Fl_Overlay_Window widget using the given position, size, and label (title) string.  
If the positions (x,y) are not given, then the window manager will choose them.

34.95.3 Member Function Documentation

34.95.3.1 as_overlay_window()

Fl_Overlay_Window ∗ Fl_Overlay_Window::as_overlay_window ( )  [inline], [virtual]  

Return non-null if this is an Fl_Overlay_Window object.  
Reimplemented from Fl_Window.

34.95.3.2 draw_overlay()

virtual void Fl_Overlay_Window::draw_overlay ( )  [pure virtual]  
You must subclass Fl_Overlay_Window and provide this method.  
It is just like a draw() method, except it draws the overlay. The overlay will have already been "cleared" when this is  
called. You can use any of the routines described in <FL/fl_draw.H>.

34.95.3.3 flush()

void Fl_Overlay_Window::flush ( )  [virtual]  
Forces the window to be drawn, this window is also made current and calls draw().  
Reimplemented from Fl_Double_Window.

34.95.3.4 hide()

void Fl_Overlay_Window::hide ( )  [virtual]  
Makes a widget invisible.  
See also  
    show(), visible(), visible_r()  
Reimplemented from Fl_Double_Window.

34.95.3.5 redraw_overlay()

void Fl_Overlay_Window::redraw_overlay ( )  
Call this to indicate that the overlay data has changed and needs to be redrawn.  
The overlay will be clear until the first time this is called, so if you want an initial display you must call this after calling  
show().
### 34.95.3.6 resize()

```cpp
class Fl_Overlay_Window
{
public:
    virtual void resize(int x, int y, int w, int h);
}
```

Changes the size or position of the widget. This is a virtual function so that the widget may implement its own handling of resizing. The default version does not call the `redraw()` method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call `resize()` a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

`position(X, Y)` is a shortcut for `resize(X, Y, w(), h())`, and `size(W, H)` is a shortcut for `resize(x(), y(), W, H)`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x, y</th>
<th>new position relative to the parent window</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>w, h</td>
<td>new size</td>
</tr>
</tbody>
</table>

See also

- `position(int,int)`, `size(int,int)`

Reimplemented from `Fl_Double_Window`.

### 34.95.3.7 show()

```cpp
class Fl_Overlay_Window
{
public:
    virtual void show();
}
```

Makes a widget visible. An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like FL_SHOW.

The `visible()` method returns true if the widget is set to be visible. The `visible_r()` method returns true if the widget and all of its parents are visible. A widget is only visible if `visible()` is true on it and all of its parents.

Changing it will send FL_SHOW or FL_HIDE events to the widget. **Do not change it if the parent is not visible, as this will send false FL_SHOW or FL_HIDE events to the widget.** `redraw()` is called if necessary on this or the parent.

See also

- `hide()`, `visible()`, `visible_r()`

Reimplemented from `Fl_Double_Window`.

The documentation for this class was generated from the following files:

- `Fl_Overlay_Window.H`
- `Fl_Overlay_Window.cxx`

### 34.96 Fl_Pack Class Reference

This widget was designed to add the functionality of compressing and aligning widgets.

```cpp
#include <Fl_Pack.H>
```

Inheritance diagram for `Fl_Pack`:

```
Fl_Widget
    |
    v
Fl_Group
    |
    v
Fl_Pack
```
Public Types

- enum { VERTICAL = 0 , HORIZONTAL = 1 }

Public Member Functions

- Fl_Pack (int X, int Y, int W, int H, const char ∗L=0)
  Creates a new Fl_Pack widget using the given position, size, and label string.
- uchar horizontal () const
  Returns non-zero if Fl_Pack alignment is horizontal.
- void resize (int X, int Y, int W, int H) FL_OVERRIDE
  Override Fl_Group resize behavior.
- int spacing () const
  Gets the number of extra pixels of blank space that are added between the children.
- void spacing (int i)
  Sets the number of extra pixels of blank space that are added between the children.

Protected Member Functions

- void draw () FL_OVERRIDE
  Draws the widget.

Additional Inherited Members

34.96.1 Detailed Description

This widget was designed to add the functionality of compressing and aligning widgets. If type() is Fl_Pack::HORIZONTAL all the children are resized to the height of the Fl_Pack, and are moved next to each other horizontally. If type() is not Fl_Pack::HORIZONTAL then the children are resized to the width and are stacked below each other. Then the Fl_Pack resizes itself to surround the child widgets.

You may want to put the Fl_Pack inside an Fl_Scroll. The 'resizable()' for Fl_Pack is set to NULL by default. Its behavior is slightly different than in a normal Fl_Group widget: only if the resizable() widget is the last widget in the group it is extended to take the full available width or height, respectively, of the Fl_Pack group.

Note

You can nest Fl_Pack widgets or put them inside Fl_Scroll widgets or inside other group widgets but their behavior can sometimes be "surprising". This is partly due to the fact that Fl_Pack widgets resize themselves during their draw() operation, trying to react on their child widgets resizing themselves during their draw() operations which can be confusing. If you want to achieve special resize behavior of nested group widgets it can sometimes be easier to derive your own specialized group widget than to try to make nested Fl_Pack widgets behave as expected.

See also

Fl_Group::resizable()

34.96.2 Constructor & Destructor Documentation

34.96.2.1 Fl_Pack()

Fl_Pack::Fl_Pack ( int X,
                 int Y,
                 int W,
int H,
const char * L = 0 )

Creates a new Fl_Pack widget using the given position, size, and label string.
The default boxtype is FL_NO_BOX.
The default type() is Fl_Pack::VERTICAL.
The destructor also deletes all the children. This allows a whole tree to be deleted at once, without having to keep
a pointer to all the children in the user code. A kludge has been done so the Fl_Pack and all of its children can be
automatic (local) variables, but you must declare the Fl_Pack first, so that it is destroyed last.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X,Y</td>
<td>X and Y coordinates (position)</td>
</tr>
<tr>
<td>W,H</td>
<td>width and height, respectively</td>
</tr>
<tr>
<td>L</td>
<td>label (optional)</td>
</tr>
</tbody>
</table>

34.96.3 Member Function Documentation

34.96.3.1 draw()

void Fl_Pack::draw ( ) [protected], [virtual]

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrew
as soon as possible, call redraw() instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded
scrollbar, you can do it (because draw() is virtual) like this:

Fl_Widget * s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()

Reimplemented from Fl_Group.

34.96.3.2 horizontal()

uchar Fl_Pack::horizontal ( ) const [inline]

Returns non-zero if Fl_Pack alignment is horizontal.

Returns

non-zero if Fl_Pack alignment is horizontal (Fl_Pack::HORIZONTAL)

Note

Currently the return value is the same as Fl_Group::type(), but this may change in the future. Do not set any
other values than the following with Fl_Pack::type():

• Fl_Pack::VERTICAL (Default)
• Fl_Pack::HORIZONTAL

See class Fl_Pack documentation for details.

34.96.3.3 resize()

void Fl_Pack::resize ( int X,
int Y,
int W,
int H ) [virtual]
Override `Fl_Group` resize behavior.
Resizing an `Fl_Pack` will not resize any of its children, but trigger a redraw, which in turn recalculates the dimensions of all children.

Parameters

\[
\text{in } X,Y,W,H \text{ new position and size of the Fl_Pack widget}
\]

Reimplemented from `Fl_Group`.
The documentation for this class was generated from the following files:

- `Fl_Pack.H`
- `Fl_Pack.cxx`

### 34.97 Fl_Paged_Device Class Reference

Represents page-structured drawing surfaces.

```
#include <Fl_Paged_Device.H>
```

Inheritance diagram for `Fl_Paged_Device`:

```
Fl_Surface_Device
  Fl_Widget_Surface
   Fl_Paged_Device
      Fl_PostScript_File_Device Fl_Printer
```

#### Classes

- struct `page_format`
  
  width, height and name of a page format

#### Public Types

- enum `Page_Format`
  
  A0 = 0, A1, A2, A3, A4, A5, A6, A7, A8, A9, B0, B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, C5E, DLE, EXECUTIVE, FOLIO, LEDGER, LEGAL, LETTER, TABLOID, ENVELOPE, MEDIA = 0x1000

  Possible page formats.

- enum `Page_Layout`
  
  PORTRAIT = 0, LANDSCAPE = 0x100, REVERSED = 0x200, ORIENTATION = 0x300

  Possible page layouts.

#### Public Member Functions

- virtual int `begin_job`
  
  int pagecount=0, int *frompage=NULL, int *topage=NULL, char **perr←message=NULL

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**Class Documentation**

- **virtual int** begin_page (void)
  
  Begins a new printed page.

- **virtual void** end_job (void)
  
  To be called at the end of a print job.

- **virtual int** end_page (void)
  
  To be called at the end of each page.

- **virtual void** margins (int *left, int *top, int *right, int *bottom)
  
  Computes the dimensions of margins that lie between the printable page area and the full page.

- **void** print_widget (Fl_Widget *widget, int delta_x=0, int delta_y=0)
  
  Synonym of draw(Fl_Widget*, int, int)

- **void** print_window (Fl_Window *win, int x_offset=0, int y_offset=0)
  
  Synonym of draw_decorated_window(Fl_Window*, int, int)

- **virtual void** rotate (float angle)
  
  Rotates the graphics operations relatively to paper.

- **virtual void** scale (float scale_x, float scale_y=0.)
  
  Changes the scaling of page coordinates.

- **int** start_job (int pagecount=0, int *frompage=NULL, int *topage=NULL, char **perr_message=NULL)
  
  Synonym of begin_job(int pagecount, int *frompage, int *topage, char **perr_message).

- **int** start_page ()
  
  Synonym of begin_page().

- **virtual ~Fl_Paged_Device ()**
  
  The destructor.

**Static Public Attributes**

- **static const** page_format page_formats [NO_PAGE_FORMATS]
  
  width, height and name of all elements of the enum Page_Format.

**Protected Member Functions**

- **Fl_Paged_Device ()**
  
  The constructor.

**Additional Inherited Members**

### 34.97.1 Detailed Description

Represents page-structured drawing surfaces.

This class has no public constructor: don't instantiate it; use Fl_Printer or Fl_PostScript_File_Device instead.

### 34.97.2 Member Enumeration Documentation

#### 34.97.2.1 Page_Format

enum Fl_Paged_Device::Page_Format

Possible page formats.

All paper formats with pre-defined width and height. The Fl_Paged_Device::page_formats array gives these widths and heights.

**Enumerator**

<table>
<thead>
<tr>
<th>A0</th>
<th>A0 format</th>
</tr>
</thead>
</table>

Generated by Doxygen
### Page_Layout

`enum Fl_Paged_Device::Page_Layout`  
Possible page layouts.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A1 format</td>
</tr>
<tr>
<td>A2</td>
<td>A2 format</td>
</tr>
<tr>
<td>A3</td>
<td>A3 format</td>
</tr>
<tr>
<td>A4</td>
<td>A4 format</td>
</tr>
<tr>
<td>A5</td>
<td>A5 format</td>
</tr>
<tr>
<td>A6</td>
<td>A6 format</td>
</tr>
<tr>
<td>A7</td>
<td>A7 format</td>
</tr>
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<td>A8</td>
<td>A8 format</td>
</tr>
<tr>
<td>A9</td>
<td>A9 format</td>
</tr>
<tr>
<td>B0</td>
<td>B0 format</td>
</tr>
<tr>
<td>B1</td>
<td>B1 format</td>
</tr>
<tr>
<td>B2</td>
<td>B2 format</td>
</tr>
<tr>
<td>B3</td>
<td>B3 format</td>
</tr>
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<td>B4</td>
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<td>B8 format</td>
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<td>B9 format</td>
</tr>
<tr>
<td>B10</td>
<td>B10 format</td>
</tr>
<tr>
<td>EXECUTIVE</td>
<td>Executive format</td>
</tr>
<tr>
<td>FOLIO</td>
<td>Folio format</td>
</tr>
<tr>
<td>LEDGER</td>
<td>Ledger format</td>
</tr>
<tr>
<td>LEGAL</td>
<td>Legal format</td>
</tr>
<tr>
<td>LETTER</td>
<td>Letter format</td>
</tr>
<tr>
<td>TABLOID</td>
<td>Tabloid format</td>
</tr>
</tbody>
</table>

### Member Function Documentation

#### begin_job()

```cpp
int Fl_Paged_Device::begin_job (  
    int pagecount = 0,  
    int * frompage = NULL,  
    int * topage = NULL,  
    char ** perr_message = NULL ) [virtual]
```
Begins a print job.

### Parameters

<table>
<thead>
<tr>
<th>Direction</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>pagecount</td>
<td>the total number of pages of the job (or 0 if you don’t know the number of pages)</td>
</tr>
<tr>
<td>out</td>
<td>frompage</td>
<td>if non-null, frompage is set to the first page the user wants printed</td>
</tr>
<tr>
<td>out</td>
<td>topage</td>
<td>if non-null, topage is set to the last page the user wants printed</td>
</tr>
<tr>
<td>out</td>
<td>perr_message</td>
<td>if non-null and if the returned value is 2, perr_message is set to a string describing the error. That string can be delete[]’d after use.</td>
</tr>
</tbody>
</table>

### Returns

- 0 if OK, 1 if user cancelled the job, 2 if any error.

Reimplemented in Fl_Personal_File_Device, and Fl_Printer.

#### 34.97.3.2 begin_page()

```cpp
int Fl_Paged_Device::begin_page ( void ) [virtual]
```

Begins a new printed page.

The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area. This function also makes this surface the current drawing surface with Fl_Surface_Device::push_current().

**Note**

begin_page() calls Fl_Surface_Device::push_current() and leaves this device as the active surface. If any calls between begin_page() and end_page() open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to Fl_Surface_Device::pop_current() and a call to Fl_Surface_Device::push_current(), or the content of the dialog box will be rendered to the printer instead of the screen.

### Returns

- 0 if OK, non-zero if any error

Reimplemented in Fl_Personal_File_Device, and Fl_Printer.

#### 34.97.3.3 end_job()

```cpp
void Fl_Paged_Device::end_job ( void ) [virtual]
```

To be called at the end of a print job.

Reimplemented in Fl_Personal_File_Device, and Fl_Printer.

#### 34.97.3.4 end_page()

```cpp
int Fl_Paged_Device::end_page ( void ) [virtual]
```

To be called at the end of each page.

This function also stops this surface from being the current drawing surface with Fl_Surface_Device::pop_current().

**Note**

end_page() calls Fl_Surface_Device::pop_current(). If any calls between begin_page() and end_page() open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to Fl_Surface_Device::pop_current() and a call to Fl_Surface_Device::push_current().

---

*Generated by Doxygen*
Returns
0 if OK, non-zero if any error.

Reimplemented in Fl_PostScript_File_Device, and Fl_Printer.

### 34.97.3.5 margins()

```cpp
def margins (int ∗left, int ∗top, int ∗right, int ∗bottom) [virtual]
```

Computes the dimensions of margins that lie between the printable page area and the full page.
Values are in the same unit as that used by FLTK drawing functions. They are changed by scale() calls.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>out left</td>
<td>If non-null, ∗left is set to the left margin size.</td>
</tr>
<tr>
<td>out top</td>
<td>If non-null, ∗top is set to the top margin size.</td>
</tr>
<tr>
<td>out right</td>
<td>If non-null, ∗right is set to the right margin size.</td>
</tr>
<tr>
<td>out bottom</td>
<td>If non-null, ∗bottom is set to the bottom margin size.</td>
</tr>
</tbody>
</table>

Reimplemented in Fl_PostScript_File_Device, and Fl_Printer.

### 34.97.3.6 rotate()

```cpp
def rotate (float angle) [virtual]
```

Rotates the graphics operations relatively to paper.
The rotation is centered on the current graphics origin. Successive rotate() calls don’t combine their effects.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle</td>
<td>Rotation angle in counter-clockwise degrees.</td>
</tr>
</tbody>
</table>

Reimplemented in Fl_PostScript_File_Device, and Fl_Printer.

### 34.97.3.7 scale()

```cpp
def scale (float scale_x, float scale_y = 0. ) [virtual]
```

Changes the scaling of page coordinates.
This function also resets the origin of graphics functions at top left of printable page area. After a scale() call, do a printable_rect() call to get the new dimensions of the printable page area. Successive scale() calls don’t combine their effects.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>scale_x</td>
<td>Horizontal dimensions of plot are multiplied by this quantity.</td>
</tr>
<tr>
<td>scale_y</td>
<td>Same as above, vertically. The value 0. is equivalent to setting scale_y = scale_x. Thus, scale(factor); is equivalent to scale(factor, factor);</td>
</tr>
</tbody>
</table>
Reimplemented in Fl_PostScript_File_Device, and Fl_Printer.

34.97.3.8 start_job()

int Fl_Paged_Device::start_job (  
    int pagecount = 0,  
    int * frompage = NULL,  
    int * topage = NULL,  
    char ** perr_message = NULL ) [inline]

Synonym of begin_job(int pagecount, int *frompage, int *topage, char **perr_message).
For API compatibility with FLTK 1.3.x

34.97.3.9 start_page()

int Fl_Paged_Device::start_page ( ) [inline]

Synonym of begin_page().
For API compatibility with FLTK 1.3.x

The documentation for this class was generated from the following files:

- Fl_Paged_Device.H
- Fl_Paged_Device.cxx

34.98 Fl_Pixmap Class Reference

The Fl_Pixmap class supports caching and drawing of colormap ( pixmap) images, including transparency.

#include <Fl_Pixmap.H>

Inheritance diagram for Fl_Pixmap:

```
Fl_Pixmap
  Fl_Image
    Fl_GIF_Image  Fl_XPM_Image
        Fl_Anim_GIF_Image
```

Public Member Functions

- int cache_h ()
- int cache_w ()
- void color_average (FL_Color c, float i) FL_OVERRIDE
  
  The color_average() method averages the colors in the image with the provided FLTK color value.
- Fl_Image * copy () const
- Fl_Image * copy (int W, int H) const FL_OVERRIDE
  
  Creates a resized copy of the image.
- void desaturate () FL_OVERRIDE
  
  The desaturate() method converts an image to grayscale.
- void draw (int X, int Y)
- void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE
  
  Draws the image to the current drawing surface with a bounding box.
- Fl_Pixmap (char *const *D)
  
  The constructors create a new pixmap from the specified XPM data.
• **FL_Pixmap** (const char ∗ const ∗D)  
  The constructors create a new pixmap from the specified XPM data.
• **FL_Pixmap** (const uchar ∗ const ∗D)  
  The constructors create a new pixmap from the specified XPM data.
• **FL_Pixmap** (uchar ∗ const ∗D)  
  The constructors create a new pixmap from the specified XPM data.
• **void label** (Fl_Menu_Item *m) FL_OVERRIDE  
  This method is an obsolete way to set the image attribute of a menu item.
• **void label** (Fl_Widget *w) FL_OVERRIDE  
  This method is an obsolete way to set the image attribute of a widget or menu item.
• **void uncache** () FL_OVERRIDE  
  If the image has been cached for display, delete the cache data.
• **virtual ~FL_Pixmap** ()  
  The destructor frees all memory and server resources that are used by the pixmap.

Public Attributes

• int alloc_data

Protected Member Functions

• void measure ()

Friends

• class Fl_Graphics_Driver

Additional Inherited Members

34.98.1 Detailed Description

The Fl_Pixmap class supports caching and drawing of colormap ( pixmap) images, including transparency.

34.98.2 Constructor & Destructor Documentation

34.98.2.1 FL_Pixmap() [1/4]

FL_Pixmap::FL_Pixmap (  
    char ∗ const ∗D ) [inline], [explicit]  
The constructors create a new pixmap from the specified XPM data.

34.98.2.2 FL_Pixmap() [2/4]

FL_Pixmap::FL_Pixmap (  
    uchar ∗ const ∗D ) [inline], [explicit]  
The constructors create a new pixmap from the specified XPM data.
34.98.2.3  Fl_Pixmap() [3/4]

Fl_Pixmap::Fl_Pixmap (  
    const char *const * D ) [inline], [explicit]  
The constructors create a new pixmap from the specified XPM data.

34.98.2.4  Fl_Pixmap() [4/4]

Fl_Pixmap::Fl_Pixmap (  
    const uchar *const * D ) [inline], [explicit]  
The constructors create a new pixmap from the specified XPM data.

34.98.3  Member Function Documentation

34.98.3.1  color_average()

void Fl_Pixmap::color_average (  
    Fl_Color c,  
    float i ) [virtual]  
The color_average() method averages the colors in the image with the provided FLTK color value.  
The first argument specifies the FLTK color to be used.  
The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.  
An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.  
Reimplemented from Fl_Image.

34.98.3.2  copy()

Fl_Image * Fl_Pixmap::copy (  
    int W,  
    int H ) const [virtual]  
Creates a resized copy of the image.  
The new image should be released when you are done with it.  
Note: since FLTK 1.4.0 you can use Fl_Image::release() for all types of images (i.e. all subclasses of Fl_Image) instead of operator delete for Fl_Image's and Fl_Image::release() for Fl_Shared_Image's.  
The new image data will be converted to the requested size. RGB images are resized using the algorithm set by Fl_Image::RGB_scaling().  
For the new image the following equations are true:  

- \( w() = data_w() = W \)  
- \( h() = data_h() = H \)

Parameters

| in W/H | Requested width and height of the new image |

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Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of Fl_RGB_Imag e, Fl_SVG_Imag e, Fl_Pixmap, Fl_Bitmap, Fl_Tiled_Imag e, Fl_Anim_GIF_Imag e and Fl_Shared_Imag e. Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an Fl_GIF_Imag e is an object of class Fl_Pixmap.

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from Fl_I mage or any subclass your overridden methods of 'Fl_I mage::copy() const' and 'Fl_I mage::copy(int, int) const' must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from Fl_I mage.

34.98.3.3 desaturate()

void Fl_Pixmap::desaturate ( ) [virtual]
The desaturate() method converts an image to grayscale. If the image contains an alpha channel (depth = 4), the alpha channel is preserved. An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
Reimplemented from Fl_I mage.

34.98.3.4 draw()

void Fl_Pixmap::draw ( int X, int Y, int W, int H, int cx = 0, int cy = 0 ) [virtual]
Draws the image to the current drawing surface with a bounding box. Arguments X,Y,W,H specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the cx and cy arguments. In other words: fl_push_clip(X,Y,W,H) is applied, the image is drawn with its upper-left corner at X-cx,Y-cy and its own width and height, fl_pop_clip() is applied.
Reimplemented from Fl_I mage.

34.98.3.5 label() [1/2]

void Fl_Pixmap::label ( Fl_Menu_Item * m ) [virtual]
This method is an obsolete way to set the image attribute of a menu item.
Deprecated Please use Fl_Menu_Item::image() instead.
Reimplemented from Fl_I mage.

34.98.3.6 label() [2/2]

void Fl_Pixmap::label ( Fl_Widget * widget ) [virtual]
This method is an obsolete way to set the image attribute of a widget or menu item.
Deprecated Please use Fl_Widget::image() or Fl_Widget::deimage() instead.
Reimplemented from Fl_I mage.
34.98.3.7 `uncache()`

```cpp
void Fl_Pixmap::uncache ( ) [virtual]
```
If the image has been cached for display, delete the cache data.
This allows you to change the data used for the image and then redraw it without recreating an image object.
Reimplemented from `Fl_Image`.
The documentation for this class was generated from the following files:
- `Fl_Pixmap.H`
- `Fl_Pixmap.cxx`

34.99 `Fl_Plugin` Class Reference

`Fl_Plugin` allows link-time and run-time integration of binary modules.

```cpp
#include <Fl_Plugin.H>
```

Inheritance diagram for `Fl_Plugin`:
```
Fl_Plugin
|   |
|___| Fl_Device_Plugin
```

**Public Member Functions**

- `Fl_Plugin (const char *klass, const char *name)`
  - Create a plugin.
- `virtual ∼Fl_Plugin ()`
  - Clear the plugin and remove it from the database.

34.99.1 Detailed Description

`Fl_Plugin` allows link-time and run-time integration of binary modules. `Fl_Plugin` and `Fl_Plugin_Manager` provide a small and simple solution for linking C++ classes at run-time, or optionally linking modules at compile time without the need to change the main application. `Fl_Plugin_Manager` uses static initialization to create the plugin interface early during startup. Plugins are stored in a temporary database, organized in classes.

Plugins should derive a new class from `Fl_Plugin` as a base:
```cpp
class My_Plugin : public Fl_Plugin {
  public:
    My_Plugin() : Fl_Plugin("effects", "blur") { }
    void do_something(...);
  }
  My_Plugin blur_plugin();
```

Plugins can be put into modules and either linked before distribution, or loaded from dynamically linkable files. An `Fl_Plugin_Manager` is used to list and access all currently loaded plugins.
```cpp
Fl_Plugin_Manager mgr("effects");
int i, n = mgr.plugins();
for (i=0; i<n; i++) {
  My_Plugin *pin = (My_Plugin*)mgr.plugin(i);
  pin->do_something();
}
```

34.99.2 Constructor & Destructor Documentation

34.99.2.1 `Fl_Plugin()`

```cpp
Fl_Plugin::Fl_Plugin ( 
    const char * klass, 
    const char * name )
```
Create a plugin.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>klass</th>
<th>plugins are grouped in classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>name</td>
<td>every plugin should have a unique name</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Plugin.H
- Fl_Preferences.cxx

### 34.100 Fl_Plugin_Manager Class Reference

**Fl_Plugin_Manager** manages link-time and run-time plugin binaries.

```cpp
#include <Fl_Plugin.H>
```

Inheritance diagram for **Fl_Plugin_Manager**:

- Fl_Preferences
- Fl_Plugin_Manager

#### Public Member Functions

- `Fl_Preferences::ID addPlugin (const char *name, Fl_Plugin *plugin)`
  - This function adds a new plugin to the database.
- `Fl_Plugin_Manager (const char *klass)`
  - Manage all plugins belonging to one class.
- `Fl_Plugin * plugin (const char *name)`
  - Return the address of a plugin by name.
- `Fl_Plugin * plugin (int index)`
  - Return the address of a plugin by index.
- `int plugins ()`
  - Return the number of plugins in the klass.
- `~Fl_Plugin_Manager ()`
  - Remove the plugin manager.

#### Static Public Member Functions

- `static int load (const char *filename)`
  - Load a module from disk.
- `static int loadAll (const char *filepath, const char *pattern=0)`
  - Use this function to load a whole directory full of modules.
- `static void removePlugin (Fl_Preferences::ID id)`
  - Remove any plugin.

#### Additional Inherited Members

### 34.100.1 Detailed Description

**Fl_Plugin_Manager** manages link-time and run-time plugin binaries.
34.100.2 Constructor & Destructor Documentation

34.100.2.1 ∼Fl_Plugin_Manager()

Fl_Plugin_Manager::∼Fl_Plugin_Manager ( )
Remove the plugin manager.
Calling this does not remove the database itself or any plugins. It just removes the reference to the database.

34.100.3 Member Function Documentation

34.100.3.1 addPlugin()

Fl_Preferences::ID Fl_Plugin_Manager::addPlugin ( const char ∗ name, Fl_Plugin ∗ plugin )
This function adds a new plugin to the database.
There is no need to call this function explicitly. Every Fl_Plugin constructor will call this function at initialization time.

34.100.3.2 load()

int Fl_Plugin_Manager::load ( const char ∗ filename ) [static]
Load a module from disk.
A module must be a dynamically linkable file for the given operating system. When loading a module, its +init function will be called which in turn calls the constructor of all statically initialized Fl_Plugin classes and adds them to the database.

34.100.3.3 removePlugin()

void Fl_Plugin_Manager::removePlugin ( Fl_Preferences::ID id ) [static]
Remove any plugin.
There is no need to call this function explicitly. Every Fl_Plugin destructor will call this function at destruction time.
The documentation for this class was generated from the following files:

- Fl_Plugin.H
- Fl_Preferences.cpp

34.101 Fl_PNG_Image Class Reference

The Fl_PNG_Image class supports loading, caching, and drawing of Portable Network Graphics (PNG) image files.
#include <Fl_PNG_Image.H>
Inheritance diagram for Fl_PNG_Image:
Public Member Functions

- `Fl_PNG_Image` (const char *filename)
  
  The constructor loads the named PNG image from the given png filename.

- `Fl_PNG_Image` (const char *name_png, const unsigned char *buffer, int datasize)

  Constructor that reads a PNG image from memory.

Friends

- class `Fl_ICO_Image`

Additional Inherited Members

34.101.1 Detailed Description

The `Fl_PNG_Image` class supports loading, caching, and drawing of Portable Network Graphics (PNG) image files. The class loads color-mapped and full-color images and handles color- and alpha-based transparency.

34.101.2 Constructor & Destructor Documentation

34.101.2.1 `Fl_PNG_Image()` [1/2]

```
Fl_PNG_Image::Fl_PNG_Image (const char *filename )
```

The constructor loads the named PNG image from the given png filename. The destructor frees all memory and server resources that are used by the image. Use `Fl_PNG_Image::fail()` to check if `Fl_PNG_Image` failed to load. `fail()` returns ERR_FILE_ACCESS if the file could not be opened or read, ERR_FORMAT if the PNG format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason.

Parameters

- `in filename` Name of PNG file to read

34.101.2.2 `Fl_PNG_Image()` [2/2]

```
Fl_PNG_Image::Fl_PNG_Image (const char *name_png, const unsigned char *buffer, int maxsize )
```

Constructor that reads a PNG image from memory. Construct an image from a block of memory inside the application. Fluid offers “binary Data” chunks as a great way to add image data into the C++ source code. name_png can be NULL. If a name is given, the image is added to the list of shared images (see: `Fl_Shared_Image`) and will be available by that name.
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name_png</td>
<td>A name given to this image or NULL</td>
</tr>
<tr>
<td>buffer</td>
<td>Pointer to the start of the PNG image in memory</td>
</tr>
<tr>
<td>maxsize</td>
<td>Size in bytes of the memory buffer containing the PNG image</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_PNG_Image.H
- Fl_PNG_Image.cxx

### 34.102 Fl_PNM_Image Class Reference

The Fl_PNM_Image class supports loading, caching, and drawing of Portable Anymap (PNM, PBM, PGM, PPM) image files.

```cpp
#include <Fl_PNM_Image.H>
```

Inheritance diagram for Fl_PNM_Image:

```
Fl_PNM_Image
|-- Fl_RGB_Image
|-- Fl_Image
```

#### Public Member Functions

- `Fl_PNM_Image (const char * filename)`
  
  The constructor loads the named PNM image.

#### Additional Inherited Members

#### 34.102.1 Detailed Description

The Fl_PNM_Image class supports loading, caching, and drawing of Portable Anymap (PNM, PBM, PGM, PPM) image files.

The class loads bitmap, grayscale, and full-color images in both ASCII and binary formats.

#### 34.102.2 Constructor & Destructor Documentation

#### 34.102.2.1 Fl_PNM_Image()

```cpp
Fl_PNM_Image::Fl_PNM_Image (const char * filename )
```

The constructor loads the named PNM image.

The destructor frees all memory and server resources that are used by the image.

Use Fl_Image::fail() to check if Fl_PNM_Image failed to load. fail() returns ERR_FILE_ACCESS if the file could not be opened or read, ERR_FORMAT if the PNM format could not be decoded, and ERR_NO_IMAGE if the image could not be loaded for another reason.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in filename</td>
<td>a full path and name pointing to a valid jpeg file</td>
</tr>
</tbody>
</table>
The documentation for this class was generated from the following files:

- Fl_PNM_Image.H
- Fl_PNM_Image.cxx

## 34.103 Fl_Positioner Class Reference

This class is provided for Forms compatibility.

```cpp
#include <Fl_Positioner.H>
```

Inheritance diagram for Fl_Positioner:

```
Fl_Widget

Fl_Positioner
```

### Public Member Functions

- **Fl_Positioner (int x, int y, int w, int h, const char *l=0)**
  
  Creates a new Fl_Positioner widget using the given position, size, and label string.

- **int handle (int) FL_OVERRIDE**
  
  Handles the specified event.

- **int value (double, double)**
  
  Returns the current position in x and y.

- **void xbounds (double, double)**
  
  Sets the X axis bounds.

- **double xmaximum () const**
  
  Gets the X axis maximum.

- **void xmaximum (double a)**
  
  Same as xbounds(xminimum(), a)

- **double xminimum () const**
  
  Gets the X axis minimum.

- **void xminimum (double a)**
  
  Same as xbounds(a, xmaximum())

- **void xstep (double a)**
  
  Sets the stepping value for the X axis.

- **double xvalue () const**
  
  Gets the X axis coordinate.

- **int xvalue (double)**
  
  Sets the X axis coordinate.

- **void ybounds (double, double)**
  
  Sets the Y axis bounds.

- **double ymaximum () const**
  
  Gets the Y axis maximum.

- **void ymaximum (double a)**
  
  Same as ybounds(yminimum(), a)

- **double yminimum () const**
  
  Gets the Y axis minimum.

- **void yminimum (double a)**
  
  Same as ybounds(a, ymaximum())

- **void ystep (double a)**
Sets the stepping value for the Y axis.

- double **yvalue** () const

  Gets the Y axis coordinate.

- int **yvalue** (double)

  Sets the Y axis coordinate.

### Protected Member Functions

- void **draw** () FL_OVERRIDE

  Draws the widget.

- void **draw** (int, int, int, int)

- int **handle** (int, int, int, int)

### Additional Inherited Members

#### 34.103.1 Detailed Description

This class is provided for Forms compatibility. It provides 2D input. It would be useful if this could be put atop another widget so that the crosshairs are on top, but this is not implemented. The color of the crosshairs is **selection_color**().

![Figure 34.35 Fl_Positioner](image)

#### 34.103.2 Constructor & Destructor Documentation

##### 34.103.2.1 Fl_Positioner()

```cpp
Fl_Positioner::Fl_Positioner (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )
```

Creates a new Fl_Positioner widget using the given position, size, and label string. The default boxtype is FL_NO_BOX.

#### 34.103.3 Member Function Documentation

##### 34.103.3.1 draw()

```cpp
void Fl_Positioner::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call **redraw**() instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method **from within your own draw() method**, e.g. for an embedded scrollbar, you can do it (because **draw()** is virtual) like this:

---

*Generated by Doxygen*
34.103.3.2 handle()

```c
int Fl_Positioner::handle (  
  int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in event | the kind of event received |

Return values

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

See also

- Fl_Event

Reimplemented from Fl_Widget.

The documentation for this class was generated from the following files:

- Fl_Positioner.H
- Fl_Positioner.cxx

34.104 Fl_PostScript_File_Device Class Reference

To send graphical output to a PostScript file.

```c
#include <Fl_PostScript.H>
```

Inheritance diagram for Fl_PostScript_File_Device:

```
Fl_Surface_Device
  Fl_Widget_Surface
    Fl_Paged_Device
      Fl_PostScript_File_Device
```

Generated by Doxygen
Public Member Functions

- **int begin_job (FILE *ps_output, int pagecount=0, enum Fl_Paged_Device::Page_Format format=Fl_Paged_Device::A4, enum Fl_Paged_Device::Page_Layout layout=Fl_Paged_Device::PORTRAIT)**
  
  Begins the session where all graphics requests will go to FILE pointer.

- **int begin_job (int pagecount, int *from, int *to, char **perr_message) FL_OVERRIDE**
  
  Don't use with this class.

- **int begin_job (int pagecount=0, enum Fl_Paged_Device::Page_Format format=Fl_Paged_Device::A4, enum Fl_Paged_Device::Page_Layout layout=Fl_Paged_Device::PORTRAIT)**
  
  Begins the session where all graphics requests will go to a local PostScript file.

- **int begin_page (void) FL_OVERRIDE**
  
  Begins a new printed page.

- **void close_command (Fl_PostScript_Close_Command cmd)**

  Sets the function end_job() calls to close the file()

- **void end_current () FL_OVERRIDE**

  FLTK calls this each time a surface ceases to be the current drawing surface.

- **void end_job (void) FL_OVERRIDE**

  Completes all PostScript output.

- **int end_page (void) FL_OVERRIDE**

  To be called at the end of each page.

- **FILE * file ()**

  Returns the underlying FILE* receiving all PostScript data.

- **Fl_PostScript_File_Device ()**

  The constructor.

- **void margins (int *left, int *top, int *right, int *bottom) FL_OVERRIDE**

  Computes the dimensions of margins that lie between the printable page area and the full page.

- **void origin (int *x, int *y) FL_OVERRIDE**

  Computes the coordinates of the current origin of graphics functions.

- **void origin (int x, int y) FL_OVERRIDE**

  Sets the position of the origin of graphics in the drawable part of the drawing surface.

- **int printable_rect (int *w, int *h) FL_OVERRIDE**

  Computes the width and height of the drawable area of the drawing surface.

- **void rotate (float angle) FL_OVERRIDE**

  Rotates the graphics operations relatively to paper.

- **void scale (float scale_x, float scale_y=0.) FL_OVERRIDE**

  Changes the scaling of page coordinates.

- **void set_current () FL_OVERRIDE**

  Make this surface the current drawing surface.

- **int start_job (FILE *ps_output, int pagecount=0, enum Fl_Paged_Device::Page_Format format=Fl_Paged_Device::A4, enum Fl_Paged_Device::Page_Layout layout=Fl_Paged_Device::PORTRAIT)**

  Synonym of begin_job().

- **int start_job (int pagecount=0, enum Fl_Paged_Device::Page_Format format=Fl_Paged_Device::A4, enum Fl_Paged_Device::Page_Layout layout=Fl_Paged_Device::PORTRAIT)**

  Synonym of begin_job().

- **void translate (int x, int y) FL_OVERRIDE**

  Translates the current graphics origin accounting for the current rotation.

- **void untranslate (void) FL_OVERRIDE**

  Undoes the effect of a previous translate() call.

- **~Fl_PostScript_File_Device ()**

  The destructor.
Static Public Attributes

- static const char ∗ file_chooser_title
  
  Label of the PostScript file chooser window.

Protected Member Functions

- Fl_PostScript_Graphics_Driver ∗ driver()
  
  Returns the PostScript driver of this drawing surface.

Additional Inherited Members

34.104.1 Detailed Description

To send graphical output to a PostScript file.

This class is used exactly as the Fl_Printer class except for the begin_job() call, two variants of which are usable and allow to specify what page format and layout are desired.

Processing of text: Text uses vectorial fonts under the X11 + Pango and the Wayland platforms. With other platforms, only text restricted to the Latin alphabet (and a few other characters listed in the table below) and to FLTK standard fonts is vectorized. All other unicode characters or all other fonts (FL_FREE_FONT and above) are output as a bitmap. FLTK standard fonts are output using the corresponding PostScript standard fonts. The latin alphabet means all unicode characters between U+0020 and U+017F, or, in other words, the ASCII, Latin-1 Supplement and Latin Extended-A charts.

<table>
<thead>
<tr>
<th>Char</th>
<th>Codepoint</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>U+0192</td>
<td>florin</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02C6</td>
<td>circumflex</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02C7</td>
<td>caron</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02D8</td>
<td>breve</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02D9</td>
<td>dotaccent</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02DA</td>
<td>ring</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02DB</td>
<td>ogonek</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+02DD</td>
<td>hungarumlaut</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+2013</td>
<td>endash</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+2014</td>
<td>emdash</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+2018</td>
<td>quotleft</td>
</tr>
<tr>
<td>&quot;</td>
<td>U+2019</td>
<td>quotright</td>
</tr>
</tbody>
</table>

Processing of transparent Fl_RGB_Image objects: Under the X11 + Pango and the Wayland platforms, these objects are output with their exact transparency. With other platforms, these objects are drawn blended to white color. Class Fl_EPS_File_Surface ‘s constructor allows to set another background color for blending.

34.104.2 Member Function Documentation

34.104.2.1 begin_job() [1/3]

int Fl_PostScript_File_Device::begin_job (FILE * ps_output,
```cpp
int pagecount = 0,
enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT
```

Begins the session where all graphics requests will go to FILE pointer.
This member function prevents `end_job()` from closing `ps_output`, so the user can check with `ferror(ps_output)` for output errors.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ps_output</code></td>
<td>A writable FILE pointer that will receive PostScript output and that should not be closed until after <code>end_job()</code> has been called.</td>
</tr>
<tr>
<td><code>pagecount</code></td>
<td>The total number of pages to be created. Use 0 if this number is unknown when this function is called.</td>
</tr>
<tr>
<td><code>format</code></td>
<td>Desired page format.</td>
</tr>
<tr>
<td><code>layout</code></td>
<td>Desired page layout.</td>
</tr>
</tbody>
</table>

### Returns

Always 0.

### 34.104.2.2 `begin_job()` [2/3]

```cpp
int Fl_PostScript_File_Device::begin_job (  
    int pagecount,
    int * from,
    int * to,
    char ** perr_message ) [virtual]
```

Don't use with this class.
Reimplemented from `Fl_Paged_Device`.

### 34.104.2.3 `begin_job()` [3/3]

```cpp
int Fl_PostScript_File_Device::begin_job (  
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT
```

Begins the session where all graphics requests will go to a local PostScript file.
Opens a file dialog to select an output PostScript file. This member function makes `end_job()` close the resulting PostScript file and display an alert message with `fl_alert()` in case of any output error.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>pagecount</code></td>
<td>The total number of pages to be created. Use 0 if this number is unknown when this function is called.</td>
</tr>
<tr>
<td><code>format</code></td>
<td>Desired page format.</td>
</tr>
<tr>
<td><code>layout</code></td>
<td>Desired page layout.</td>
</tr>
</tbody>
</table>

### Returns

0 if OK, 1 if user cancelled the file dialog, 2 if fopen failed on user-selected output file.

### 34.104.2.4 `begin_page()`

```cpp
int Fl_PostScript_File_Device::begin_page (  
```
void ) [virtual]
Begins a new printed page.
The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area. This function also makes this surface the current drawing surface with Fl_Surface_Device::push_current().

Note

begin_page() calls Fl_Surface_Device::push_current() and leaves this device as the active surface. If any calls between begin_page() and end_page() open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to Fl_Surface_Device::pop_current() and a call to Fl_Surface_Device::push_current(), or the content of the dialog box will be rendered to the printer instead of the screen.

Returns

0 if OK, non-zero if any error
Reimplemented from Fl_Paged_Device.

34.104.2.5 end_current()

void Fl_PostScript_File_Device::end_current ( ) [virtual]
FLTK calls this each time a surface ceases to be the current drawing surface.
This member function is mostly of interest to developers of new Fl_Surface_Device derived classes. It allows to perform surface-specific operations necessary when this surface ceases to be current. Each implementation should end with a call to Fl_Surface_Device::end_current().
Reimplemented from Fl_Surface_Device.

34.104.2.6 end_job()

void Fl_PostScript_File_Device::end_job { 
void ) [virtual]
Completes all PostScript output.
This also closes with fclose() the underlying file() unless close_command() was used to set another function.
Reimplemented from Fl_Paged_Device.

34.104.2.7 end_page()

int Fl_PostScript_File_Device::end_page { 
void ) [virtual]
To be called at the end of each page.
This function also stops this surface from being the current drawing surface with Fl_Surface_Device::pop_current().

Note

end_page() calls Fl_Surface_Device::pop_current(). If any calls between begin_page() and end_page() open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to Fl_Surface_Device::pop_current() and a call to Fl_Surface_Device::push_current().

Returns

0 if OK, non-zero if any error.
Reimplemented from Fl_Paged_Device.
34.104.2.8  margins()

```c
void Fl_PostScript_File_Device::margins (  
    int * left,  
    int * top,  
    int * right,  
    int * bottom ) [virtual]
```

Computes the dimensions of margins that lie between the printable page area and the full page. Values are in the same unit as that used by FLTK drawing functions. They are changed by `scale()` calls.

**Parameters**

<table>
<thead>
<tr>
<th>out</th>
<th>left</th>
<th>If non-null, *left is set to the left margin size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>top</td>
<td>If non-null, *top is set to the top margin size.</td>
</tr>
<tr>
<td>out</td>
<td>right</td>
<td>If non-null, *right is set to the right margin size.</td>
</tr>
<tr>
<td>out</td>
<td>bottom</td>
<td>If non-null, *bottom is set to the bottom margin size.</td>
</tr>
</tbody>
</table>

Reimplemented from `Fl_Paged_Device`.

34.104.2.9  origin()[1/2]

```c
void Fl_PostScript_File_Device::origin (  
    int * x,  
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

**Parameters**

| out | x,y  | If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin. |

Reimplemented from `Fl_Widget_Surface`.

34.104.2.10  origin()[2/2]

```c
void Fl_PostScript_File_Device::origin (  
    int x,  
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface. Arguments should be expressed relatively to the result of a previous `printable_rect()` call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive `origin()` calls don’t combine their effects. Origin() calls are not affected by `rotate()` calls (for classes derived from `Fl_Paged_Device`).

**Parameters**

| in | x,y  | Horizontal and vertical positions in the drawing surface of the desired origin of graphics. |

Reimplemented from `Fl_Widget_Surface`.

34.104.2.11  printable_rect()

```c
int Fl_PostScript_File_Device::printable_rect (  
    int * w,  
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.
Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to `origin()`. If the object is derived from class `Fl_Paged_Device`, values account for the user-selected paper type and print orientation and are changed by `scale()` calls.

Returns

0 if OK, non-zero if any error

Reimplemented from `Fl_Widget_Surface`.

### rotate()

```cpp
define void Fl_PostScript_File_Device::rotate ( float angle ) [virtual]
```

Rotates the graphics operations relatively to paper.
The rotation is centered on the current graphics origin. Successive `rotate()` calls don't combine their effects.

**Parameters**

| angle | Rotation angle in counter-clockwise degrees |

Reimplemented from `Fl_Paged_Device`.

### scale()

```cpp
define void Fl_PostScript_File_Device::scale ( float scale_x, float scale_y = 0. ) [virtual]
```

Changes the scaling of page coordinates.
This function also resets the origin of graphics functions at top left of printable page area. After a `scale()` call, do a `printable_rect()` call to get the new dimensions of the printable page area. Successive `scale()` calls don't combine their effects.

**Parameters**

| scale_x | Horizontal dimensions of plot are multiplied by this quantity. |
| scale_y | Same as above, vertically. The value 0. is equivalent to setting `scale_y = scale_x`. Thus, `scale(factor);` is equivalent to `scale(factor, factor);` |

Reimplemented from `Fl_Paged_Device`.

### set_current()

```cpp
define void Fl_PostScript_File_Device::set_current ( void ) [virtual]
```

Make this surface the current drawing surface.
This surface will receive all future graphics requests. Starting from FLTK 1.4.0, the preferred API to change the current drawing surface is `Fl_Surface_Device::push_current()` / `Fl_Surface_Device::pop_current()`.

**Note**

It's recommended to use this function only as follows:

- The current drawing surface is the display;
- make current another surface, e.g., an `Fl_Printer` or an `Fl_Image_Surface` object, calling `set_current()` on this object;
• draw to that surface;
• make the display current again with `Fl_Display_Device::display_device() -> set_current()`: Don’t do any other call to `set_current()` before this one.

Other scenarios of drawing surface changes should be performed via `Fl_Surface_Device::push_current()` / `Fl_Surface_Device::pop_current()`.

Reimplemented from `Fl_Surface_Device`.

### 34.104.2.15 `start_job()` [1/2]

```c
int Fl_PostScript_File_Device::start_job (  
    FILE * ps_output,
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT ) [inline]
```

Synonym of `begin_job()`.
For API compatibility with FLTK 1.3.x

### 34.104.2.16 `start_job()` [2/2]

```c
int Fl_PostScript_File_Device::start_job (  
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT ) [inline]
```

Synonym of `begin_job()`.
For API compatibility with FLTK 1.3.x

### 34.104.2.17 `translate()`

```c
void Fl_PostScript_File_Device::translate (  
    int x,
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation.
Each `translate()` call must be matched by an `untranslate()` call. Successive `translate()` calls add up their effects.
Reimplemented from `Fl_Widget_Surface`.

### 34.104.2.18 `untranslate()`

```c
void Fl_PostScript_File_Device::untranslate (  
    void ) [virtual]
```

Undoes the effect of a previous `translate()` call.
Reimplemented from `Fl_Widget_Surface`.

The documentation for this class was generated from the following file:

• `Fl_PostScript.H`

### 34.105 `Fl_Preferences` Class Reference

`Fl_Preferences` store user settings between application starts.

```c
#include <Fl_Preferences.H>
```

Inheritance diagram for `Fl_Preferences`:
Classes

- struct Entry
- class Name
  "Name" provides a simple method to create numerical or more complex procedural names for entries and groups on the fly.
- class Node
- class RootNode

Public Types

- typedef void * ID
  Every Fl_Preferences-Group has a unique ID.
- enum Root {
    UNKNOWN_ROOT_TYPE = -1 , SYSTEM = 0 , USER , MEMORY ,
    ROOT_MASK = 0x00FF , CORE = 0x0100 , C_LOCALE = 0x1000 , CLEAR = 0x2000 ,
    SYSTEM_L = SYSTEM | C_LOCALE , USER_L = USER | C_LOCALE , CORE_SYSTEM_L = CORE |
    SYSTEM_L , CORE_USER_L = CORE | USER_L ,
    CORE_SYSTEM = CORE | SYSTEM , CORE_USER = CORE | USER 
  }
  Define the scope of the preferences.

Public Member Functions

- char clear ()
  Delete all groups and all entries.
- char delete_all_entries ()
  Delete all entries.
- char delete_all_groups ()
  Delete all groups.
- char delete_entry (const char * entry)
  Deletes a single name/value pair.
- char delete_group (const char * group)
  Deletes a group.
- int dirty ()
  Check if there were changes to the database that need to be written to disk.
- int entries ()
  Returns the number of entries (name/value pairs) in a group.
- const char * entry (int index)
  Returns the name of an entry.
- char entry_exists (const char *key)
  Returns non-zero if an entry with this name exists.
- Root filename (char *buffer, size_t buffer_size)
  Return the file name and path to the preference file.
- Fl_Preferences (const char *path, const char *vendor, const char *application)
  Deprecated: Use this constructor to create or read a preference file at an arbitrary position in the file system.
- Fl_Preferences (const char *path, const char *vendor, const char *application, Root flags)
  Use this constructor to create or read a preference file at an arbitrary position in the file system.
- **Fl_Preferences** (const Fl_Preferences &)
  Create another reference to a Preferences group.
- **Fl_Preferences** (Fl_Preferences &parent, const char *group)
  Generate or read a new group of entries within another group.
- **Fl_Preferences** (Fl_Preferences &parent, int groupIndex)
  Open a child group using a given index.
- **Fl_Preferences** (Fl_Preferences &parent, const char *group)
  Create or access a group of preferences using a name.
- **Fl_Preferences** (Fl_Preferences &parent, const char *group)
  Create a new dataset access point using a dataset ID.
- **Fl_Preferences** (Root root, const char *vendor, const char *application)
  The constructor creates a group that manages key/value pairs and child groups.
- int **flush** ()
  Writes preferences to disk if they were modified.
- char **get** (const char *entry, char *&value, const char *defaultValue)
  Reads an entry from the group.
- char **get** (const char *entry, char *value, const char *defaultValue, int maxSize)
  Reads an entry from the group.
- char **get** (const char *entry, double &value, double defaultValue)
  Reads an entry from the group.
- char **get** (const char *entry, float &value, float defaultValue)
  Reads an entry from the group.
- char **get** (const char *entry, int &value, int defaultValue)
  Reads an entry from the group.
- char **get** (const char *entry, void *&value, const void *defaultValue, int defaultSize)
  Reads an entry from the group.
- char **get** (const char *entry, void *value, const void *defaultValue, int defaultSize, int *size)
  Reads a binary entry from the group, encoded in hexadecimal blocks.
- char **get** (const char *entry, void *value, const void *defaultValue, int defaultSize, int maxSize)
  Reads a binary entry from the group, encoded in hexadecimal blocks.
- char **get_userdata_path** (char *path, int pathlen)
  Creates a path that is related to the preference file and that is usable for additional application data.
- const char * **group** (int num_group)
  Returns the name of the Nth (num_group) group.
- char **group_exists** (const char *key)
  Returns non-zero if a group with this name exists.
- int **groups** ()
  Returns the number of groups that are contained within a group.
- **ID** id ()
  Return an ID that can later be reused to open more references to this dataset.
- const char * **name** ()
  Return the name of this entry.
- const char * **path** ()
  Return the full path to this entry.
- char **set** (const char *entry, const char *value)
  Sets an entry (name/value pair).
- char **set** (const char *entry, const void *value, int size)
  Sets an entry (name/value pair).
- char **set** (const char *entry, double value)
  Sets an entry (name/value pair).
• char `set` (const char ∗`entry`, double value, int precision)
  Sets an entry (name/value pair).
• char `set` (const char ∗`entry`, float value)
  Sets an entry (name/value pair).
• char `set` (const char ∗`entry`, float value, int precision)
  Sets an entry (name/value pair).
• char `set` (const char ∗`entry`, int value)
  Sets an entry (name/value pair).
• int `size` (const char ∗`entry`)
  Returns the size of the value part of an entry.
• virtual `~Fl_Preferences` ()
  The destructor removes allocated resources.

**Static Public Member Functions**

• static unsigned int `file_access` ()
  Return the current file access permissions for the FLTK preferences system.
• static void `file_access` (unsigned int flags)
  Tell the FLTK preferences system which files in the file system it may read, create, or write.
• static `Root` `filename` (char ∗`buffer`, size_t `buffer_size`, `Root` `root`, const char ∗`vendor`, const char ∗`application`)
  Determine the file name and path to preferences that would be openend with these parameters.
• static const char ∗`new_UUID` ()
  Returns a UUID as generated by the system.
• static char `remove` (ID `id_`)
  Remove the group with this ID from a database.

**Static Public Attributes**

• static const unsigned int `ALL` = `ALL_READ_OK` | `ALL_WRITE_OK`
  Set this to give FLTK and applications permission to read, write, and create preference files.
• static const unsigned int `ALL_READ_OK` = `USER_READ_OK` | `SYSTEM_READ_OK` | `CORE_READ_OK`
  Set this to allow FLTK and applications to read preference files.
• static const unsigned int `ALL_WRITE_OK` = `USER_WRITE_OK` | `SYSTEM_WRITE_OK` | `CORE_WRITE_OK`
  Set this to allow FLTK and applications to create and write preference files.
• static const unsigned int `APP_OK` = `SYSTEM_OK` | `USER_OK`
  Set this if it is OK for applications to read, create, and write any kind of preference files.
• static const unsigned int `CORE_OK` = `CORE_READ_OK` | `CORE_WRITE_OK`
  Set this if it is OK for FLTK to read, create, or write preference files.
• static const unsigned int `CORE_READ_OK` = 0x0010
  Set this if it is OK for FLTK to read preference files.
• static const unsigned int `CORE_WRITE_OK` = 0x0020
  Set this if it is OK for FLTK to create or write preference files.
• static const unsigned int `NONE` = 0x0000
  Set this if no call to `Fl_Preferences` shall access the file system.
• static const unsigned int `SYSTEM_OK` = `SYSTEM_READ_OK` | `SYSTEM_WRITE_OK`
  Set this if it is OK for applications to read, create, and write system wide preference files.
• static const unsigned int `SYSTEM_READ_OK` = 0x0004
  Set this if it is OK for applications to read system wide preference files.
• static const unsigned int `SYSTEM_WRITE_OK` = 0x0008
  Set this if it is OK for applications to create and write system wide preference files.
Set this if it is OK for applications to read, create, and write user preference files.

- static const unsigned int USER_READ_OK = 0x0001
- static const unsigned int USER_WRITE_OK = 0x0002

Protected Attributes

- Node * node
- RootNode * rootNode

Friends

- class Node
- class RootNode

34.105.1 Detailed Description

Fl_Preferences store user settings between application starts. Fl_Preferences are similar to the Registry on Windows and Preferences on MacOS, providing a simple method to store customizable user settings between app launches, for instance the previous window position or a history of previously used documents.

Preferences are organized in a hierarchy of groups. Every group can contain more groups and any number of key/value pairs. Keys can be text strings containing ASCII letters, digits, periods, and underscores. Forward slashes in a key name are treated as subgroups, i.e. the key 'window/width' would actually refer to the key 'width' inside the group 'window'.

Keys usually have a unique name within their group. Duplicate keys are possible though and can be accessed using the index based functions.

A value can be an UTF-8 string. Control characters and UTF-8 sequences are stored as octal values. Long strings are wrapped at the line ending and will be reassembled when reading the file back.

Several methods allow setting and getting numerical values and binary data.

Preferences are stored in text files that can be edited manually if needed. The file format is easy to read and relatively forgiving. Preference files are the same on all platforms. User comments in preference files are preserved. Filenames are unique for each application by using a vendor/application naming scheme. The user must provide default values for all entries to ensure proper operation should preferences be corrupted or not yet exist. FLTK preferences are not meant to replace a fully features database. No merging of data takes place. If several instances of an app access the same database at the same time, only the most recent changes will persist. Preferences should no be used to store document data. The .prefs file should be kept small for performance reasons. One application can have multiple preference files. Extensive binary data however should be stored in separate files: see Fl_Preferences::get_userdata_path().

Fl_Preferences are not thread-safe. They can temporarily change the locale on some platforms during read and write access, which also changes it temporarily in other threads of the same app.

Typically a preferences database is read at startup, and then reopened and written at app shutdown:

```c
int appWindowWidth, appWindowHeight;
void launch() {
    Fl_Preferences app(Fl_Preferences::USER_L, "matthiasm.com", "hello");
    // 'app' constructor will be called, reading data from .prefs file
    Fl_Preferences window(app, "window");
    window.get("width", appWindowWidth, 800);
    window.get("height", appWindowHeight, 600);
    // 'app' destructor will be called. This will write data to the
    // .prefs file if any preferences were changed or added
}
void quit() {
    Fl_Preferences app(Fl_Preferences::USER_L, "matthiasm.com", "hello");
    Fl_Preferences window(app, "window");
    window.set("width", appWindowWidth);
    window.set("height", appWindowHeight);
}
```

See also

Fl_Preferences::Fl_Preferences(Root root, const char *vendor, const char *application)

As a special case, Fl_Preferences can be memory mapped and not be associated with a file on disk.
See also

\texttt{Fl\_Preferences::Fl\_Preferences(Fl\_Preferences \*parent, const char \*group)} for more details on memory mapped preferences.

Note

Starting with FLTK 1.3, preference databases are expected to be in UTF-8 encoding. Previous databases were stored in the current character set or code page which renders them incompatible for text entries using international characters.

Starting with FLTK 1.4, searching a valid path to store the preference files has changed slightly. Please see \texttt{Fl\_Preferences::Fl\_Preferences(Root, const char *, const char *)} for details.

Starting with FLTK 1.4, preference files should be created with \texttt{SYSTEM\_L} or \texttt{USER\_L} to be interchangeable between computers with differing locale settings. The legacy modes, \texttt{LOCAL} and \texttt{SYSTEM}, will read and write floating point values using the decimal point of the current locale. As a result, a fp-value would be written ‘3,1415’ on a German machine, and would be read back as ‘3.0’ on a US machine because the comma would not be recognized as an alternative decimal point.

34.105.2 Member Typedef Documentation

34.105.2.1 ID

typedef void* Fl\_Preferences::ID

Every Fl\_Preferences-Group has a unique ID.

ID's can be retrieved from an Fl\_Preferences-Group and can then be used to create more Fl\_Preference references to the same data set, as long as the database remains open.

34.105.3 Member Enumeration Documentation

34.105.3.1 Root

enum Fl\_Preferences::Root

Define the scope of the preferences.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNKNOWN_ROOT_TYPE</td>
<td>Returned if storage could not be determined.</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>Preferences are used system-wide. Deprecated, see SYSTEM_L.</td>
</tr>
<tr>
<td>USER</td>
<td>Preferences apply only to the current user. Deprecated, see USER_L.</td>
</tr>
<tr>
<td>MEMORY</td>
<td>Returned if querying memory mapped preferences.</td>
</tr>
<tr>
<td>ROOT_MASK</td>
<td>Mask for the values above.</td>
</tr>
<tr>
<td>CORE</td>
<td>OR'd by FLTK to read and write core library preferences and options.</td>
</tr>
<tr>
<td>C_LOCALE</td>
<td>This flag should always be set, it makes sure that floating point.</td>
</tr>
<tr>
<td>CLEAR</td>
<td>Don't read a possibly existing database. Instead, start with an empty set of preferences. values are written correctly independently of the current locale</td>
</tr>
<tr>
<td>SYSTEM_L</td>
<td>Preferences are used system-wide, locale independent.</td>
</tr>
<tr>
<td>USER_L</td>
<td>Preferences apply only to the current user, locale independent.</td>
</tr>
<tr>
<td>CORE_SYSTEM_L</td>
<td>Same as CORE</td>
</tr>
<tr>
<td>CORE_USER_L</td>
<td>Same as CORE</td>
</tr>
<tr>
<td>CORE_SYSTEM</td>
<td>Deprecated, same as CORE</td>
</tr>
<tr>
<td>CORE_USER</td>
<td>Deprecated, same as CORE</td>
</tr>
</tbody>
</table>
34.105.4 Constructor & Destructor Documentation

34.105.4.1 Fl_Preferences() [1/8]

```c
Fl_Preferences::Fl_Preferences (Root root,
   const char * vendor,
   const char * application )
```

The constructor creates a group that manages key/value pairs and child groups. Preferences can be stored per user using the root type `Fl_Preferences::USER_L`, or stored system-wide using `Fl_Preferences::SYSTEM_L`. Groups and key/value pairs can be read and written randomly. Reading undefined values will return the default value. Writing undefined values will create all required groups and key/value pairs.

This constructor creates the base instance for all following entries and reads the database from disk into memory if it exists. The vendor argument is a unique text string identifying the development team or vendor of an application. A domain name or an EMail address (replacing the '@' with '.') are great unique names, e.g. "research.matthiasm.com" or "fluid.fltk.org". The application argument can be the working title or final name of your application. Both vendor and application must be valid UNIX path segments as they become parts of the preference file path and may contain forward slashes to create deeper file structures.

Note

On Windows, the directory is constructed by querying the Common AppData or AppData key of the Software\Microsoft\Windows\CurrentVersion\Explorer\Shell Folders registry entry. The filename and path is then constructed as $(query)/$(vendor)/$(application).prefs. If the query call fails, data will be stored in RAM only. It will be lost when the app exits.

In FLTK versions before 1.4.0, if querying the registry failed,

preferences would be written to C:\FLTK\$(vendor)\$(application).prefs.

Note

On Linux, the USER directory is constructed by reading $HOME. If $HOME is not set or not pointing to an existing directory, FLTK will check the path member of the passwd struct returned by getpwuid(getuid()). If all attempts fail, data will be stored in RAM only and be lost when the app exits.

The SYSTEM preference filename is hardcoded as /etc/fltk/$(vendor)/$(application).prefs. For backward compatibility, the old USER.prefs file naming scheme $(directory)/.fltk/$(vendor)/$(application).prefs is checked first. If that file does not exist, the environment variable $XDG_CONFIG_HOME is read as a base directory. If $XDG_CONFIG_HOME not set, the base directory defaults to $HOME/.config/. The user preferences will be stored in $(directory)/$(vendor)/$(application).prefs. The user data path will be $(directory)/$(vendor)/$(application)/.

In FLTK versions before 1.4.0, if $HOME was not set, the USER path would be empty, generating $(vendor)/$(application).prefs, which was used relative to the current working directory.

Note

On macOS, the USER directory is constructed by reading $HOME. If $HOME is not set or not pointing to an existing directory, we check the path returned by NSHomeDirectory(), and finally checking the path member of the passwd struct returned by getpwuid(getuid()). If all attempts fail, data will be stored in RAM only and be lost when the app exits. The filename and path is then constructed as $(directory)/Library/Preferences/$(vendor)/$(application).prefs. The SYSTEM directory is hardcoded as /Library/Preferences/$(vendor)/$(application).prefs. In FLTK versions before 1.4.0, if $HOME was not set, the USER path would be NULL, generating <null>/Library/Preferences/$(vendor)/$(application).prefs, which would silently fail to create a preference file.
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>root</th>
<th>can be USER_L or SYSTEM_L for user specific or system wide preferences, add the CLEAR flag to start with a clean set of preferences instead of reading them from a preexisting database</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>vendor</td>
<td>unique text describing the company or author of this file, must be a valid filepath segment</td>
</tr>
<tr>
<td>in</td>
<td>application</td>
<td>unique text describing the application, must be a valid filepath segment</td>
</tr>
</tbody>
</table>

See also

`Fl_Preferences(Fl_Preferences *parent, const char *group)` with parent set to NULL

### 34.105.4.2 `Fl_Preferences()` [2/8]

```cpp
Fl_Preferences::Fl_Preferences (const char *path, const char *vendor, const char *application, Root flags)
```

Use this constructor to create or read a preference file at an arbitrary position in the file system. The file name is generated in the form `$(path)/$(application).prefs`. If `application` is NULL, `path` is taken literally as the file path and name.

// Example: read from an existing database and write modifications when flushed
// or destructor is called
Fl_Preferences database("/user/matt/test.prefs", "org.fltk.test", NULL,
Fl_Preferences::C_LOCALE);

// Example: create a new preferences file with an empty data set
Fl_Preferences database("/user/matt/test.prefs", "org.fltk.test", NULL,
(Fl_Preferences::Root)(Fl_Preferences::C_LOCALE|Fl_Preferences::CLEAR));

Note

the C_LOCALE flag is not set by default for backward compatibility, but it is highly recommended to set it when opening a database.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>path</th>
<th>path to the directory that contains the preference file</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>vendor</td>
<td>unique text describing the company or author of this file, must be a valid file path segment</td>
</tr>
<tr>
<td>in</td>
<td>application</td>
<td>unique text describing the application, must be a valid filename or NULL</td>
</tr>
<tr>
<td>in</td>
<td>flags</td>
<td>C_LOCALE to make the preferences file independent of the current locale, add the CLEAR flag to start with a clean set of preferences instead of reading from the database</td>
</tr>
</tbody>
</table>

### 34.105.4.3 `Fl_Preferences()` [3/8]

```cpp
Fl_Preferences::Fl_Preferences (Fl_Preferences & parent, const char *group )
```

Generate or read a new group of entries within another group. Use the `group` argument to name the group that you would like to access. Group can also contain a path to a group further down the hierarchy by separating group names with a forward slash '/'.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>parent</th>
<th>reference object for the new group</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>group</td>
<td>name of the group to access (may contain '/')</td>
</tr>
</tbody>
</table>
34.105.4.4  Fl_Preferences()  [4/8]

Fl_Preferences::Fl_Preferences (  
    Fl_Preferences * parent,  
    const char * group  
)  

Create or access a group of preferences using a name.

Parent should point to a previously created parent preferences group to create a preferences hierarchy.

If `parent` is set to `NULL`, an unnamed database will be accessed that exists only in local memory and is not associated with a file on disk. The root type of this database is set to `Fl_Preferences::MEMORY`.

- the memory database is not shared among multiple instances of the same app
- memory databases are not thread safe
- all data will be lost when the app quits

```cpp
void some_function() {  
    Fl_Preferences guide( NULL, "Guide" );  
    guide.set("answer", 42);  
}  
void other_function() {  
    int x;  
    Fl_Preferences guide( NULL, "Guide" );  
    guide.get("answer", x, -1);  
}
```

FLTK uses the memory database to manage plugins. See `Fl_Pugin`.

**Parameters**

- **parent**
  - the parameter `parent` is a pointer to the parent group. If `parent` is `NULL`, the new preferences item refers to an application internal database ("runtime prefs") which exists only once, and remains in RAM only until the application quits. This database is used to manage plugins and other data indexes by strings. Runtime prefs are not thread-safe.

- **group**
  - a group name that is used as a key into the database

See also

`Fl_Preferences( Fl_Preferences&, const char *group )`

34.105.4.5  Fl_Preferences()  [5/8]

Fl_Preferences::Fl_Preferences (  
    Fl_Preferences & parent,  
    int groupIndex  
)  

Open a child group using a given index.

Use the `groupIndex` argument to find the group that you would like to access. If the given index is invalid (negative or too high), a new group is created with a UUID as a name.

The index needs to be fixed. It is currently backward. Index 0 points to the last member in the 'list' of preferences.

**Parameters**

- **parent**
  - reference object for the new group

- **groupIndex**
  - zero based index into child groups
34.105.4.6  Fl_Preferences() [6/8]

Fl_Preferences::Fl_Preferences (  
    Fl_Preferences * parent,  
    int groupIndex )

See also

    Fl_Preferences( Fl_Preferences&, int groupIndex )

34.105.4.7  Fl_Preferences() [7/8]

Fl_Preferences::Fl_Preferences (  
    Fl_Preferences::ID id )

Create a new dataset access point using a dataset ID.  
ID's are a great way to remember shortcuts to database entries that are deeply nested in a preferences database,  
as long as the database root is not deleted. An ID can be retrieved from any Fl_Preferences dataset, and can then  
be used to create multiple new references to the same dataset.  
ID's can be very helpful when put into the user_data() field of widget callbacks.

34.105.4.8  ~Fl_Preferences()

Fl_Preferences::~Fl_Preferences ( ) [virtual]

The destructor removes allocated resources.  
When used on the base preferences group, the destructor flushes all changes to the preference file and deletes all  
internal databases.  
The destructor does not remove any data from the database. It merely deletes your reference to the database.

34.105.4.9  Fl_Preferences() [8/8]

Fl_Preferences::Fl_Preferences (  
    const char * path,  
    const char * vendor,  
    const char * application )

Deprecated: Use this constructor to create or read a preference file at an arbitrary position in the file system.  

    "in 1.4.0 - use Fl_Preferences(path, vendor, application, flags) instead"

This constructor should no longer be used because the generated database uses the current locale, making it  
impossible to exchange floating point settings between machines with different language settings.  
Use Fl_Preferences(path, vendor, application, Fl_Preferences::C_LOCALE) in new projects and Fl_Preferences(path, vendor, application, 0) if you must keep backward com-
patibility.

See also

    Fl_Preferences( const char *path, const char *vendor, const char *application, Root flags )

34.105.5  Member Function Documentation

34.105.5.1  delete_entry()

char Fl_Preferences::delete_entry (  
    const char * key )

Deletes a single name/value pair.  
This function removes the entry key from the database.
**Parameters**

<table>
<thead>
<tr>
<th>Key</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>key</td>
<td></td>
<td>name of entry to delete</td>
</tr>
</tbody>
</table>

**Returns**

0 if deleting the entry failed

### 34.105.5.2 delete_group()

```c
char Fl_Preferences::delete_group ( const char * group )
```

Deletes a group.
Removes a group and all keys and groups within that group from the database.

**Parameters**

<table>
<thead>
<tr>
<th>Key</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>group</td>
<td></td>
<td>name of the group to delete</td>
</tr>
</tbody>
</table>

**Returns**

0 if call failed

### 34.105.5.3 dirty()

```c
int Fl_Preferences::dirty ( )
```

Check if there were changes to the database that need to be written to disk.

**Returns**

1 if the database will be written to disk by flush or destructor.
0 if the database is unchanged since the last write operation.
-1 if there is an internal database error.

### 34.105.5.4 entries()

```c
int Fl_Preferences::entries ( )
```

Returns the number of entries (name/value pairs) in a group.

**Returns**

number of entries

### 34.105.5.5 entry()

```c
const char * Fl_Preferences::entry ( int index )
```

Returns the name of an entry.
There is no guaranteed order of entry names. The index must be within the range given by entries().

**Parameters**

<table>
<thead>
<tr>
<th>Key</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>index</td>
<td></td>
<td>number indexing the requested entry</td>
</tr>
</tbody>
</table>
Returns

pointer to value cstring

34.105.5.6 entry_exists()

char Fl_Preferences::entry_exists ( const char * key )

Returns non-zero if an entry with this name exists.

Parameters

| in | key | name of entry that is searched for |

Returns

0 if entry was not found

34.105.5.7 file_access() [1/2]

unsigned int Fl_Preferences::file_access ( ) [static]

Return the current file access permissions for the FLTK preferences system.

See also

Fl_Preferences::file_access(unsigned int)

34.105.5.8 file_access() [2/2]

void Fl_Preferences::file_access ( unsigned int flags ) [static]

Tell the FLTK preferences system which files in the file system it may read, create, or write.

The FLTK core library will try to read or even create or write preference files when calling Fl::option(), Fl_File_Chooser, the printing panel, and possibly some other internal functions. If your application wants to keep FLTK from touching the file system, call this function before making any other FLTK calls:

```
// neither FLTK nor the app may read, create, or write preference files
Fl_Preferences::file_access( Fl_Preferences::NONE );
```

or

```
// FLTK may not read, create, or write preference files, but the application may
Fl_Preferences::file_access( Fl_Preferences::APP_OK );
```

All flags can be combined using an OR operator. If flags are not set, that specific access to the file system will not be allowed. By default, all access is granted. To clear one or more flags from the default setting, use:

```
Fl_Preferences::file_access( Fl_Preferences::file_access() &~ Fl_Preferences::SYSTEM_WRITE );
```

If preferences are created using a filename (instead of Fl_Preferences::USER or Fl_Preferences::SYSTEM), file access is handled as if the Fl_Preferences::USER flag was set.

See also

Fl_Preferences::NONE and others for a list of flags.

Fl_Preferences::file_access()

34.105.5.9 filename() [1/2]

Fl_Preferences::Root Fl_Preferences::filename ( char * buffer,
size_t buffer_size )
Return the file name and path to the preference file.
If the preferences have not changed or have not been flushed, the file or directory may not have been created yet.

Parameters

<table>
<thead>
<tr>
<th>out buffer</th>
<th>write the resulting path into this buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>in buffer_size</td>
<td>size of the buffer in bytes</td>
</tr>
</tbody>
</table>

Returns

the root type at creation type, or MEMORY for runtime prefs, it does not return CORE or LOCALE flags.

34.105.5.10  filename() [2/2]

Fl_Preferences::Root Fl_Preferences::filename {
    char * buffer,
    size_t buffer_size,
    Root root,
    const char * vendor,
    const char * application ) [static]

Determine the file name and path to preferences that would be openend with these parameters.
Find the possible location of a preference file on disk without touching any of the pathname components. This can
be used to check if a preference file already exists.

Parameters

<table>
<thead>
<tr>
<th>out buffer</th>
<th>write the resulting path into this buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>in buffer_size</td>
<td>size of the buffer in bytes</td>
</tr>
<tr>
<td>in root</td>
<td>can be USER_L or SYSTEM_L for user specific or system wide preferences</td>
</tr>
<tr>
<td>in vendor</td>
<td>unique text describing the company or author of this file, must be a valid filepath segment</td>
</tr>
<tr>
<td>in application</td>
<td>unique text describing the application, must be a valid filepath segment</td>
</tr>
</tbody>
</table>

Returns

the input root value, or Fl_Preferences::UNKNOWN_ROOT_TYPE if the path could not be determined.

See also

Fl_Preferences( Root root, const char *vendor, const char *application )

34.105.5.11  flush()

int Fl_Preferences::flush ( )

Writes preferences to disk if they were modified.
This method can be used to verify that writing a preference file went well. Deleting the base preferences object will
also write the contents of the database to disk.

Returns

-1 if anything went wrong, i.e. file could not be opened, permissions blocked writing, etc.
0 if the file was written to disk. This does not check if the disk ran out of space and the file is truncated.
1 if no data was written to the database and no write attempt to disk was made.
34.105.12  get() [1/8]

char Fl_Preferences::get (  
    const char * key,  
    char * & text,  
    const char * defaultValue )

Reads an entry from the group.
A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). `get()` allocates memory of sufficient size to hold the value. The buffer must be free'd by the developer using 'free(value)'.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>text</td>
<td>returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
</tbody>
</table>

Returns

0 if the default value was used

34.105.13  get() [2/8]

char Fl_Preferences::get (  
    const char * key,  
    char * text,  
    const char * defaultValue,  
    int maxSize )

Reads an entry from the group.
A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). 'maxSize' is the maximum length of text that will be read. The text buffer must allow for one additional byte for a trailing zero.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>text</td>
<td>returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
<tr>
<td>in</td>
<td>maxSize</td>
<td>maximum length of value plus one byte for a trailing zero</td>
</tr>
</tbody>
</table>

Returns

0 if the default value was used

34.105.14  get() [3/8]

char Fl_Preferences::get (  
    const char * key,  
    double & value,  
    double defaultValue )

Reads an entry from the group.
A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0).
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>value</td>
<td>returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
</tbody>
</table>

Returns

0 if the default value was used

34.105.5.15 get() [4/8]

```cpp
char Fl_Preferences::get ( 
    const char * key, 
    float & value, 
    float defaultValue )
```

Reads an entry from the group.
A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0).

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>value</td>
<td>returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
</tbody>
</table>

Returns

0 if the default value was used

34.105.5.16 get() [5/8]

```cpp
char Fl_Preferences::get ( 
    const char * key, 
    int & value, 
    int defaultValue )
```

Reads an entry from the group.
A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0).

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>value</td>
<td>returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
</tbody>
</table>
Returns

0 if the default value was used

34.105.5.17  get() [6/8]

char Fl_Preferences::get (  
    const char * key,  
    void ** data,  
    const void * defaultValue,  
    int defaultSize )

Reads an entry from the group.  
A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). get() allocates memory of sufficient size to hold the value. The buffer must be free’d by the developer using 'free(value)'.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>data</td>
<td>returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultSize</td>
<td>size of default value array</td>
</tr>
</tbody>
</table>

Returns

0 if the default value was used

34.105.5.18  get() [7/8]

char Fl_Preferences::get (  
    const char * key,  
    void * data,  
    const void * defaultValue,  
    int defaultSize,  
    int * maxSize )

Reads a binary entry from the group, encoded in hexadecimal blocks.  
A binary (not hex) default value can be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). maxSize is the maximum length of text that will be read and returns the actual number of bytes read.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>data</td>
<td>value returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value to be used if no preference was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultSize</td>
<td>size of default value array</td>
</tr>
<tr>
<td>in, out</td>
<td>maxSize</td>
<td>maximum length of value and actual number of bytes set</td>
</tr>
</tbody>
</table>

Returns

0 if the default value was used
34.105.5.19 get() [8/8]

```cpp
class get {
    const char * key,
    void * data,
    const void * defaultValue,
    int defaultSize,
    int maxSize
}
```

Reads a binary entry from the group, encoded in hexadecimal blocks.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>data</td>
<td>value returned from preferences or default value if none was set</td>
</tr>
<tr>
<td>in</td>
<td>defaultValue</td>
<td>default value</td>
</tr>
<tr>
<td>in</td>
<td>defaultSize</td>
<td>size of default value array</td>
</tr>
<tr>
<td>in</td>
<td>maxSize</td>
<td>maximum length of value, to receive the number of bytes read, use the function below instead.</td>
</tr>
</tbody>
</table>

**Returns**

0 if the default value was used

**See also**

`Fl_Preferences::get( const char ∗key, void ∗data, const void ∗defaultValue, int defaultSize, int ∗maxSize )`

34.105.5.20 get_userdata_path()

```cpp
class get_userdata_path {
    char * path,
    int pathlen
}
```

Creates a path that is related to the preference file and that is usable for additional application data.

This function creates a directory that is named after the preferences database without the .prefs extension and located in the same directory. It then fills the given buffer with the complete path name. There is no way to verify that the path name fit into the buffer. If the name is too long, it will be clipped. This function can be used with direct paths that don't end in .prefs. `getUserDataPath()` will remove any extension and end the path with a / . If the file name has no extension, `getUserDataPath()` will append .data/ to the path name.

**Example:**

```cpp
Fl_Preferences prefs( USER, "matthiasm.com", "test" );
prefs.getUserDataPath( path, FL_PATH_MAX );
creates the preferences database in the directory (User 'matt' on Linux):
/Users/matt/.fltk/matthiasm.com/test.prefs
..and returns the userdata path:
/Users/matt/.fltk/matthiasm.com/test/
```

**Parameters**

<table>
<thead>
<tr>
<th>out</th>
<th>path</th>
<th>buffer for user data path</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>pathlen</td>
<td>size of path buffer (should be at least FL_PATH_MAX )</td>
</tr>
</tbody>
</table>
Returns

1 if there is no filename (path will be unmodified)
1 if pathlen is 0 (path will be unmodified)
1 if a path was created successfully, path will contain the path name ending in a '/'
0 if path was not created for some reason; path will contain the path name that could not be created

See also

Fl_Preferences::Fl_Preferences(Root, const char*, const char*)

34.105.5.21 group()

const char * Fl_Preferences::group ( int num_group )

Returns the name of the Nth (num_group) group.
There is no guaranteed order of group names. The index must be within the range given by groups().

Parameters

| in | num_group | number indexing the requested group |

Returns

'C' string pointer to the group name

34.105.5.22 group_exists()

char Fl_Preferences::group_exists ( const char * key )

Returns non-zero if a group with this name exists.
Group names are relative to the Fl_Preferences node and can contain a path. "." describes the current node, "./" describes the topmost node. By preceding a groupname with a "/" its path becomes relative to the topmost node.

Parameters

| in | key | name of group that is searched for |

Returns

0 if no group by that name was found

34.105.5.23 groups()

int Fl_Preferences::groups ( )

Returns the number of groups that are contained within a group.

Returns

0 for no groups at all
34.105.5.24 new_UUID()

```cpp
const char* Fl_Preferences::new_UUID ( ) [static]
```

Returns a UUID as generated by the system.

A UUID is a "universally unique identifier” which is commonly used in configuration files to create identities. A UUID in ASCII looks like this: 937C4900-51AA-4C11-8DD3-7AB59944F03E. It has always 36 bytes plus a trailing zero.

Returns

a pointer to a static buffer containing the new UUID in ASCII format. The buffer is overwritten during every call to this function!

34.105.5.25 set() [1/7]

```cpp
char Fl_Preferences::set ( 
    const char * key,
    const char * text )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>text</td>
<td>set this entry to value</td>
</tr>
</tbody>
</table>

Returns

0 if setting the value failed

34.105.5.26 set() [2/7]

```cpp
char Fl_Preferences::set ( 
    const char * key,
    const void * data,
    int dsize )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>data</td>
<td>set this entry to value</td>
</tr>
<tr>
<td>in</td>
<td>dsize</td>
<td>size of data array</td>
</tr>
</tbody>
</table>

Returns

0 if setting the value failed

34.105.5.27 set() [3/7]

```cpp
char Fl_Preferences::set ( 
```
```cpp
const char * key,
    double value )

Sets an entry (name/value pair).
The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>set this entry to value</td>
</tr>
</tbody>
</table>

Returns

0 if setting the value failed

34.105.5.28  set() [4/7]

char Fl_Preferences::set (  
    const char * key,
    double value,
    int precision )

Sets an entry (name/value pair).
The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>set this entry to value</td>
</tr>
<tr>
<td>in</td>
<td>precision</td>
<td>number of decimal digits to represent value</td>
</tr>
</tbody>
</table>

Returns

0 if setting the value failed

34.105.5.29  set() [5/7]

char Fl_Preferences::set (  
    const char * key,
    float value )

Sets an entry (name/value pair).
The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>key</th>
<th>name of entry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>set this entry to value</td>
</tr>
</tbody>
</table>

Returns

0 if setting the value failed
34.105.5.30 \textbf{set} [6/7]

\begin{verbatim}
char Fl_Preferences::set ( 
    const char * key, 
    float value, 
    int precision )
\end{verbatim}

Sets an entry (name/value pair). The return value indicates if there was a
problem storing the data in memory. However it does not reflect if the value
was actually stored in the preference file.

\begin{table}[h]
\begin{tabular}{|c|c|}
\hline
\textit{in} & \textit{key} \quad \text{name of entry} \\
\hline
\textit{in} & \textit{value} \quad \text{set this entry to value} \\
\hline
\textit{in} & \textit{precision} \quad \text{number of decimal digits to represent value} \\
\hline
\end{tabular}
\end{table}

Returns

0 if setting the value failed

34.105.5.31 \textbf{set} [7/7]

\begin{verbatim}
char Fl_Preferences::set ( 
    const char * key, 
    int value )
\end{verbatim}

Sets an entry (name/value pair). The return value indicates if there was a
problem storing the data in memory. However it does not reflect if the value
was actually stored in the preference file.

\begin{table}[h]
\begin{tabular}{|c|c|}
\hline
\textit{in} & \textit{key} \quad \text{name of entry} \\
\hline
\textit{in} & \textit{value} \quad \text{set this entry to value} \\
\hline
\end{tabular}
\end{table}

Returns

0 if setting the value failed

34.105.5.32 \textbf{size}()

\begin{verbatim}
int Fl_Preferences::size ( 
    const char * key )
\end{verbatim}

Returns the size of the value part of an entry.

\begin{table}[h]
\begin{tabular}{|c|c|}
\hline
\textit{in} & \textit{key} \quad \text{name of entry} \\
\hline
\end{tabular}
\end{table}
Returns

size of value

34.105.6 Member Data Documentation

34.105.6.1 CORE_READ_OK
const unsigned int Fl_Preferences::CORE_READ_OK = 0x0010 [static]
Set this if it is OK for FLTK to read preference files.
USER_READ_OK and/or SYSTEM_READ_OK must also be set.

34.105.6.2 CORE_WRITE_OK
const unsigned int Fl_Preferences::CORE_WRITE_OK = 0x0020 [static]
Set this if it is OK for FLTK to create or write preference files.
USER_WRITE_OK and/or SYSTEM_WRITE_OK must also be set.

34.105.6.3 NONE
const unsigned int Fl_Preferences::NONE = 0x0000 [static]
Set this if no call to Fl_Preferences shall access the file system.

See also

Fl_PREFERENCES::file_access(unsigned int)
Fl_PREFERENCES::file_access()

The documentation for this class was generated from the following files:

- Fl_PREFERENCES.H
- Fl_PREFERENCES.cxx

34.106 Fl_Printer Class Reference

OS-independent print support.
#include <Fl_Printer.H>
Inheritance diagram for Fl_Printer:

```
Fl_Surface_Device
   Fl_Widget_Surface
   Fl_Paged_Device
   Fl_Printer
```

Public Member Functions

- int begin_job (int pagecount=0, int *frompage=NULL, int *topage=NULL, char **perr_message=NULL) FL_OVERRIDE
  Begins a print job.
- int begin_page (void) FL_OVERRIDE
  Begins a new printed page.
• void end_job (void) FL_OVERRIDE
  To be called at the end of a print job.
• int end_page (void) FL_OVERRIDE
  To be called at the end of each page.
• Fl_Printer (void)
  The constructor.
• bool is_current () FL_OVERRIDE
  Is this surface the current drawing surface?
• void margins (int *left, int *top, int *right, int *bottom) FL_OVERRIDE
  Computes the dimensions of margins that lie between the printable page area and the full page.
• void origin (int *x, int *y) FL_OVERRIDE
  Computes the coordinates of the current origin of graphics functions.
• void origin (int x, int y) FL_OVERRIDE
  Sets the position of the origin of graphics in the drawable part of the drawing surface.
• int printable_rect (int *w, int *h) FL_OVERRIDE
  Computes the width and height of the drawable area of the drawing surface.
• void rotate (float angle) FL_OVERRIDE
  Rotates the graphics operations relatively to paper.
• void scale (float scale_x, float scale_y=0.) FL_OVERRIDE
  Changes the scaling of page coordinates.
• void set_current (void) FL_OVERRIDE
  Make this surface the current drawing surface.
• void translate (int x, int y) FL_OVERRIDE
  Translates the current graphics origin accounting for the current rotation.
• void untranslate (void) FL_OVERRIDE
  Undoes the effect of a previous translate() call.
• ~Fl_Printer (void)
  The destructor.

Static Public Attributes

These attributes are useful for the Linux/Unix platform only.

• static const char * dialog_title = "Print"
  [this text may be customized at run-time]
• static const char * dialog_printer = "Printer:" 
  [this text may be customized at run-time]
• static const char * dialog_range = "Print Range"
  [this text may be customized at run-time]
• static const char * dialog_copies = "Copies"
  [this text may be customized at run-time]
• static const char * dialog_all = "All"
  [this text may be customized at run-time]
• static const char * dialog_pages = "Pages"
  [this text may be customized at run-time]
• static const char * dialog_from = "From:"
  [this text may be customized at run-time]
• static const char * dialog_to = "To:"
  [this text may be customized at run-time]
• static const char * dialog_properties = "Properties..."
  [this text may be customized at run-time]
• static const char * dialog_copyNo = "# Copies:"
  [this text may be customized at run-time]
• static const char * dialog_print_button = "Print"
Additional Inherited Members

34.106.1 Detailed Description

OS-independent print support.

**Fl_Printer** allows to use all drawing, color, text, image, and clip FLTK functions, and to have them operate on printed page(s). There are two main, non exclusive, ways to use it.

- Print any widget (standard, custom, **Fl_Widget**, **Fl_Gl_Window**) as it appears on screen, with optional translation, scaling and rotation. This is done by calling `print_widget()`, `print_window()` or `print_window_part()`.

- Use a series of FLTK graphics commands (e.g., font, text, lines, colors, clip, image) to compose a page appropriately shaped for printing.

In both cases, begin by `begin_job()`, `begin_page()`, `printable_rect()` and `origin()` calls and finish by `end_page()` and `end_job()` calls.

Example of use: print a widget centered in a page

```c
#include <FL/Fl_Printer.H>
#include <FL/fl_draw.H>

int width, height;
Fl_Widget *widget = ... // a widget we want printed
Fl_Printer *printer = new Fl_Printer();
if (printer->begin_job(1) == 0) {
    printer->begin_page();
    printer->printable_rect(&width, &height);
    fl_color(FL_BLACK);
    fl_line_style(FL_SOLID, 2);
    fl_rect(0, 0, width, height);
    fl_font(FL_COURIER, 12);
    time_t now; time(&now); fl_draw(ctime(&now), 0, fl_height());
    printer->origin(width/2, height/2);
    printer->print_widget(widget, -widget->w()/2, -widget->h()/2);
    printer->end_page();
    printer->end_job();
}
delete printer;
```

Recommended method to refresh GUI while printing:

```c
printer->begin_job(0);
......
Fl_Surface_Device::push_current(Fl_Display_Device::display_device());
Fl::check(); // or any operation that draws to display
Fl_Surface_Device::pop_current();
......
printer->end_job();
```

Platform specifics:

- X11 and Wayland platforms:
  - FLTK expresses all graphics data using (Level 2) PostScript and sends that to the selected printer. See class **Fl_PostScript_File_Device** for a description of how text and transparent images appear in print.
  - If the GTK library is available at run-time, class **Fl_Printer** runs GTK's printer dialog which allows to set printer, paper size and orientation.
– Under the KDE desktop, Fl_Printer runs the kdialog command to create KDE-styled file dialogs if that command is available at run-time, unless FLTK was built with CMake and option OPTION_USE_KDIALOG turned off. In that case, Fl_Printer attempts to run the GTK dialog.

– If the GTK library is not available, or if Fl::option(Fl::OPTION_PRINTER_USES_GTK) has been turned off, class Fl_Printer runs FLTK's print dialog.

  - Unless it has been previously changed, the default paper size is A4. To change that, press the "Properties" button of the "Print" dialog window opened by an Fl_Printer::begin_job() call. This opens a "Printer Properties" window where it's possible to select the adequate paper size. Finally press the "Save" button therein to assign the chosen paper size to the chosen printer for this and all further print operations.

  - Use the static public attributes of this class to set the print dialog to other languages than English. For example, the "Printer:" dialog item Fl_Printer::dialog_printer can be set to French with:
    
    ```cpp
    Fl_Printer::dialog_printer = "Imprimante:"
    ```

    before creation of the Fl_Printer object.

  - Use Fl_PostScript_File_Device::file_chooser_title to customize the title of the file chooser dialog that opens when using the "Print To File" option of the print dialog.

  - Windows platform: Transparent Fl_RGB_Image's don't print with exact transparency on most printers (a workaround is to use print_window_part()). Fl_RGB_Images don't rotate() well.

  - Mac OS X platform: all graphics requests print as on display and accept rotation and scaling.

### 34.106.2 Member Function Documentation

#### 34.106.2.1 begin_job()

```cpp
int Fl_Printer::begin_job (  
    int pagecount = 0,  
    int * frompage = NULL,  
    int * topage = NULL,  
    char ** perr_message = NULL ) [virtual]
```

Begins a print job.

**Parameters**

<table>
<thead>
<tr>
<th>parameter</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pagecount</td>
<td>the total number of pages of the job (or 0 if you don’t know the number of pages)</td>
</tr>
<tr>
<td>frompage</td>
<td>if non-null, *frompage is set to the first page the user wants printed</td>
</tr>
<tr>
<td>topage</td>
<td>if non-null, *topage is set to the last page the user wants printed</td>
</tr>
<tr>
<td>perr_message</td>
<td>if non-null and if the returned value is 2, *perr_message is set to a string describing the error. That string can be delete[]d after use.</td>
</tr>
</tbody>
</table>

**Returns**

0 if OK, 1 if user cancelled the job, 2 if any error.

Reimplemented from Fl_Paged_Device.

#### 34.106.2.2 begin_page()

```cpp
int Fl_Printer::begin_page (  
    void ) [virtual]
```

Begins a new printed page.

The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area. This function also makes this surface the current drawing surface with Fl_Surface_Device::push_current().
Note
begin_page() calls Fl_Surface_Device::push_current() and leaves this device as the active surface. If any calls between begin_page() and end_page() open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to Fl_Surface_Device::pop_current() and a call to Fl_Surface_Device::push_current(), or the content of the dialog box will be rendered to the printer instead of the screen.

Returns
0 if OK, non-zero if any error
Reimplemented from Fl_Paged_Device.

34.106.2.3 end_job()
void Fl_Printer::end_job ( ) [virtual]
To be called at the end of a print job.
Reimplemented from Fl_Paged_Device.

34.106.2.4 end_page()
int Fl_Printer::end_page ( ) [virtual]
To be called at the end of each page.
This function also stops this surface from being the current drawing surface with Fl_Surface_Device::pop_current().
Note
disable_page() calls Fl_Surface_Device::pop_current(). If any calls between begin_page() and end_page() open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to Fl_Surface_Device::pop_current() and a call to Fl_Surface_Device::push_current().

Returns
0 if OK, non-zero if any error.
Reimplemented from Fl_Paged_Device.

34.106.2.5 is_current()
bool Fl_Printer::is_current ( ) [virtual]
Is this surface the current drawing surface?
Reimplemented from Fl_Surface_Device.

34.106.2.6 margins()
void Fl_Printer::margins ( int * left, int * top, int * right, int * bottom ) [virtual]
Computes the dimensions of margins that lie between the printable page area and the full page.
Values are in the same unit as that used by FLTK drawing functions. They are changed by scale() calls.
Parameters

<table>
<thead>
<tr>
<th></th>
<th>out</th>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>left</td>
<td>If non-null, *left is set to the left margin size.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>top</td>
<td>If non-null, *top is set to the top margin size.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>right</td>
<td>If non-null, *right is set to the right margin size.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bottom</td>
<td>If non-null, *bottom is set to the bottom margin size.</td>
<td></td>
</tr>
</tbody>
</table>

Reimplemented from Fl_Paged_Device.

34.106.2.7 origin() [1/2]

```cpp
void Fl_Printer::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

Parameters

|    | out | x,y | If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin. |

Reimplemented from Fl_Widget_Surface.

34.106.2.8 origin() [2/2]

```cpp
void Fl_Printer::origin (    
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous `printable_rect()` call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive `origin()` calls don't combine their effects. Origin() calls are not affected by `rotate()` calls (for classes derived from Fl_Paged_Device).

Parameters

|    | in | x,y | Horizontal and vertical positions in the drawing surface of the desired origin of graphics. |

Reimplemented from Fl_Widget_Surface.

34.106.2.9 printable_rect()

```cpp
int Fl_Printer::printable_rect (    
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to `origin()`. If the object is derived from class Fl_Paged_Device, values account for the user-selected paper type and print orientation and are changed by `scale()` calls.

Returns

0 if OK, non-zero if any error

Reimplemented from Fl_Widget_Surface.
34.106.2.10 rotate()

```cpp
void Fl_Printer::rotate ( float angle ) [virtual]
```

Rotates the graphics operations relatively to paper. The rotation is centered on the current graphics origin. Successive rotate() calls don't combine their effects.

**Parameters**

- `angle` Rotation angle in counter-clockwise degrees.

Reimplemented from Fl_Paged_Device.

34.106.2.11 scale()

```cpp
void Fl_Printer::scale ( float scale_x, float scale_y = 0. ) [virtual]
```

Changes the scaling of page coordinates. This function also resets the origin of graphics functions at top left of printable page area. After a scale() call, do a printable_rect() call to get the new dimensions of the printable page area. Successive scale() calls don't combine their effects.

**Parameters**

- `scale_x`, `scale_y` Horizontal dimensions of plot are multiplied by this quantity.
- `scale_y` Same as above, vertically. The value 0. is equivalent to setting `scale_y = scale_x`. Thus, scale(factor); is equivalent to scale(factor, factor);

Reimplemented from Fl_Paged_Device.

34.106.2.12 set_current()

```cpp
void Fl_Printer::set_current ( ) [virtual]
```

Make this surface the current drawing surface. This surface will receive all future graphics requests. Starting from FLTK 1.4.0, the preferred API to change the current drawing surface is Fl_Surface_Device::push_current() / Fl_Surface_Device::pop_current().

**Note**

It's recommended to use this function only as follows:

- The current drawing surface is the display;
- make current another surface, e.g., an Fl_Printer or an Fl_Image_Surface object, calling set_current() on this object;
- draw to that surface;
- make the display current again with Fl_Display_Device::display_device()->set_current();. Don't do any other call to set_current() before this one.

Other scenarios of drawing surface changes should be performed via Fl_Surface_Device::push_current() / Fl_Surface_Device::pop_current().

Reimplemented from Fl_Surface_Device.
34.106.2.13 translate()

```cpp
void Fl_Printer::translate (  
    int x,  
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation. Each `translate()` call must be matched by an `untranslate()` call. Successive `translate()` calls add up their effects. Reimplemented from `Fl_Widget_Surface`.

34.106.2.14 untranslate()

```cpp
void Fl_Printer::untranslate (    
    void ) [virtual]
```

Undoes the effect of a previous `translate()` call. Reimplemented from `Fl_Widget_Surface`.

The documentation for this class was generated from the following files:
- `Fl_Printer.H`
- `Fl_Printer.cxx`

---

### 34.107 Fl_Progress Class Reference

Displays a progress bar for the user.

```c
#include <Fl_Progress.H>
```

Inheritance diagram for Fl_Progress:

```
Fl_Widget

   Fl_Progress
```

**Public Member Functions**

- `Fl_Progress (int x, int y, int w, int h, const char *l=0)`
    
    The constructor creates the progress bar using the position, size, and label.

- float `maximum () const`
    
    Gets the maximum value in the progress widget.

- void `maximum (float v)`
    
    Sets the maximum value in the progress widget.

- float `minimum () const`
    
    Gets the minimum value in the progress widget.

- void `minimum (float v)`
    
    Sets the minimum value in the progress widget.

- float `value () const`
    
    Gets the current value in the progress widget.

- void `value (float v)`
    
    Sets the current value in the progress widget.

**Protected Member Functions**

- void `draw () FL_OVERRIDE`
    
    Draws the progress bar.
Additional Inherited Members

34.107.1 Detailed Description
Displays a progress bar for the user.

34.107.2 Constructor & Destructor Documentation

34.107.2.1 Fl_Progress()

Fl_Progress::Fl_Progress (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ L = 0 )

The constructor creates the progress bar using the position, size, and label. You can set the background color with color() and the progress bar color with selection_color(), or you can set both colors together with color(unsigned bg, unsigned sel). The default colors are FL_BACKGROUND2_COLOR and FL_YELLOW, resp.

34.107.3 Member Function Documentation

34.107.3.1 draw()

void Fl_Progress::draw (  
    void ) [protected], [virtual]

Draws the progress bar. Implements Fl_Widget.

34.107.3.2 maximum() [1/2]

float Fl_Progress::maximum ( ) const [inline]

Gets the maximum value in the progress widget.

34.107.3.3 maximum() [2/2]

void Fl_Progress::maximum (  
    float v ) [inline]

Sets the maximum value in the progress widget.

34.107.3.4 minimum() [1/2]

float Fl_Progress::minimum ( ) const [inline]

Gets the minimum value in the progress widget.
34.107.3.5  minimum() [2/2]

void Fl_Progress::minimum (  
    float v )  [inline]
Sets the minimum value in the progress widget.

34.107.3.6  value() [1/2]

float Fl_Progress::value ( ) const  [inline]
Gets the current value in the progress widget.

34.107.3.7  value() [2/2]

void Fl_Progress::value (  
    float v )  [inline]
Sets the current value in the progress widget.

The documentation for this class was generated from the following files:

- Fl_Progress.H
- Fl_Progress.cxx

34.108  Fl_Radio_Button Class Reference

Inheritance diagram for Fl_Radio_Button:

```
Fl_Widget
    |
    v
Fl_Button
    |
    v
Fl_Radio_Button
```

Public Member Functions

- **Fl_Radio_Button** (int X, int Y, int W, int H, const char *L=0)
  
  *The constructor creates the button using the given position, size, and label.*

Additional Inherited Members

34.108.1  Constructor & Destructor Documentation

34.108.1.1  Fl_Radio_Button()

Fl_Radio_Button::Fl_Radio_Button (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0 )
The constructor creates the button using the given position, size, and label. The Button type() is set to FL_RADIO_BUTTON.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y,W,H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Radio_Button.H
- Fl_Button.cxx

34.109 Fl_Radio_Light_Button Class Reference

Inheritance diagram for Fl_Radio_Light_Button:

```
Fl_Widget
  Fl_Button
    Fl_Light_Button
      Fl_Radio_Light_Button
```

Public Member Functions

- Fl_Radio_Light_Button (int X, int Y, int W, int H, const char *l=0)

Additional Inherited Members

The documentation for this class was generated from the following files:

- Fl_Radio_Light_Button.H
- Fl_Light_Button.cxx

34.110 Fl_Radio_Round_Button Class Reference

Inheritance diagram for Fl_Radio_Round_Button:

```
Fl_Widget
  Fl_Button
    Fl_Light_Button
      Fl_Round_Button
        Fl_Radio_Round_Button
```

Generated by Doxygen
Public Member Functions

- **Fl_Radio_Round_Button** (int X, int Y, int W, int H, const char *L=0)

  Creates a new Fl_Radio_Button widget using the given position, size, and label string.

Additional Inherited Members

34.110.1 Constructor & Destructor Documentation

34.110.1.1 Fl_Radio_Round_Button()

```cpp
Fl_Radio_Round_Button::Fl_Radio_Round_Button {
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0
}
```

Creates a new Fl_Radio_Button widget using the given position, size, and label string.
The button type() is set to FL_RADIO_BUTTON.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y,W,H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Radio_Round_Button.H
- Fl_Round_Button.cxx

34.111 Fl_Rect Class Reference

Rectangle with standard FLTK coordinates (X, Y, W, H).

`#include <Fl_Rect.H>`

Public Member Functions

- **int b () const**

  Gets the bottom edge (y + h).

- **void b (int B)**

  Sets the height based on B and y

- **Fl_Rect ()**

  The default constructor creates an empty rectangle (x = y = w = h = 0).

- **Fl_Rect (const Fl_Widget &widget)**

  This constructor creates a rectangle based on a widget's position and size.

- **Fl_Rect (const Fl_Widget *const widget)**

  This constructor creates a rectangle based on a widget's position and size.

- **Fl_Rect (int W, int H)**

  This constructor creates a rectangle with x = y = 0 and the given width and height.

- **Fl_Rect (int X, int Y, int W, int H)**

  This constructor creates a rectangle with the given x,y coordinates and the given width and height.

- **Fl_Rect (int X, int Y, int W, int H, Fl_Boxtype bt)**

  This constructor creates a rectangle with the given x,y coordinates and the given width and height reduced by the box frame size.
• int h () const
  gets the height
• void h (int H)
  sets the height
• void inset (Fl_Boxtype bt)
  Move all edges in by the frame size of box type bt.
• void inset (int d)
  Move all edges in by d.
• void inset (int left, int top, int right, int bottom)
  Move all edges in by left, top, right, bottom.
• int r () const
  gets the right edge (x + w).
• void r (int R)
  sets the width based on R and x
• int w () const
  gets the width
• void w (int W)
  sets the width
• int x () const
  gets the x coordinate (left edge)
• void x (int X)
  sets the x coordinate (left edge)
• int y () const
  gets the y coordinate (top edge)
• void y (int Y)
  sets the y coordinate (top edge)

Friends
• bool operator!=(const Fl_Rect &lhs, const Fl_Rect &rhs)
• bool operator==(const Fl_Rect &lhs, const Fl_Rect &rhs)

34.111.1 Detailed Description
Rectangle with standard FLTK coordinates (X, Y, W, H).
This may be used internally, for overloaded widget constructors and other overloaded methods like fl_measure(),
fl_text_extents(), fl_rect(), fl_rectf(), and maybe more.

34.111.2 Constructor & Destructor Documentation

34.111.2.1 Fl_Rect()

Fl_Rect::Fl_Rect (int X, int Y, int W, int H, Fl_Boxtype bt) [inline]
This constructor creates a rectangle with the given x,y coordinates and the given width and height reduced by the
box frame size.
This is the same as using the constructor w/o bt and subsequently calling inset(bt).
34.111.3 Member Function Documentation

34.111.3.1 b()

```cpp
int Fl_Rect::b ( ) const [inline]
```

gets the bottom edge \( y + h \).

Note

\( r() \) and \( b() \) are coordinates outside the area of the rectangle.

34.111.3.2 inset() [1/3]

```cpp
void Fl_Rect::inset ( Fl_Boxtype bt ) [inline]
```

Move all edges in by the frame size of box type \( bt \).
Shrinks the rectangle at all sides by the frame width or height of the given box type \( bt \).
This method uses the frame sizes given by the box type \( bt \) using:

- \( Fl::box_dx(bt) \)
- \( Fl::box_dy(bt) \)
- \( Fl::box_dw(bt) \)
- \( Fl::box_dh(bt) \)

If the rectangle is smaller than the frame sizes the result is undefined, i.e. an invalid or empty rectangle.

34.111.3.3 inset() [2/3]

```cpp
void Fl_Rect::inset ( int d ) [inline]
```

Move all edges in by \( d \).
Shrinks the rectangle by \( d \) at all sides keeping the center of the rectangle at the same spot.
If \( d \) is negative, the rectangle is enlarged.
If \( d \geq w() \) or \( h() \) the result is undefined, i.e. an invalid or empty rectangle.

34.111.3.4 inset() [3/3]

```cpp
void Fl_Rect::inset ( int left,
        int top,
        int right,
        int bottom ) [inline]
```

Move all edges in by \( left, top, right, bottom \).
Shrinks the rectangle on all sides keeping the center of the rectangle at the same spot.
If any value is negative, the rectangle is enlarged.
Values are not range checked; it is possible to create an invalid or empty rectangle.

34.111.3.5 r()

```cpp
int Fl_Rect::r ( ) const [inline]
```

gets the right edge \( x + w \).

Note

\( r() \) and \( b() \) are coordinates outside the area of the rectangle.

The documentation for this class was generated from the following file:

- Fl_Rect.H
34.112 Fl_Scroll::Fl_Region_LRTB Struct Reference

A local struct to manage a region defined by left/right/top/bottom.
#include <Fl_Scroll.H>

Public Attributes

• int b
  (b)ottom "y" position, aka y2
• int l
  (l)eft "x" position, aka x1
• int r
  (r)ight "x" position, aka x2
• int t
  (t)op "y" position, aka y1

34.112.1 Detailed Description

A local struct to manage a region defined by left/right/top/bottom.
The documentation for this struct was generated from the following file:

• Fl_Scroll.H

34.113 Fl_Scroll::Fl_Region_XYWH Struct Reference

A local struct to manage a region defined by xywh.
#include <Fl_Scroll.H>

Public Attributes

• int h
• int w
• int x
• int y

34.113.1 Detailed Description

A local struct to manage a region defined by xywh.
The documentation for this struct was generated from the following file:

• Fl_Scroll.H

34.114 Fl_Repeat_Button Class Reference

The Fl_Repeat_Button is a subclass of Fl_Button that generates a callback when it is pressed and then repeatedly
generates callbacks as long as it is held down.
#include <Fl_Repeat_Button.H>

Inheritance diagram for Fl_Repeat_Button:

```
Fl_Widget
   |
   V
Fl_Button
   |
   V
Fl_Repeat_Button
```
Public Member Functions

- void **deactivate** ()
- **Fl_Repeat_Button** (int X, int Y, int W, int H, const char ∗l=0)
  
  Creates a new **Fl_Repeat_Button** widget using the given position, size, and label string.
- int **handle** (int) FL_OVERRIDE
  
  Handles the specified event.

Additional Inherited Members

34.114.1 Detailed Description

The **Fl_Repeat_Button** is a subclass of **Fl_Button** that generates a callback when it is pressed and then repeatedly generates callbacks as long as it is held down.

The speed of the repeat is fixed and depends on the implementation.

34.114.2 Constructor & Destructor Documentation

34.114.2.1 **Fl_Repeat_Button()**

**Fl_Repeat_Button::Fl_Repeat_Button** {
  int X,
  int Y,
  int W,
  int H,
  const char ∗ l = 0 )

Creates a new **Fl_Repeat_Button** widget using the given position, size, and label string.

The default boxtype is FL_UP_BOX. Deletes the button.

34.114.3 Member Function Documentation

34.114.3.1 **handle()**

**int Fl_Repeat_Button::handle** {
  int event ) [virtual]

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class. In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in  | event | the kind of event received |
Return values

<table>
<thead>
<tr>
<th>0</th>
<th>if the event was not used or understood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

Fl_Event

Reimplemented from Fl_Button.

The documentation for this class was generated from the following files:

- Fl_Repeat_Button.H
- Fl_Repeat_Button.cxx

### 34.115 Fl_Return_Button Class Reference

The `Fl_Return_Button` is a subclass of `Fl_Button` that generates a callback when it is pressed or when the user presses the Enter key.

```c
#include <Fl_Return_Button.H>
```

Inheritance diagram for `Fl_Return_Button`:

```
Fl_Widget
   |
   v
Fl_Button
   |
   v
Fl_Return_Button
```

#### Public Member Functions

- `Fl_Return_Button(int X, int Y, int W, int H, const char *l=0)`
  
  Creates a new `Fl_Return_Button` widget using the given position, size, and label string.
- `int handle(int)` [FL OVERRIDE]
  
  Handles the specified event.

#### Protected Member Functions

- `void draw()` [FL OVERRIDE]
  
  Draws the widget.

#### Additional Inherited Members

### 34.115.1 Detailed Description

The `Fl_Return_Button` is a subclass of `Fl_Button` that generates a callback when it is pressed or when the user presses the Enter key.

A carriage-return symbol is drawn next to the button label.

![Fl_Return_Button](image)

Figure 34.37 Fl_Return_Button

### 34.115.2 Constructor & Destructor Documentation

Generated by Doxygen
34.115.2.1  Fl_Return_Button()

Fl_Return_Button::Fl_Return_Button {
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0
}

Creates a new Fl_Return_Button widget using the given position, size, and label string.
The default boxtype is FL_UP_BOX.
The inherited destructor deletes the button.

34.115.3  Member Function Documentation

34.115.3.1  draw()

void Fl_Return_Button::draw ( ) [protected], [virtual]

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
Reimplemented from Fl_Button.

34.115.3.2  handle()

int Fl_Return_Button::handle {
    int event ) [virtual]

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.
This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in  | event | the kind of event received |

Return values

| 0   | if the event was not used or understood |
| 1   | if the event was used and can be deleted |
34.116 Fl_RGB_Image Class Reference

The Fl_RGB_Image class supports caching and drawing of full-color images with 1 to 4 channels of color information.

#include <Fl_Image.H>

Inheritance diagram for Fl_RGB_Image:

Public Member Functions

- virtual Fl_SVG_Image * as_svg_image ()
  Returns whether an image is an Fl_SVG_Image or not.
- int cache_h ()
- int cache_w ()
- void color_average (Fl_Color c, float i) FL_OVERRIDE
  The color_average() method averages the colors in the image with the provided FLTK color value.
- Fl_Image * copy () const
- Fl_Image * copy (int W, int H) const FL_OVERRIDE
  Creates a resized copy of the image.
- void desaturate () FL_OVERRIDE
  The desaturate() method converts an image to grayscale.
- void draw (int X, int Y)
- void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE
  Draws the image to the current drawing surface with a bounding box.
- Fl_RGB_Image (const Fl_Pixmap *pxm, Fl_Color bg=FL_GRAY)
  The constructor creates a new RGBA image from the specified Fl_Pixmap.
- Fl_RGB_Image (const uchar *bits, int bits_length, int W, int H, int D, int LD=0)
  The constructor creates a new image from the specified data.
- void label (Fl_Menu_Item *m) FL_OVERRIDE
  This method is an obsolete way to set the image attribute of a menu item.
- void label (Fl_Widget *w) FL_OVERRIDE
  This method is an obsolete way to set the image attribute of a widget or menu item.
- virtual void normalize ()
Makes sure the object is fully initialized.

- void uncache () FL_OVERRIDE
  
  If the image has been cached for display, delete the cache data.

- ~Fl_RGB_Image () FL_OVERRIDE
  
  The destructor frees all memory and server resources that are used by the image.

### Static Public Member Functions

- static size_t max_size ()
  
  Returns the maximum allowed image size in bytes when creating an Fl_RGB_Image object.

- static void max_size (size_t size)
  
  Sets the maximum allowed image size in bytes when creating an Fl_RGB_Image object.

### Public Attributes

- int alloc_array
  
  If non-zero, the object’s data array is delete[]d when deleting the object.

- const uchar * array
  
  Points to the start of the object’s data array.

### Friends

- class Fl_Graphics_Driver

### Additional Inherited Members

#### 34.116.2 Constructor & Destructor Documentation

#### 34.116.2.1 Fl_RGB_Image() [1/3]

Fl_RGB_Image::Fl_RGB_Image (  
  const uchar * bits,  
  int W,  
  int H,  
  int D = 3,  
  int LD = 0 )

The constructor creates a new image from the specified data.

The data array bits must contain sufficient data to provide \( W \times H \times D \) image bytes and optional line padding, see LD.

\( W \) and \( H \) are the width and height of the image in pixels, resp.

\( D \) is the image depth and can be:

- \( D=1 \): each uchar in bits[] is a grayscale pixel value
- \( D=2 \): each uchar pair in bits[] is a grayscale + alpha pixel value
- \( D=3 \): each uchar triplet in bits[] is an R/G/B pixel value
D=4: each uchar quad in \texttt{bits[]} is an R/G/B/A pixel value

\texttt{LD} specifies the line data size of the array, see \texttt{Fl\_Image::ld(int)}. If \texttt{LD} is zero, then \( W \times D \) is assumed, otherwise \texttt{LD} must be greater than or equal to \( W \times D \) to account for (unused) extra data per line (padding).

The caller is responsible that the image data array \texttt{bits} persists as long as the image is used.

This constructor sets \texttt{Fl\_RGB\_Image::alloc\_array} to 0. To have the image object control the deallocation of the data array \texttt{bits}, set alloc\_array to non-zero after construction.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>\texttt{bits}</th>
<th>The image data array.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{W}</td>
<td>The width of the image in pixels.</td>
</tr>
<tr>
<td>in</td>
<td>\texttt{H}</td>
<td>The height of the image in pixels.</td>
</tr>
<tr>
<td>in</td>
<td>\texttt{D}</td>
<td>The image depth, or 'number of channels' (default=3).</td>
</tr>
<tr>
<td>in</td>
<td>\texttt{LD}</td>
<td>Line data size (default=0).</td>
</tr>
</tbody>
</table>

See also

\texttt{Fl\_Image::data()}, \texttt{Fl\_Image::w()}, \texttt{Fl\_Image::h()}, \texttt{Fl\_Image::d()}, \texttt{Fl\_Image::ld(int)}

### 34.116.2.2 \texttt{Fl\_RGB\_Image() [2/3]}

\texttt{Fl\_RGB\_Image::Fl\_RGB\_Image (}
\begin{verbatim}
const uchar * \texttt{bits},
int \texttt{bits\_length},
int \texttt{W},
int \texttt{H},
int \texttt{D},
int \texttt{LD})
\end{verbatim}

The constructor creates a new image from the specified data. If the provided array is too small to contain all the image data, the constructor will not generate the image to avoid illegal memory read access and instead set \texttt{data} to NULL and \texttt{ld} to \texttt{ERR\_MEMORY\_ACCESS}.

**Parameters**

| \texttt{bits} | image data |
| \texttt{bits\_length} | length of the \texttt{bits} array in bytes |
| \texttt{W} | image width in pixels |
| \texttt{H} | image height in pixels |
| \texttt{D} | image depth in bytes, 1 for gray scale, 2 for gray with alpha, 3 for RGB, and 4 for RGB plus alpha |
| \texttt{LD} | line length in bytes, or 0 to use W+D. |

See also

\texttt{Fl\_RGB\_Image(const uchar *\texttt{bits}, int \texttt{W}, int \texttt{H}, int \texttt{D}, int \texttt{LD})}

### 34.116.2.3 \texttt{Fl\_RGB\_Image() [3/3]}

\texttt{Fl\_RGB\_Image::Fl\_RGB\_Image (}
\begin{verbatim}
const Fl\_Pixmap * \texttt{pxm},
Fl\_Color \texttt{bg} = \texttt{FL\_GRAY})
\end{verbatim}

The constructor creates a new RGBA image from the specified \texttt{Fl\_Pixmap}. The RGBA image is built fully opaque except for the transparent area of the pixmap that is assigned the \texttt{bg} color with full transparency.

Generated by Doxygen
This constructor creates a new internal data array and sets `Fl_RGB_Image::alloc_array` to 1 so the data array is deleted when the image is destroyed.

### 34.116.3 Member Function Documentation

#### 34.116.3.1 as_svg_image()

```cpp
virtual Fl_SVG_Image * Fl_RGB_Image::as_svg_image ( ) [inline], [virtual]
```

Returns whether an image is an `Fl_SVG_Image` or not.
This virtual method returns a pointer to the `Fl_SVG_Image` if this object is an instance of `Fl_SVG_Image` or NULL if not.
Reimplemented in `Fl_SVG_Image`.

#### 34.116.3.2 color_average()

```cpp
void Fl_RGB_Image::color_average ( Fl_Color c, float i ) [virtual]
```

The `color_average()` method averages the colors in the image with the provided FLTK color value.
The first argument specifies the FLTK color to be used.
The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.
An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
Reimplemented from `Fl_Image`.
Reimplemented in `Fl_SVG_Image`.

#### 34.116.3.3 copy()

```cpp
Fl_Image * Fl_RGB_Image::copy ( int W, int H ) const [virtual]
```

Creates a resized copy of the image.
The new image should be released when you are done with it.
Note: since FLTK 1.4.0 you can use `Fl_Image::release()` for all types of images (i.e. all subclasses of `Fl_Image`) instead of operator delete for `Fl_Image`'s and `Fl_Image::release()` for `Fl_Shared_Image`'s.
The new image data will be converted to the requested size. RGB images are resized using the algorithm set by `Fl_Image::RGB_scaling()`.
For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

**Parameters**

| in | W,H | Requested width and height of the new image |

**Note**

The returned image can be safely cast to the same image type as that of the source image provided this type is one of `Fl_RGB_Image`, `Fl_SVG_Image`, `Fl_Pixmap`, `Fl_Bitmap`, `Fl_Tiled_Image`, `Fl_Anim_GIF_Image` and `Fl_Shared_Image`. Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an `Fl_GIF_Image` is an object of class `Fl_Pixmap`.
Since FLTK 1.4.0 this method is ‘const’. If you derive your own class from `Fl_Image` or any subclass your...
overridden methods of 'Fl_Image::copy() const' and 'Fl_Image::copy(int, int) const' must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from Fl_Image.
Reimplemented in Fl_SVG_Image.

34.116.3.4 desaturate()

void Fl_RGB_Image::desaturate ( ) [virtual]
The desaturate() method converts an image to grayscale.
If the image contains an alpha channel (depth = 4), the alpha channel is preserved.
An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
Reimplemented from Fl_Image.
Reimplemented in Fl_SVG_Image.

34.116.3.5 draw()

void Fl_RGB_Image::draw (int X, int Y, int W, int H, int cx = 0, int cy = 0 ) [virtual]
Draws the image to the current drawing surface with a bounding box.
Arguments X, Y, W, H specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the cx and cy arguments.
In other words: fl_push_clip(X, Y, W, H) is applied, the image is drawn with its upper-left corner at X-cx,Y-cy and its own width and height, fl_pop_clip() is applied.
Reimplemented from Fl_Image.
Reimplemented in Fl_SVG_Image.

34.116.3.6 label() [1/2]

void Fl_RGB_Image::label (Fl_Menu_Item * m ) [virtual]
This method is an obsolete way to set the image attribute of a menu item.

Deprecated Please use Fl_Menu_Item::image() instead.
Reimplemented from Fl_Image.

34.116.3.7 label() [2/2]

void Fl_RGB_Image::label (Fl_Widget * widget ) [virtual]
This method is an obsolete way to set the image attribute of a widget or menu item.

Deprecated Please use Fl_Widget::image() or Fl_Widget::deimage() instead.
Reimplemented from Fl_Image.
34.116.3.8 max_size() [1/2]

static size_t Fl_RGB_Image::max_size () [inline], [static]

Returns the maximum allowed image size in bytes when creating an Fl_RGB_Image object.

See also

void Fl_RGB_Image::max_size(size_t)

34.116.3.9 max_size() [2/2]

static void Fl_RGB_Image::max_size ( size_t size ) [inline], [static]

Sets the maximum allowed image size in bytes when creating an Fl_RGB_Image object. The image size in bytes of an Fl_RGB_Image object is the value of the product w() * h() * d(). If this product exceeds size, the created object of a derived class of Fl_RGB_Image won’t be loaded with the image data. This does not apply to direct RGB image creation with Fl_RGB_Image::Fl_RGB_Image(const uchar *bits, int W, int H, int D, int LD). The default max_size() value is essentially infinite.

34.116.3.10 normalize()

virtual void Fl_RGB_Image::normalize ( ) [inline], [virtual]

Makes sure the object is fully initialized. In particular, makes sure member variable array is non-null. Reimplemented in Fl_SVG_Image.

34.116.3.11 uncache()

void Fl_RGB_Image::uncache ( ) [virtual]

If the image has been cached for display, delete the cache data. This allows you to change the data used for the image and then redraw it without recreating an image object. Reimplemented from Fl_Image.

34.116.4 Member Data Documentation

34.116.4.1 array

const uchar* Fl_RGB_Image::array

Points to the start of the object's data array.

See also

class Fl_SVG_Image which delays initialization of this member variable.

The documentation for this class was generated from the following files:

- Fl_Image.H
- Fl_Image.cxx

34.117 Fl_Roller Class Reference

The Fl_Roller widget is a "dolly" control commonly used to move 3D objects.

#include <Fl_Roller.H>

Inheritance diagram for Fl_Roller:
Public Member Functions

- **FL_Roller** (int X, int Y, int W, int H, const char ∗L=0)
  Creates a new FL_Roller widget using the given position, size, and label string.
- **int handle** (int) FL_OVERRIDE
  Handles the specified event.

Protected Member Functions

- **void draw ()** FL_OVERRIDE
  Draws the widget.

Additional Inherited Members

34.117.1 Detailed Description

The FL_Roller widget is a "dolly" control commonly used to move 3D objects. The roller can be controlled by clicking and dragging the mouse, by the corresponding arrow keys when the roller has the keyboard focus, or by the mouse wheels when the mouse pointer is positioned over the roller widget.

34.117.2 Constructor & Destructor Documentation

34.117.2.1 FL_Roller()

FL_Roller::FL_Roller (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char ∗L = 0 )

Creates a new FL_Roller widget using the given position, size, and label string. The default boxtype is FL_NO_BOX. Inherited destructor destroys the valuator.

34.117.3 Member Function Documentation
34.117.3.1  draw()

```c
void Fl_Roller::draw ( ) [protected], [virtual]
```

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own `draw()` method, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:
```c
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements `Fl_Widget`.

34.117.3.2  handle()

```c
int Fl_Roller::handle ( int event ) [virtual]
```

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited `handle()` method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your `handle()` method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the `handle()` method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

```
Parameters
  in event the kind of event received
```

```
Return values
  0 if the event was not used or understood
  1 if the event was used and can be deleted
```

See also
- `Fl_Event`

Reimplemented from `Fl_Widget`.
The documentation for this class was generated from the following files:
- `Fl_Roller.H`
- `Fl_Roller.cxx`

### 34.118  Fl_Round_Button Class Reference

Buttons generate callbacks when they are clicked by the user.
```c
#include <Fl_Round_Button.H>
```

Inheritance diagram for `Fl_Round_Button`:
Public Member Functions

- **Fl_Round_Button** (int x, int y, int w, int h, const char ∗l=0)
  
  Creates a new Fl_Round_Button widget using the given position, size, and label string.

Additional Inherited Members

34.118.1 Detailed Description

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for type() and when().

![Fl_Round_Button](image)

The Fl_Round_Button subclass displays the "on" state by turning on a light, rather than drawing pushed in. The shape of the "light" is initially set to FL_ROUND_DOWN_BOX. The color of the light when on is controlled with selection_color(), which defaults to FL_FOREGROUND_COLOR.

34.118.2 Constructor & Destructor Documentation

34.118.2.1 Fl_Round_Button()

Fl_Round_Button::Fl_Round_Button (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char ∗L = 0 )

Creates a new Fl_Round_Button widget using the given position, size, and label string.

![Fl_Round_Button](image)

The Fl_Round_Button subclass displays the "ON" state by turning on a light, rather than drawing pushed in. The default box type is FL_NO_BOX, which draws the label w/o a box right of the checkmark. The shape of the "light" is set with down_box() and its default value is FL_ROUND_DOWN_BOX. The color of the light when on is controlled with selection_color(), which defaults to FL_FOREGROUND_COLOR (usually black).
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y,W,H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Round_Button.H
- Fl_Round_Button.hxx

### 34.119 Fl_Round_Clock Class Reference

A clock widget of type FL_ROUND_CLOCK.

```c
#include <Fl_Round_Clock.H>
```

Inheritance diagram for Fl_Round_Clock:

```
Fl_Widget
   |
   v
Fl_Clock_Output
   |
   v
Fl_Clock
   |
   v
Fl_Round_Clock
```

#### Public Member Functions

- `Fl_Round_Clock (int X, int Y, int W, int H, const char *L=0)`

  *Creates the clock widget, setting his type and box.*

#### Additional Inherited Members

### 34.119.1 Detailed Description

A clock widget of type FL_ROUND_CLOCK.

Has no box.

### 34.119.2 Constructor & Destructor Documentation

#### 34.119.2.1 Fl_Round_Clock()

```c
Fl_Round_Clock::Fl_Round_Clock {
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0
}
```

*Creates the clock widget, setting his type and box.*

Create an `Fl_Round_Clock` widget using the given position, size, and label string.

The clock type is `FL_ROUND_CLOCK` and the boxtype is `FL_NO_BOX`.

This constructor is the same as `Fl_Clock(FL_ROUND_CLOCK, X, Y, W, H, L).`
See also

`Fl_Clock(uchar, int, int, int, int, const char ∗)`

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th><code>X,Y,W,H</code></th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>L</code></td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- `Fl_Round_Clock.H`
- `Fl_Clock.cxx`

### 34.120 Fl_Scheme Class Reference

#### Static Public Member Functions

- static int `add_scheme_name` (const char ∗name)
  
  Add a scheme name to the list of known schemes.

- static const char ∗∗`names` ()
  
  Return a list of all known scheme names.

- static int `num_schemes` ()
  
  Return the number of currently registered schemes.

### 34.120.1 Member Function Documentation

#### 34.120.1.1 add_scheme_name()

```cpp
int Fl_Scheme::add_scheme_name ( const char ∗name ) [static]
```

Add a scheme name to the list of known schemes.

This method is public in FLTK 1.4.0 because derived classes of `Fl_Scheme` are not yet implemented. Thus, users implementing their own schemes can use this method to add the scheme name to the list of known schemes which is for instance used in `Fl_Scheme::names()`.

**Note**

**Attention!** In a future version, when subclasses of `Fl_Scheme` will be implemented, this method will either be replaced by another protected method or it will no longer do anything (kept only for ABI reasons).

The new scheme name must consist of valid ASCII characters as described below:

- lowercase letters 'a' - 'z'
- numbers '0' - '9'
- any character in "$+._" (w/o the quotes).

The name must not be longer than 12 ASCII characters (bytes). The new scheme name is added to the end of the unordered list.

**Note**

Call this method only once for each scheme name. If the returned value is ≤ 0 you should check the scheme name.

The given scheme name is copied and may be freed directly after the call to `add_scheme_name()`.

Generated by Doxygen
Parameters

| in  | name | New scheme name |

Returns

The new number of schemes if the name was successfully added. This is the same as the index of the scheme + 1.

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Scheme name already exists</td>
</tr>
<tr>
<td>-1</td>
<td>Invalid character(s) in name</td>
</tr>
<tr>
<td>-2</td>
<td>The name is too long</td>
</tr>
</tbody>
</table>

Since

1.4.0

34.120.1.2 names()

```
const char ** Fl_Scheme::names ( ) [static]
```

Return a list of all known scheme names. This list is only valid until a new scheme is added or one is removed. It is possible that scheme names are appended to the list during the runtime of the program but schemes can't be removed. Getting the list of known schemes can be useful to populate a menu of scheme choices to let the user select a scheme. You should process the names immediately and you should never store a pointer to the list or any individual name for later reference because the location of the list can be changed (reallocated) when schemes are added. The list of scheme names is nul-terminated.

Note

Currently (in FLTK 1.4.0) schemes can only be added to the list and not removed from the list. This may change in a later version.

Returns

List of currently known scheme names.

34.120.1.3 num_schemes()

```
static int Fl_Scheme::num_schemes ( ) [inline], [static]
```

Return the number of currently registered schemes.

Returns

Number of registered schemes.

The documentation for this class was generated from the following files:

- Fl_Scheme.H
- Fl_Scheme.cxx
34.121 Fl_Scheme_Choice Class Reference

Inheritance diagram for Fl_Scheme_Choice:

```
+--- Fl_Widget
 |   +--- Fl_Menu_
 |       +--- Fl_Choice
 |               +--- Fl_Scheme_Choice
```

Public Member Functions

- **Fl_Scheme_Choice (int X, int Y, int W, int H, const char ∗L=0)**
  The constructor initializes the Fl_Scheme_Choice object with all known schemes.

- **int handle (int event) FL_OVERRIDE**
  Handle FLTK events.

- **virtual void init_value ()**
  Public method to initialize the value of the Fl_Scheme_Choice widget.

Static Protected Member Functions

- **static void scheme_cb_ (Fl_Widget ∗w, void ∗)**
  Internal Fl_Scheme_Choice callback function (protected).

Additional Inherited Members

34.121.1 Constructor & Destructor Documentation

34.121.1.1 Fl_Scheme_Choice()

```
Fl_Scheme_Choice::Fl_Scheme_Choice ( int X, int Y, int W, int H, const char ∗L = 0 )
```

The constructor initializes the Fl_Scheme_Choice object with all known schemes.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y</th>
<th>Widget coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>W,H</td>
<td>Widget size (width, height)</td>
</tr>
<tr>
<td>in</td>
<td>L</td>
<td>Widget label (default: NULL, no label)</td>
</tr>
</tbody>
</table>

34.121.2 Member Function Documentation
34.121.2.1 handle()

```cpp
int Fl_Scheme_Choice::handle (  
    int event  ) [virtual]
```

Handle FLTK events.
This widget uses FL_SHOW and some other events to initialize its value() according to the current scheme.
All events are also handled by the base class Fl_Choice.

**Parameters**

| in | event |

**Returns**

1 if the event was used, 0 otherwise

Reimplemented from Fl_Choice.

34.121.2.2 init_value()

```cpp
void Fl_Scheme_Choice::init_value ( ) [virtual]
```

Public method to initialize the value of the Fl_Scheme_Choice widget.
Normally you don't need to call this unless you change the current scheme by calling Fl::scheme(const char ∗).
The Fl_Scheme_Choice widget does this automatically when the widget is shown (when receiving the FL_SHOW event) which should always be after Fl_Window::show(argc, argv) which may set the current scheme by interpreting the commandline.

Since

1.4.0

34.121.2.3 scheme_cb()

```cpp
void Fl_Scheme_Choice::scheme_cb_ (  
    Fl_Widget ∗ w,  
    void ∗ ) [static], [protected]
```

Internal Fl_Scheme_Choice callback function (protected).
You don't need to set a callback for this widget. The default callback changes the scheme (Fl::scheme()) and redraws all open windows.
You may override the callback if changing the scheme shall redraw other windows or don't redraw the window at all.

**Parameters**

| in | w | The Fl_Scheme_Choice widget |

The documentation for this class was generated from the following files:

- Fl_Scheme_Choice.H
- Fl_Scheme_Choice.cxx

34.122 Fl_Scroll Class Reference

This container widget lets you maneuver around a set of widgets much larger than your window.

```cpp
#include <Fl_Scroll.H>
```

Inheritance diagram for Fl_Scroll:
Classes

- struct Fl_Region_LRTB
  A local struct to manage a region defined by left/right/top/bottom.
- struct Fl_Region_XYWH
  A local struct to manage a region defined by xywh.
- struct Fl_Scrollbar_Data
  A local struct to manage a scrollbar's xywh region and tab values.
- struct ScrollInfo
  Structure to manage scrollbar and widget interior sizes.

Public Types

- enum {
  HORIZONTAL = 1 , VERTICAL = 2 , BOTH = 3 , ALWAYS_ON = 4 ,
  HORIZONTAL_ALWAYS = 5 , VERTICAL_ALWAYS = 6 , BOTH_ALWAYS = 7 }

Public Member Functions

- void clear ()
  Clear all but the scrollbars...
- int delete_child (int n) FL_OVERRIDE
  Removes the widget at index from the group and deletes it.
- Fl_Scroll (int X, int Y , int W, int H, const char ∗=0)
  Creates a new Fl_Scroll widget using the given position, size, and label string.
- int handle (int) FL_OVERRIDE
  Handles the specified event.
- void resize (int X, int Y, int W, int H) FL_OVERRIDE
  Resizes the Fl_Scroll widget and moves its children if necessary.
- void scroll_to (int, int)
  Moves the contents of the scroll group to a new position.
- int scrollbar_size () const
  Gets the current size of the scrollbars' troughs, in pixels.
- void scrollbar_size (int newSize)
  Sets the pixel size of the scrollbars' troughs to newSize, in pixels.
- int xposition () const
  Gets the current horizontal scrolling position.
- int yposition () const
  Gets the current vertical scrolling position.
- virtual ~Fl_Scroll ()
  The destructor also deletes all the children.

Public Attributes

- Fl_Scrollbar hscrollbar
- Fl_Scrollbar scrollbar
Protected Member Functions

- **void bbox (int &, int &, int &, int &) const**
  
  Returns the bounding box for the interior of the scrolling area, inside the scrollbars.

- **void draw () FL_OVERRIDE**
  
  Draws the widget.

- **void fix_scrollbar_order ()**
  
  Ensure the scrollbars are the last children.

- **int on_insert (Fl_Widget *, int) FL_OVERRIDE**

  Change insert position of a child before it is added.

- **int on_move (int, int) FL_OVERRIDE**

  Change new position of a child before it is moved.

- **void recalc_scrollbars (ScrollInfo &si) const**

  Calculate visibility/size/position of scrollbars, find children's bounding box.

Additional Inherited Members

34.122.1 Detailed Description

This container widget lets you maneuver around a set of widgets much larger than your window. If the child widgets are larger than the size of this object then scrollbars will appear so that you can scroll over to them:

![Figure 34.41 Fl_Scroll](image)

If all of the child widgets are packed together into a solid rectangle then you want to set `box()` to FL_NO_BOX or one of the _FRAME types. This will result in the best output. However, if the child widgets are a sparse arrangement you must set `box()` to a real _BOX type. This can result in some blinking during redrawing, but that can be solved by using a Fl_Double_Window.

The Fl_Scroll widget calculates the bounding box of all its children by using their widget positions and sizes (x, y, w, h). Outside labels are not considered. If you need outside labels of any widgets or free space outside of this bounding box you can add a tiny invisible Fl_Box at the relevant corner(s) of the Fl_Scroll widget, for instance:

```c
Fl_Scroll scroll(100, 100, 200, 200); // Fl_Scroll at (100, 100)
Fl_Box(100, 100, 1, 1); // Fl_Box in top left corner
Fl_Input(150, 120, 60, 30, "Input:"); // left most widget with label
// ... more widgets ...
scroll.end();
```

By default you can scroll in both directions, and the scrollbars disappear if the data will fit in the area of the scroll. Use `Fl_Scroll::type()` to change this as follows:

- **0 - No scrollbars**
- **Fl_Scroll::HORIZONTAL - Only a horizontal scrollbar.**
- **Fl_Scroll::VERTICAL - Only a vertical scrollbar.**
- **Fl_Scroll::BOTH - The default is both scrollbars.**
- **Fl_Scroll::HORIZONTAL_ALWAYS - Horizontal scrollbar always on, vertical always off.**
- **Fl_Scroll::VERTICAL_ALWAYS - Vertical scrollbar always on, horizontal always off.**
- **Fl_Scroll::BOTH_ALWAYS - Both always on.**
Use scrollbar.align(int) (see void Fl_Widget::align(Fl_Align)) to change what side the scrollbars are drawn on.

If the FL_ALIGN_LEFT bit is on, the vertical scrollbar is on the left. If the FL_ALIGN_TOP bit is on, the horizontal scrollbar is on the top. Note that only the alignment flags in scrollbar are considered. The flags in hscrollbar however are ignored.

This widget can also be used to pan around a single child widget "canvas". This child widget should be of your own class, with a draw() method that draws the contents. The scrolling is done by changing the x() and y() of the widget, so this child must use the x() and y() to position its drawing. To speed up drawing it should test fl_not_clipped(int x,int y,int w,int h) to find out if a particular area of the widget must be drawn.

Another very useful child is a single Fl_Pack, which is itself a group that packs its children together and changes size to surround them. Filling the Fl_Pack with Fl_Tabs groups (and then putting normal widgets inside those) gives you a very powerful scrolling list of individually-openable panels.

Fluid lets you create these, but you can only lay out objects that fit inside the Fl_Scroll without scrolling. Be sure to leave space for the scrollbars, as Fluid won't show these either.

You cannot use Fl_Window as a child of this since the clipping is not conveyed to it when drawn, and it will draw over the scrollbars and neighboring objects.

### 34.122.2 Constructor & Destructor Documentation

#### 34.122.2.1 Fl_Scroll()

Fl_Scroll::Fl_Scroll (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0 )

Creates a new Fl_Scroll widget using the given position, size, and label string. The default boxtype is FL_NO_BOX.

The destructor also deletes all the children. This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the Fl_Scroll and all of its children can be automatic (local) variables, but you must declare the Fl_Scroll first, so that it is destroyed last.

#### 34.122.2.2 ~Fl_Scroll()

Fl_Scroll::~Fl_Scroll ( ) [virtual]

The destructor also deletes all the children.

See also

Fl_Group::~Fl_Group()

### 34.122.3 Member Function Documentation

#### 34.122.3.1 bbox()

void Fl_Scroll::bbox (  
    int & X,  
    int & Y,  
    int & W,  
    int & H ) const [protected]

Returns the bounding box for the interior of the scrolling area, inside the scrollbars.

This method does not change the scrollbars or their visibility. First the scrollbar positions and visibility are calculated as they should be, according to the positions and sizes of the children. Then the bounding box is calculated.

You may need to call redraw() to make sure the widget gets updated.
See also

recalc_scrollbars()

### 34.122.3.2 delete_child()

```cpp
int Fl_Scroll::delete_child ( int index ) [virtual]
```

Removes the widget at `index` from the group and deletes it.
This method does nothing if `index` is out of bounds or if `Fl_Group::child(index)` is one of the scrollbars.

**Parameters**

* `index` index of child to be removed

**Returns**

success (0) or error code

**Return values**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>success</td>
</tr>
<tr>
<td>1</td>
<td>index out of range</td>
</tr>
<tr>
<td>2</td>
<td>widget not allowed to be removed (see note)</td>
</tr>
</tbody>
</table>

See also

`Fl_Group::delete_child(int index)`

Since

FLTK 1.4.0

Reimplemented from `Fl_Group`.

### 34.122.3.3 draw()

```cpp
void Fl_Scroll::draw ( ) [protected], [virtual]
```

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method *from within your own draw() method*, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Reimplemented from `Fl_Group`.

### 34.122.3.4 fix_scrollbar_order()

```cpp
void Fl_Scroll::fix_scrollbar_order ( ) [protected]
```

Ensure the scrollbars are the last children.
When `Fl_Scroll` is instantiated the first child of the `Fl_Group` is the vertical scrollbar `scrollbar` and the second child is the horizontal scrollbar `hscrollbar`.
These two widgets must always be the last two widgets and in this order to guarantee the correct drawing order and event delivery.
Since FLTK 1.4.0 the new method \texttt{on_insert()} modifies the insert position of other children if it would be after the scrollbars.

### 34.122.3.5 \texttt{handle()}

```c
int Fl_Scroll::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited \texttt{handle()} method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your \texttt{handle()} method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the \texttt{handle()} method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

**Parameters**

| in | \texttt{event} | the kind of event received |

**Return values**

- 0 if the event was not used or understood
- 1 if the event was used and can be deleted

**See also**

\texttt{Fl_Event}

Reimplemented from \texttt{Fl_Group}.

### 34.122.3.6 \texttt{on_insert()}

```c
int Fl_Scroll::on_insert (
    Fl_Widget * candidate,
    int index ) [protected], [virtual]
```

Change insert position of a child before it is added.

Fix insert position if the new child is planned to be inserted after the scrollbars. We can assume that the scrollbars are always the last two children!

\texttt{Fl_Group} calls this when a new widget is added. We return the new index if the new widget would be added after the scrollbars.

**Parameters**

| in | \texttt{candidate} | the candidate will be added to the child array\_ after this method returns. |
| in | \texttt{index} | add the child at this position in the array\_ |

**Returns**

- index to position the child as planned
- a new index to force the child to a different position
- -1 to keep the group from adding the candidate

Generated by Doxygen
Version
1.4.0

See also

\[ \text{Fl\_Group}:\text{on\_insert(Fl\_Widget } \ast \text{candidate, int index)} \]

Reimplemented from Fl\_Group.

34.122.3.7 on\_move()

\[ \text{int Fl\_Scroll}:\text{on\_move} \{ \]
\[ \quad \text{int old\_index}, \]
\[ \quad \text{int new\_index} \} \] [protected], [virtual]

Change new position of a child before it is moved.
Fix new position if the new child is planned to be moved after the scrollbars. We can assume that the scrollbars are always the last two children!
Fl\_Group calls this when a widget is moved within the list of children. We return a new index if the widget would be moved after the scrollbars.

Parameters

<table>
<thead>
<tr>
<th>old_index</th>
<th>the current index of the child that will be moved</th>
</tr>
</thead>
<tbody>
<tr>
<td>new_index</td>
<td>the new index of the child</td>
</tr>
</tbody>
</table>

Returns

new index, possibly corrected to avoid last two scrollbar entries

Reimplemented from Fl\_Group.

34.122.3.8 recalc\_scrollbars()

\[ \text{void Fl\_Scroll}:\text{recalc\_scrollbars} \{ \]
\[ \quad \text{ScrollInfo } \& \text{ si } \] const [protected]

Calculate visibility/size/position of scrollbars, find children's bounding box.
The si parameter will be filled with data from the calculations. Derived classes can make use of this call to figure out the scrolling area eg. during resize() handling.
This method does not change the scrollbars or their visibility. It calculates the scrollbar positions and visibility as they should be, according to the positions and sizes of the children.
You may need to call redraw() to make sure the widget gets updated.

Parameters

| in,out | si | ScrollInfo structure, filled with data |

See also

bbox()

34.122.3.9 resize()

\[ \text{void Fl\_Scroll}:\text{resize} \{ \]
\[ \quad \text{int X}, \]
\[ \quad \text{int Y}, \]

Generated by Doxygen
int W, int H) [virtual]

Resizes the Fl_Scroll widget and moves its children if necessary. The Fl_Scroll widget first resizes itself, and then it moves all its children if (and only if) the Fl_Scroll widget has been moved. The children are moved by the same amount as the Fl_Scroll widget has been moved, hence all children keep their relative positions.

Note

Fl_Scroll::resize() does not call Fl_Group::resize(), and child widgets are not resized.

Since children of an Fl_Scroll are not resized, the resizable() widget is ignored (if it is set).
The scrollbars are moved to their proper positions, as given by Fl_Scroll::scrollbar.align(), and switched on or off as necessary.

Note

Due to current (FLTK 1.3.x) implementation constraints some of this may effectively be postponed until the Fl_Scroll is drawn the next time. This may change in a future release.

See also

Fl_Group::resizable()
Fl_Widget::resize(int, int, int, int)

Reimplemented from Fl_Group.

34.122.3.10 scroll_to()

void Fl_Scroll::scroll_to ( int X, int Y )

Moves the contents of the scroll group to a new position. This is like moving the scrollbars of the Fl_Scroll around. For instance:

```plaintext
Fl_Scroll scroll (10,10,200,200);
Fl_Box b1 (10, 10, 50, 50, "b1"); // relative (x,y) = (0,0)
Fl_Box b2 (60, 60, 50, 50, "b2"); // relative (x,y) = (50,50)
Fl_Box b3 (60,110,50,50,"b3"); // relative (x,y) = (50,100)
// populate scroll with more children ...
scroll.end();
scroll.scroll_to(50,100);
```

will move the logical origin of the internal scroll area to (-50,-100) relative to the origin of the Fl_Scroll (10,10), i.e. Fl_Box b3 will be visible in the top left corner of the scroll area.

34.122.3.11 scrollbar_size() [1/2]

int Fl_Scroll::scrollbar_size ( ) const [inline]

Gets the current size of the scrollbars' troughs, in pixels.
If this value is zero (default), this widget will use the Fl::scrollbar_size() value as the scrollbar's width.

Returns

Scrollbar size in pixels, or 0 if the global Fl::scrollbar_size() is being used.

See also

Fl::scrollbar_size(int)
scrollbar_size() [2/2]

void Fl_Scroll::scrollbar_size (  
    int newSize ) [inline]

Sets the pixel size of the scrollbars' troughs to newSize, in pixels.  
Normally you should not need this method, and should use Fl::scrollbar_size(int) instead to manage the size of ALL 
your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally 
what you want.  
Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.  
Setting newSize to the special value of 0 causes the widget to track the global Fl::scrollbar_size(), which is the 
default.

Parameters

| in  | newSize    | Sets the scrollbar size in pixels.  
|     |            | If 0 (default), scrollbar size tracks the global Fl::scrollbar_size() |

See also

Fl::scrollbar_size()

xposition()

int Fl_Scroll::xposition ( ) const [inline]

Gets the current horizontal scrolling position.

yposition()

int Fl_Scroll::yposition ( ) const [inline]

Gets the current vertical scrolling position.

The documentation for this class was generated from the following files:

• Fl_Scroll.H
  • Fl_Scroll.cxx

FI_Scrollbar Class Reference

The FI_Scrollbar widget displays a slider with arrow buttons at the ends of the scrollbar.

#include <FI_Scrollbar.H>

Inheritance diagram for FI_Scrollbar:
Public Member Functions

- **Fl_Scrollbar** (int X, int Y, int W, int H, const char *L=0)
  
  Creates a new Fl_Scrollbar widget with given position, size, and label.

- int **handle** (int) FL_OVERRIDE

  Handles the specified event.

- int **linesize** () const

  Get the size of step, in lines, that the arrow keys move.

- void **linesize** (int i)

  This number controls how big the steps are that the arrow keys do.

- int **value** () const

  Gets the integer value (position) of the slider in the scrollbar.

- int **value** (int p)

  Sets the integer value (position) of the slider in the scrollbar.

- int **value** (int pos, int windowSize, int first_line, int total_lines)

  Sets the position, size and range of the slider in the scrollbar.

- **~Fl_Scrollbar** ()

  Destroys the Scrollbar.

Protected Member Functions

- void **draw** () FL_OVERRIDE

  Draws the widget.

Additional Inherited Members

34.123.1 Detailed Description

The Fl_Scrollbar widget displays a slider with arrow buttons at the ends of the scrollbar. Clicking on the arrows move up/left and down/right by linesize(). Scrollbars also accept FL_SHORTCUT events: the arrows move by linesize(), and vertical scrollbars take Page Up/Down (they move by the page size minus linesize()) and Home/End (they jump to the top or bottom).

Scrollbars have step(1) preset (they always return integers). If desired you can set the step() to non-integer values. You will then have to use casts to get at the floating-point versions of value() from Fl_Slider.

![Figure 34.42 Fl_Scrollbar](image)

Figure 34.42 Fl_Scrollbar

34.123.2 Constructor & Destructor Documentation

34.123.2.1 Fl_Scrollbar()

Fl_Scrollbar::Fl_Scrollbar ( int X, int Y, int W, }
Creates a new Fl_Scrollbar widget with given position, size, and label.
You need to do type(FL_HORIZONTAL) if you want a horizontal scrollbar.

### Member Function Documentation

#### draw()

```cpp
void Fl_Scrollbar::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own draw() method*, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.

#### handle()

```cpp
int Fl_Scrollbar::handle ( int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited `handle()` method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class.

This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your `handle()` method although you don't really handle the event. The effect would be to *filter event processing*, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the `handle()` method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't do anything with it.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>event</th>
<th>the kind of event received</th>
</tr>
</thead>
</table>

**Return values**

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

**See also**

Fl_Event

Reimplemented from Fl_Widget.

#### linesize()

```cpp
void Fl_Scrollbar::linesize ( )
```

Generated by Doxygen
This number controls how big the steps are that the arrow keys do. In addition page up/down move by the size last sent to \texttt{value()} minus one linesize(). The default is 16.

### 34.123.3.4 value() [1/3]

```cpp
int Fl_Scrollbar::value ( ) const [inline]
```

Get the integer value (position) of the slider in the scrollbar. You can get the floating point value with \texttt{Fl_Slider::value()}.

See also

- \texttt{Fl_Scrollbar::value(int p)}
- \texttt{Fl_Scrollbar::value(int pos, int size, int first, int total)}

### 34.123.3.5 value() [2/3]

```cpp
int Fl_Scrollbar::value ( int p ) [inline]
```

Sets the value (position) of the slider in the scrollbar.

See also

- \texttt{Fl_Scrollbar::value()}
- \texttt{Fl_Scrollbar::value(int pos, int size, int first, int total)}

### 34.123.3.6 value() [3/3]

```cpp
int Fl_Scrollbar::value ( int pos,
  int windowSize,
  int first_line,
  int total_lines ) [inline]
```

Sets the position, size and range of the slider in the scrollbar.

#### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>pos</th>
<th>position, first line displayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>windowSize</td>
<td>number of lines displayed</td>
</tr>
<tr>
<td>in</td>
<td>first_line</td>
<td>number of first line</td>
</tr>
<tr>
<td>in</td>
<td>total_lines</td>
<td>total number of lines</td>
</tr>
</tbody>
</table>

You should call this every time your window changes size, your data changes size, or your scroll position changes (even if in response to a callback from this scrollbar). All necessary calls to \texttt{redraw()} are done. Calls \texttt{Fl_Slider::scrollvalue(int pos, int size, int first, int total)}.

The documentation for this class was generated from the following files:

- \texttt{Fl_Scrollbar.H}
- \texttt{Fl_Scrollbar.cxx}

### 34.124 Fl_Scroll::Fl_Scrollbar_Data Struct Reference

A local struct to manage a scrollbar's xwyn region and tab values.

```cpp
#include <Fl_Scroll.H>
```
Public Attributes

- int first
  scrollbar tab's "number of first line"
- int h
- int pos
  scrollbar tab's "position of first line displayed"
- int size
  scrollbar tab's "size of window in lines"
- int total
  scrollbar tab's "total number of lines"
- int w
- int x
- int y

34.124.1 Detailed Description

A local struct to manage a scrollbar's xywh region and tab values.
The documentation for this struct was generated from the following file:

- Fl_Scroll.H

34.125 Fl_Secret_Input Class Reference

The Fl_Secret_Input class is a subclass of Fl_Input that displays its input as a string of placeholders.

#include <Fl_Secret_Input.H>

Inheritance diagram for Fl_Secret_Input:

```
Fl_Widget
  Fl_Input_
  Fl_Input
  Fl_Secret_Input
```

Public Member Functions

- Fl_Secret_Input (int X, int Y, int W, int H, const char *l=0)
  Creates a new Fl_Secret_Input widget using the given position, size, and label string.
- int handle (int) FL_OVERRIDE
  Handles the specified event.

Additional Inherited Members

34.125.1 Detailed Description

The Fl_Secret_Input class is a subclass of Fl_Input that displays its input as a string of placeholders.
Depending on the platform this placeholder is either the asterisk ('*') or the Unicode bullet character (U+2022).
This subclass is usually used to receive passwords and other "secret" information.

34.125.2 Constructor & Destructor Documentation
34.125.2.1 Fl_Secret_Input()

Fl_Secret_Input::Fl_Secret_Input (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ l = 0 )

Creates a new Fl_Secret_Input widget using the given position, size, and label string.  
The default boxtype is FL_DOWN_BOX.  
Inherited destructor destroys the widget and any value associated with it.

34.125.3 Member Function Documentation

34.125.3.1 handle()

int Fl_Secret_Input::handle (    
    int event ) [virtual]

Handles the specified event.  
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.  
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.  
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short- 
circuit events that you don't handle. In this last case you should return the callee retval.  
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.  
This requires knowledge of the details of the inherited class.  
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The 
effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) 
in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In 
such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by 
returning 1 even if you didn't do anything with it.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>event</th>
<th>the kind of event received</th>
</tr>
</thead>
</table>

Return values

<table>
<thead>
<tr>
<th>0</th>
<th>if the event was not used or understood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

Fl_Event

Reimplemented from Fl_Input.  
The documentation for this class was generated from the following files:

- Fl_Secret_Input.H
- Fl_Input.cxx

34.126 Fl_Select_Browser Class Reference

The class is a subclass of Fl_Browser which lets the user select a single item, or no items by clicking on the empty 
space.  
#include <Fl_Select_Browser.H>
Inheritance diagram for Fl_Select_Browser:

```
Fl_Widget
   ▼
    Fl_Group
       ▼
        Fl_Browser_
             ▼
              Fl_Browser
                  ▼
                   Fl_Select_Browser
```

Public Member Functions

- **Fl_Select_Browser** (int X, int Y, int W, int H, const char *L=0)
  
  Creates a new Fl_Select_Browser widget using the given position, size, and label string.

Additional Inherited Members

### 34.126.1 Detailed Description

The class is a subclass of Fl_Browser which lets the user select a single item, or no items by clicking on the empty space.

As long as the mouse button is held down on an unselected item it is highlighted. Normally the callback is done when the user presses the mouse, but you can change this with when().

See Fl_Browser for methods to add and remove lines from the browser.

### 34.126.2 Constructor & Destructor Documentation

#### 34.126.2.1 Fl_Select_Browser()

```cpp
Fl_Select_Browser::Fl_Select_Browser (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * L = 0  
)
```

Creates a new Fl_Select_Browser widget using the given position, size, and label string.

The default boxtype is FL_DOWN_BOX. The constructor specializes Fl_Browser() by setting the type to FL_SELECT_BROWSER. The destructor destroys the widget and frees all memory that has been allocated.

The documentation for this class was generated from the following files:

- Fl_Select_Browser.H
- Fl_Browser.cxx

### 34.127 Fl_Shared_Image Class Reference

This class supports caching, loading, and drawing of image files.

```cpp
#include <Fl_Shared_Image.H>
```

Inheritance diagram for Fl_Shared_Image:
Public Member Functions

- `Fl_Shared_Image * as_shared_image () FL_OVERRIDE`
  Returns whether an image is an `Fl_Shared_Image` or not.
- `void color_average (FLTK_color c, float i) FL_OVERRIDE`
  The `color_average()` method averages the colors in the image with the provided FLTK color value.
- `Fl_Image * copy () const`
- `Fl_Image * copy (int W, int H) const FL_OVERRIDE`
  Creates a resized copy of the image.
- `void desaturate () FL_OVERRIDE`
  The `desaturate()` method converts an image to grayscale.
- `void draw (int X, int Y)`
- `void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE`
  Draws the image to the current drawing surface with a bounding box.
- `const Fl_Image * image () const`
  Returns a pointer to the internal Fl_Image object.
- `const char * name ()`
  Returns the filename of the shared image.
- `int original ()`
  Returns whether this is an original image.
- `int refcount ()`
  Returns the number of references of this shared image.
- `void release () FL_OVERRIDE`
  Releases and possibly destroys (if refcount <= 0) a shared image.
- `virtual void reload ()`
  Reloads the shared image from disk.
- `void uncache () FL_OVERRIDE`
  If the image has been cached for display, delete the cache data.

Static Public Member Functions

- `static void add_handler (Fl_Shared_Handler f)`
  Adds a shared image handler, which is basically a test function for adding new image formats.
- `static Fl_Shared_Image * find (const char *name, int W=0, int H=0)`
  Finds a shared image from its name and size specifications.
- `static Fl_Shared_Image * get (const char *name, int W=0, int H=0)`
  Finds or load an image that can be shared by multiple widgets.
- `static Fl_Shared_Image * get (Fl_RGB_Image *rgb, int own_it=1)`
  Builds a shared image from a pre-existing Fl_RGB_Image.
- `static Fl_Shared_Image ** images ()`
  Returns the Fl_Shared_Image* array.
- `static int num_images ()`
  Returns the total number of shared images in the array.
- `static void remove_handler (Fl_Shared_Handler f)`
  Removes a shared image handler.
Protected Member Functions

- void add ()
  Adds a shared image to the image cache.
- Fl_Shared_Image ()
  Creates an empty shared image.
- Fl_Shared_Image (const char ∗n, Fl_Image ∗img=0)
  Creates a shared image from its filename and its corresponding Fl_Image∗ img.
- void update ()
- virtual ∼Fl_Shared_Image ()
  The destructor frees all memory and server resources that are used by the image.

Static Protected Member Functions

- static int compare (Fl_Shared_Image **i0, Fl_Shared_Image **i1)
  Compares two shared images.

Protected Attributes

- int alloc_image_
- Fl_Image ∗image_
- const char ∗name_
- int original_
- int refcount_

Static Protected Attributes

- static int alloc_handlers_ = 0
- static int alloc_images_ = 0
- static Fl_Shared_Handler ∗handlers_ = 0
- static Fl_Shared_Image **images_ = 0
- static int num_handlers_ = 0
- static int num_images_ = 0

Friends

- class Fl_Graphics_Driver
- class Fl_JPEG_Image
- class Fl_PNG_Image
- class Fl_SVG_Image

Additional Inherited Members

34.127.1 Detailed Description

This class supports caching, loading, and drawing of image files. Most applications will also want to link against the fltk_images library and call the fl_register_images() function to support standard image formats such as BMP, GIF, JPEG, PNG, and SVG (unless the library was built with the option removing SVG support). Images can be requested (loaded) with Fl_Shared_Image::get(), find(), and some other methods. All images are cached in an internal list of shared images and should be released when they are no longer needed. A refcount is used to determine if a released image is to be destroyed with delete.

See also

- fl_register_image()
- Fl_Shared_Image::get()
- Fl_Shared_Image::find()
- Fl_Shared_Image::release()
34.127.2 Constructor & Destructor Documentation

34.127.2.1 Fl_Shared_Image() [1/2]

Fl_Shared_Image::Fl_Shared_Image ( ) [protected]
Creates an empty shared image.
The constructors create a new shared image record in the image cache.
The constructors are protected and cannot be used directly from a program. Use the get() method instead.

34.127.2.2 Fl_Shared_Image() [2/2]

Fl_Shared_Image::Fl_Shared_Image (const char ∗ n, Fl_Image ∗ img = 0 ) [protected]
Creates a shared image from its filename and its corresponding Fl_Image* img.
The constructors create a new shared image record in the image cache.
The constructors are protected and cannot be used directly from a program. Use the get() method instead.

34.127.2.3 ~Fl_Shared_Image()

Fl_Shared_Image::~Fl_Shared_Image ( ) [protected], [virtual]
The destructor frees all memory and server resources that are used by the image.
The destructor is protected and cannot be used directly from a program. Use the Fl_Shared_Image::release() method instead.

34.127.3 Member Function Documentation

34.127.3.1 add()

void Fl_Shared_Image::add ( ) [protected]
Adds a shared image to the image cache.
This protected method adds an image to the cache, an ordered list of shared images. The cache is searched for a
matching image whenever one is requested, for instance with Fl_Shared_Image::get() or Fl_Shared_Image::find().

34.127.3.2 add_handler()

void Fl_Shared_Image::add_handler ( Fl_Shared_Handler f ) [static]
Adds a shared image handler, which is basically a test function for adding new image formats.
This function will be called when an Fl_Shared_Image is to be loaded (for instance with Fl_Shared_Image::get())
and the image type is not known to FLTK.
All registered image handlers will be called in the order of registration. You should always call fl_register_images()
before adding your own handlers - unless you need to override a known image file type which should be rare.
See also

Fl_Shared_Handler for more information of the function you need to define.

34.127.3.3 as_shared_image()

Fl_Shared_Image ∗ Fl_Shared_Image::as_shared_image ( ) [inline], [virtual]
Returns whether an image is an Fl_Shared_Image or not.
This virtual method returns a pointer to an Fl_Shared_Image if this object is an instance of Fl_Shared_Image
or NULL if not. This can be used to detect if a given Fl_Image object is a shared image, i.e. derived from
Fl_Shared_Image.
Since 1.4.0

Reimplemented from Fl_Image.

### 34.127.3.4 color_average()

```cpp
void Fl_Shared_Image::color_average ( Fl_Color c, float i ) [virtual]
```

The `color_average()` method averages the colors in the image with the provided FLTK color value. The first argument specifies the FLTK color to be used. The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color. An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory. Reimplemented from Fl_Image.

### 34.127.3.5 compare()

```cpp
int Fl_Shared_Image::compare ( Fl_Shared_Image **i0, Fl_Shared_Image **i1 ) [static], [protected]
```

Compares two shared images.
The order of comparison is:

1. Image name, usually the filename used to load it
2. Image width
3. Image height

Binary search in a sorted array works only if we search for the same parameters that were also used for sorting. No special cases are possible here. `Fl_Shared_Image::find()` requires a search for an element with a matching name and the original_ flags set. This is not implemented via binary search, but by a simple run of the array inside `Fl_Shared_Image::find()`.

The order of comparison is:

Returns

Whether the images match or their relative sort order (see text).

Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>the images match</td>
</tr>
<tr>
<td>&lt;0</td>
<td>Image i0 is less than image i1</td>
</tr>
<tr>
<td>&gt;0</td>
<td>Image i0 is greater than image i1</td>
</tr>
</tbody>
</table>

### 34.127.3.6 copy()

```cpp
Fl_Image * Fl_Shared_Image::copy ( int W, int H ) const [virtual]
```

Creates a resized copy of the image.
The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use `Fl_Image::release()` for all types of images (i.e. all subclasses of Fl_Image)
instead of operator delete for Fl_Image's and Fl_Image::release() for Fl_Shared_Image's.
The new image data will be converted to the requested size. RGB images are resized using the algorithm set by
Fl_Image::RGB_scaling().
For the new image the following equations are true:

- \( w() = \text{data}_w() = W \)
- \( h() = \text{data}_h() = H \)

**Parameters**

| in | W/H | Requested width and height of the new image |

**Note**

The returned image can be safely cast to the same image type as that of the source image provided this type
is one of Fl_RGB_Image, Fl_SVG_Image, Fl_Pixmap, Fl_Bitmap, Fl_Tiled_Image, Fl_Anim_GIF_Image and
Fl_Shared_Image. Returned objects copied from images of other, derived, image classes belong to the parent
class appearing in this list. For example, the copy of an Fl_GIF_Image is an object of class Fl_Pixmap.
Since FLTK 1.4.0 this method is 'const'. If you derive your own class from Fl_Image or any subclass your
overridden methods of 'Fl_Image::copy() const' and 'Fl_Image::copy(int, int) const' must also be 'const'
for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not
been 'const'.

Reimplemented from Fl_Image.

### 34.127.3.7 desaturate()

```cpp
void Fl_Shared_Image::desaturate ( ) [virtual]
```

The desaturate() method converts an image to grayscale.
If the image contains an alpha channel (depth = 4), the alpha channel is preserved.
An internal copy is made of the original image data before changes are applied, to avoid modifying the original
image data in memory.
Reimplemented from Fl_Image.

### 34.127.3.8 draw()

```cpp
void Fl_Shared_Image::draw (
    int X, int Y, int W, int H, int cx = 0, int cy = 0 ) [virtual]
```

Draws the image to the current drawing surface with a bounding box.
Arguments \( X, Y, W, H \) specify a bounding box for the image, with the origin (upper-left corner) of the image offset
by the \( cx \) and \( cy \) arguments.
In other words: fl_push_clip(X,Y,W,H) is applied, the image is drawn with its upper-left corner at
\( X-cx,Y-cy \) and its own width and height, fl_pop_clip() is applied.
Reimplemented from Fl_Image.

### 34.127.3.9 find()

```cpp
Fl_Shared_Image * Fl_Shared_Image::find ( const char * name,
```

Generated by Doxygen
Finds a shared image from its name and size specifications. This uses a binary search in the image cache.

If the image name exists with the exact width \( W \) and height \( H \), then it is returned.

If \( W = 0 \) and the image name exists with another size, then the original image with that name is returned.

In either case the refcount of the returned image is increased. The found image should be released with Fl_Shared_Image::release() when no longer needed.

An image is marked original if it was directly loaded from a file or from memory as opposed to copied and resized images.

This comparison is used in Fl_Shared_Image::find() to find an image that matches the requested one or to find the position where a new image should be entered into the sorted list of shared images.

It is used in two steps by Fl_Shared_Image::add():

1. search with exact width and height
2. if not found, search again with width = 0 (and height = 0)

The first step will only return a match if the image exists with the same width and height. The second step will match if there is an image marked original with the same name, regardless of width and height.

34.127.3.10  get()  [1/2]

Fl_Shared_Image ∗ Fl_Shared_Image::get ( const char ∗ name,
int \( W = 0 \),
int \( H = 0 \ )  \ [\text{static}]$

Find or load an image that can be shared by multiple widgets.

If the image exists with the requested size, this image will be returned.

If the image exists, but only with another size, then a new copy with the requested size (width \( W \) and height \( H \)) will be created as a resized copy of the original image. The new image is added to the internal list of shared images.

If the image does not yet exist, then a new image of the proper dimension is created from the filename name. The original image from filename name is always added to the list of shared images in its original size. If the requested size differs, then the resized copy with width \( W \) and height \( H \) is also added to the list of shared images.

Note

If the sizes differ, then two images are created as mentioned above. This is intentional so the original image is cached and preserved. If you request the same image with another size later, then the original image will be found, copied, resized, and returned.

Shared JPEG and PNG images can also be created from memory by using their named memory access constructor. You should release() the image when you're done with it.

Parameters

<table>
<thead>
<tr>
<th>name</th>
<th>name of the image</th>
</tr>
</thead>
<tbody>
<tr>
<td>W,H</td>
<td>desired size</td>
</tr>
</tbody>
</table>

See also

Fl_Shared_Image::find(const char ∗name, int W, int H)
Fl_Shared_Image::release()

Fl_JPEG_Image::Fl_JPEG_Image(const char ∗name, const unsigned char ∗data)
Fl_PNG_Image::Fl_PNG_Image (const char ∗name_png, const unsigned char ∗buffer, int maxsize)
34.127.3.11  get() [2/2]

 Fl_Shared_Image ∗ Fl_Shared_Image::get (  
  Fl_RGB_Image ∗ rgb,  
  int own_it = 1 ) [static]

Builds a shared image from a pre-existing Fl_RGB_Image.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>rgb</th>
<th>an Fl_RGB_Image used to build a new shared image.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>own_it</td>
<td>1 if the shared image should delete rgb when it is itself deleted, 0 otherwise</td>
</tr>
</tbody>
</table>

Version

1.3.4

34.127.3.12  image()

const Fl_Image ∗ Fl_Shared_Image::image ( ) const [inline]

Returns a pointer to the internal Fl_Image object.
The output is a pointer to the internal image ('Fl_Image' or subclass) which can be used to inspect or copy the image.

Do not try to modify the image! You can copy the image though if you want or need to change any attributes, size etc. If all you need to do is to resize the image you should use Fl_Shared_Image::copy(int, int) instead.

Note

The internal image (pointer) is protected for good reasons, e.g. to prevent access to the image so it can't be modified by user code. DO NOT cast away the 'const' attribute to modify the image.

User code should rarely need this method. Use with caution.

Returns

const Fl_Image ∗ image, the internal Fl_Image

Since

1.4.0

34.127.3.13  original()

int Fl_Shared_Image::original ( ) [inline]

Returns whether this is an original image.
Images loaded from a file or from memory are marked original as opposed to images created as a copy of another image with different size (width or height).

Note

This is useful for debugging (rarely used in user code).

Since

FLTK 1.4.0
34.127.3.14 refcount()

Returns the number of references of this shared image.
When reference is below 1, the image is deleted.

34.127.3.15 release()

Releases and possibly destroys (if refcount <= 0) a shared image.
In the latter case, it will reorganize the shared image array so that no hole will occur.
Reimplemented from Fl_Image.

34.127.3.16 uncache()

If the image has been cached for display, delete the cache data.
This allows you to change the data used for the image and then redraw it without recreating an image object.
Reimplemented from Fl_Image.

The documentation for this class was generated from the following files:

- Fl_Shared_Image.H
- Fl_Shared_Image.cxx

34.128 Fl_Shortcut_Button Class Reference

A button that allows the user to type a key combination to create shortcuts.

Inheritance diagram for Fl_Shortcut_Button:

```
Fl_Widget
  Fl_Button
  Fl_Shortcut_Button
```

Public Member Functions

- **Fl_Shortcut_Button** (int X, int Y, int W, int H, const char *l=0)
  Construct a shortcut button.
- **Fl_Shortcut value ()**
  Return the user selected shortcut.
- **void value (Fl_Shortcut shortcut)**
  Set the displayed shortcut.

Protected Member Functions

- **void do_end_hot_callback ()**
  Call the callback if the user is interested.
- **void draw () FL_OVERRIDE**
  Draw the textual representation of the shortcut button.
- **int handle (int) FL_OVERRIDE**
  Handle keystrokes to catch the user’s shortcut.
Protected Attributes

- Fl_Shortcut shortcut_value

Additional Inherited Members

34.128.1 Detailed Description

A button that allows the user to type a key combination to create shortcuts. After clicked once, the button catches the following keyboard events and records the pressed keys and all modifiers. It draws a text representation of the shortcut. The backspace key deletes the current shortcut. A second click on the button or moving focus makes the last shortcut permanent. The Shortcut button calls the user callback after every change if FL_WHEN_CHANGED is set, and when the button is no longer recording shortcuts if FL_WHEN_RELEASE is set.

34.128.2 Constructor & Destructor Documentation

34.128.2.1 Fl_Shortcut_Button()

Fl_Shortcut_Button::Fl_Shortcut_Button (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )

Construct a shortcut button.

Parameters

<table>
<thead>
<tr>
<th>X, Y, W, H</th>
<th>position and size of the button</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>label text when no shortcut is set</td>
</tr>
</tbody>
</table>

34.128.3 Member Function Documentation

34.128.3.1 draw()

void Fl_Shortcut_Button::draw (  
    void ) [protected], [virtual]

Draw the textual representation of the shortcut button. When the button can receive shortcut key events, it's "hot". A hot button is drawn in selection color. A cold button is drawn as a regular text box containing a human readable version of the shortcut key. Reimplemented from Fl_Button.

34.128.3.2 handle()

int Fl_Shortcut_Button::handle (  
    int e ) [protected], [virtual]

Handle keystrokes to catch the user's shortcut. Reimplemented from Fl_Button.
34.128.3.3 value() [1/2]

FlShortcut FlShortcut_Button::value ()
Return the user selected shortcut.
Returns

shortcut encoded as key and modifier

34.128.3.4 value() [2/2]

void FlShortcut_Button::value ( 
    FlShortcut shortcut )
Set the displayed shortcut.
Parameters

| in | shortcut | encoded as key and modifier |

The documentation for this class was generated from the following files:

• FlShortcut_Button.H
• FlShortcut_Button.cxx

34.129 FlSimple_Counter Class Reference

This widget creates a counter with only 2 arrow buttons.
#include <Fl_Simple_Counter.H>
Inheritance diagram for FlSimple_Counter:

![Inheritance diagram for FlSimple_Counter](image)

Public Member Functions

• FlSimple_Counter (int X, int Y, int W, int H, const char ∗L=0)

Additional Inherited Members

34.129.1 Detailed Description

This widget creates a counter with only 2 arrow buttons.
The documentation for this class was generated from the following files:

- Fl_Simple_Counter.H
- Fl_Counter.cxx

34.130 Fl_Simple_Terminal Class Reference

This is a continuous text scroll widget for logging and debugging output, much like a terminal.

```c
#include <Fl_Simple_Terminal.H>
```

Inheritance diagram for Fl_Simple_Terminal:

```
Fl_Widget
  ↓
Fl_Group
  ↓
Fl_Text_Display
  ↓
Fl_Simple_Terminal
```

Public Member Functions

- `bool ansi () const`
  
  Get the state of the ANSI flag which enables/disables the handling of ANSI sequences in text.

- `void ansi (bool val)`
  
  Enable/disable support of ANSI sequences like "\033[31m", which sets the color/font/weight/size of any text that follows.

- `bool ansi_show_unknown () const`
  
  See if we should show unknown ANSI sequences with '¿' or not.

- `void ansi_show_unknown (bool val)`
  
  Enable showing unknown ESC sequences with the '¿' character.

- `void append (const char ∗s, int len=-1)`
  
  Appends new string 's' of length 'len' to terminal.

- `void clear ()`
  
  Clears the terminal's screen and history.

- `int current_style () const`
  
  Get the current style char used for style buffer.

- `int current_style_index () const`
  
  Get the style table index used as the current drawing color/font/weight/size for new text.

- `void current_style_index (int)`
  
  Set the style table index used as the current drawing color/font/weight/size for new text.

- `Fl_Simple_Terminal (int X, int Y, int W, int H, const char ∗l=0)`
  
  Creates a new Fl_Simple_Terminal widget that can be a child of other FLTK widgets.

- `int history_lines () const`
  
  Get the maximum number of terminal history lines last set by history_lines(int).

- `void history_lines (int)`
  
  Sets the maximum number of lines for the terminal history.

- `int normal_style_index () const`
  
  Gets the style table index used by the ANSI terminal reset sequence "\033[0m".

- `void normal_style_index (int)`
  
  Sets the maximum number of lines for the terminal history.
Sets the style table index used by the ANSI terminal reset sequence "\033[0m", which resets the current drawing color/font/weight/size to "normal".

- void printf (const char *fmt,....)
  Appends printf formatted messages to the terminal.

- void remove_lines (int start, int count)
  Remove the specified range of lines from the terminal, starting with line 'start' and removing 'count' lines.

- bool stay_at_bottom () const
  Gets the current value of the stay_at_bottom(bool) flag.

- void stay_at_bottom (bool)
  Configure the terminal to remain scrolled to the bottom when possible, chasing the end of the buffer whenever new text is added.

- const Fl_Text_Display::Style_Table_Entry *style_table () const
  Return the current style table being used.

- void style_table (Fl_Text_Display::Style_Table_Entry *stable, int stable_size, int normal_style_index=0)
  Set a user defined style table, which controls the font colors, faces, weights and sizes available for the terminal's text content.

- int style_table_size () const
  Return the current style table's size (in bytes).

- const char * text () const
  Returns entire text content of the terminal as a single string.

- void text (const char *s, int len=-1)
  Replaces the terminal with new text content in string 's'.

- void vprintf (const char *fmt, va_list ap)
  Appends printf formatted messages to the terminal.

- ~Fl_Simple_Terminal ()
  Destructor for this widget; removes any internal allocations for the terminal, including text buffer, style buffer, etc.

Protected Member Functions

- void append_ansi (const char *s, int len)
  Handle appending string with ANSI escape sequences, and other 'special' character processing (such as backspaces).

- void backspace_buffer (unsigned int count)
  Destructive backspace from end of existing buffer() for specified count characters.

- void draw () FL_OVERRIDE
  Draws the widget, including a cursor at the end of the buffer.

- void enforce_history_lines ()
  Enforce 'history_lines' limit on the history buffer by trimming off lines from the top of the buffer.

- void enforce_stay_at_bottom ()
  Scroll to last line unless someone has manually scrolled the vertical scrollbar away from the bottom.

- void handle_backspace ()
  Handle a Unicode aware backspace.

- void unknown_escape ()
  void vscroll_cb2 (Fl_Widget *, void *)

Static Protected Member Functions

- static void vscroll_cb (Fl_Widget *, void *)

Protected Attributes

- Fl_Text_Buffer * buf
- Fl_Text_Buffer * sbuf
Additional Inherited Members

34.130.1 Detailed Description

This is a continuous text scroll widget for logging and debugging output, much like a terminal.
Includes printf() for appending messages, a line limit for the screen history size, ANSI sequences to control text
color, font face, font weight and font size.
This is useful in place of using stdout/stderr for logging messages when no terminal is available, such as when an
application is invoked from a desktop shortcut, dock, or file browser.
Like a regular console terminal, the vertical scrollbar 'tracks' the bottom of the buffer as new output is added. If
the user scrolls away from the bottom, this 'tracking' feature is temporarily suspended, so the user can browse the
terminal history without fighting the scrollbar when new text is added asynchronously. When the user returns the
scroller to the bottom of the display, the scrollbar's tracking resumes.
Features include:

- history_lines(int) can define a maximum size for the terminal screen history
- stay_at_bottom(bool) can be used to cause the terminal to keep scrolled to the bottom
- ansi(bool) enables ANSI sequences within the text to control text colors
- style_table() can be used to define custom color/font/weight/size combinations

What this widget is NOT is a full terminal emulator; it does NOT handle stdio redirection, pipes, pseudo tys,
termio character cooking, keyboard input processing, screen addressing, random cursor positioning, curses(3)
compatibility, or VT100/xterm emulation.
It is a simple text display widget that leverages the features of the Fl_Text_Display base class to handle terminal-like
behavior, such as logging events or debug information.
Example use:

```c++
#include <FL/Fl_Simple_Terminal.H>

tty = new Fl_Simple_Terminal(...);
tty->ansi(true); // enable use of "\033[0m"
tty->printf("The time is now: \033[32m%s\033[0m", date_time_str);
```

Example application:

Style Tables For Color/Font/Fontsize Control

Internally this widget derives from Fl_Text_Display, and therefore inherits some of its idiosyncracies. In particular,
when colors are used, the base class's concept of a 'style table' is used.
The 'style table' is similar to a color mapped image; where each pixel is a single value that is an index into a table of
colors to minimize per-pixel memory use.
The style table has a similar goal; since every character in the terminal can potentially be a different color, instead
of managing several integer attribute values per-character, a single character for each character is used as an index
into the style table, choosing one of the available color/font/weight/size values available. This saves on as much as
3 to 4 times the memory use, useful when there's a large amount of text.
When ansi() is set to 'true', ANSI sequences of the form "\033[#m" can be used to select different colors, font faces,
font weights (bold,italic..), and font sizes, where '#' is the index number into the style table. Example:

```
\033[0mThis text uses the 1st entry in the style table\n\033[1mThis text uses the 2nd entry in the style table\n\033[2mThis text uses the 3rd entry in the style table\n```

There is a built-in style table that provides some commonly used ANSI colors for "\033[30m" through "\033[37m"
(blk,red,grn,yel,blu,mag,cyn,wht), and a brighter version of those colors for "\033[40" through "\033[47m". See
ansi(bool) for more info.
You can also supply a custom style table using style_table(Style_Table_Entry*,int,int), allowing you to define your
own color/font/weight/size combinations. See that method's docs for more info.
All style index numbers are rounded to the size of the style table (via modulus) to protect the style array from
overruns.

34.130.2 Member Function Documentation

Generated by Doxygen
34.130.2.1 ansi() [1/2]

`bool Fl_Simple_Terminal::ansi ( ) const`

Get the state of the ANSI flag which enables/disables the handling of ANSI sequences in text.
When true, ANSI sequences in the text stream control color, font and font sizes of text (e.g. "\033[41mThis is Red\033[0m"). For more info, see `ansi(bool)`.

See also

`ansi(bool)`

34.130.2.2 ansi() [2/2]

`void Fl_Simple_Terminal::ansi ( bool val )`

Enable/disable support of ANSI sequences like "\033[31m", which sets the color/font/weight/size of any text that follows.
If enabled, ANSI sequences of the form "\033[#{m}" can be used to change font color, face, and size, where '#' is an index number into the current style table. These "escape sequences" are hidden from view.
If disabled, the `textcolor()` / `textfont()` / `textsize()` methods define the color and font for all text in the terminal. ANSI sequences are not handled specially, and rendered as raw text.
A built-in style table is provided, but you can configure a custom style table using `style_table(Style_Table_Entry*, int, int)` for your own colors and fonts.

The built-in style table supports these ANSI sequences:

<table>
<thead>
<tr>
<th>ANSI Sequence</th>
<th>Color Name</th>
<th>Font Face + Size</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;\033[0m&quot;</td>
<td>&quot;Normal&quot;</td>
<td>FL_COURIER, 14</td>
<td>Resets to default color/font/weight/size</td>
</tr>
<tr>
<td>&quot;\033[30m&quot;</td>
<td>Medium Black</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[31m&quot;</td>
<td>Medium Red</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[32m&quot;</td>
<td>Medium Green</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[33m&quot;</td>
<td>Medium Yellow</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[34m&quot;</td>
<td>Medium Blue</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[35m&quot;</td>
<td>Medium Magenta</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[36m&quot;</td>
<td>Medium Cyan</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[37m&quot;</td>
<td>Medium White</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[40m&quot;</td>
<td>Bright Black</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[41m&quot;</td>
<td>Bright Red</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[42m&quot;</td>
<td>Bright Green</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[43m&quot;</td>
<td>Bright Yellow</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[44m&quot;</td>
<td>Bright Blue</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[45m&quot;</td>
<td>Bright Magenta</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[46m&quot;</td>
<td>Bright Cyan</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
<tr>
<td>&quot;\033[47m&quot;</td>
<td>Bright White</td>
<td>FL_COURIER, 14</td>
<td></td>
</tr>
</tbody>
</table>

Here's example code demonstrating the use of ANSI codes to select the built-in colors, and how it looks in the terminal:

![Figure 34.44 Fl_Simple_Terminal built-in ANSI sequences](image)

Note

Changing the `ansi(bool)` value clears the buffer and forces a `redraw()`.

Enabling ANSI mode overrides `textfont()`, `textsize()`, `textcolor()` completely, which are controlled instead by `current_style_index()` and the current `style_table()`.

See also

`style_table(Style_Table_Entry*, int, int)`, `current_style_index()`, `normal_style_index()`
34.130.2.3 ansi_show_unknown() [1/2]

bool Fl_Simple_Terminal::ansi_show_unknown (  
  void ) const

See if we should show unknown ANSI sequences with '¿' or not.

See also

ansi_show_unknown(bool)

34.130.2.4 ansi_show_unknown() [2/2]

void Fl_Simple_Terminal::ansi_show_unknown (  
  bool val )

Enable showing unknown ESC sequences with the '¿' character.  
By default this is off, and unknown escape sequences are silently ignored.

See also

ansi_show_unknown()

34.130.2.5 append()

void Fl_Simple_Terminal::append (  
  const char * s,  
  int len = -1 )

Appends new string 's' of length 'len' to terminal.  
The string can contain UTF-8, crlf's. And if ansi(bool) is set to 'true', ANSI 'ESC' sequences (such as ESC[1m) and other control characters (such as backspace) are handled.

Parameters

<table>
<thead>
<tr>
<th>s</th>
<th>string to append.</th>
</tr>
</thead>
<tbody>
<tr>
<td>len</td>
<td>optional length of string can be specified if known to save the internals from having to call strlen(). If -1 is specified for len, strlen(s) is used to find the length.</td>
</tr>
</tbody>
</table>

See also

printf(), vprintf(), text(), clear()

34.130.2.6 append_ansi()

void Fl_Simple_Terminal::append_ansi (  
  const char * s,  
  int len ) [protected]

Handle appending string with ANSI escape sequences, and other 'special' character processing (such as backspaces).

- s – the string containing ANSI codes to be appended
- len – the length of the string to be appended, or -1 for a NULL terminated string.
34.130.2.7 backspace_buffer()

void Fl_Simple_Terminal::backspace_buffer (unsigned int count) [protected]

Destructive backspace from end of existing buffer() for specified count characters.
Takes into account multi-byte (Unicode) chars. So if count is 3, last 3 chars are deleted from end of buffer.

34.130.2.8 clear()

void Fl_Simple_Terminal::clear (void)

Clears the terminal's screen and history.
Cursor moves to top of window.

34.130.2.9 current_style()

int Fl_Simple_Terminal::current_style () const

Get the current style char used for style buffer.
This character appends in parallel with any text in the text buffer to specify the per-character styling. This is typically 'A' for the first entry, 'B' for the second entry, etc.
This value is changed by current_style_index(int).

See also

  current_style_index(int)

34.130.2.10 current_style_index() [1/2]

int Fl_Simple_Terminal::current_style_index () const

Get the style table index used as the current drawing color/font/weight/size for new text.
This value is also controlled by the ANSI sequence "\033[#m", where # would be a new style index value. So if the application executes: term->append("\033[4mTesting"), then current_style_index() returns 4.

See also

  current_style_index(int)

34.130.2.11 current_style_index() [2/2]

void Fl_Simple_Terminal::current_style_index (int val)

Set the style table index used as the current drawing color/font/weight/size for new text.
For example:

  tty->ansi(true);
  tty->append("Some normal text.\n");
  tty->current_style_index(2); // same as "\033[2n"
  tty->append("This text will be green.\n");
  tty->current_style_index(tty->normal_style_index()); // same as "\033[0n"
  tty->append("Back to normal text.\n");

This value can also be changed by an ANSI sequence like "\033[#m", where # would be a new style index value. So if the application executes: term->append("\033[4mTesting"), then current_style_index() will be left set to 4.
The index number specified should be within the number of items in the current style table. Values larger than the table will be clamped to the size of the table with a modulus operation. Effective only when ansi(bool) is 'true'.

Generated by Doxygen
34.130.2.12 draw()

```cpp
void Fl_Simple_Terminal::draw (
    void ) [protected], [virtual]
```

Draws the widget, including a cursor at the end of the buffer. This is needed since currently Fl_Text_Display doesn't provide a reliable way to always do this. Reimplemented from Fl_Group.

34.130.2.13 enforce_history_lines()

```cpp
void Fl_Simple_Terminal::enforce_history_lines ( ) [protected]
```

Enforce 'history_lines' limit on the history buffer by trimming off lines from the top of the buffer. This is a protected member called automatically by the public API functions. Only internal methods or subclasses adjusting the internal buffer directly should need to call this.

34.130.2.14 enforce_stay_at_bottom()

```cpp
void Fl_Simple_Terminal::enforce_stay_at_bottom ( ) [protected]
```

Scroll to last line unless someone has manually scrolled the vertical scrollbar away from the bottom. This is a protected member called automatically by the public API functions. Only internal methods or subclasses adjusting the internal buffer directly should need to call this.

34.130.2.15 handle_backspace()

```cpp
void Fl_Simple_Terminal::handle_backspace ( ) [protected]
```

Handle a Unicode aware backspace. This flushes the string parsed so far to Fl_Text_Display, then lets Fl_Text_Display handle the unicode aware backspace.

34.130.2.16 history_lines() [1/2]

```cpp
int Fl_Simple_Terminal::history_lines ( ) const
```

Get the maximum number of terminal history lines last set by history_lines(int). `-1` indicates an unlimited scroll history.

See also

```cpp
history_lines(int)
```

34.130.2.17 history_lines() [2/2]

```cpp
void Fl_Simple_Terminal::history_lines (  
    int maxlines )
```

Sets the maximum number of lines for the terminal history. The new limit value is automatically enforced on the current screen history, truncating off any lines that exceed the new limit. When a limit is set, the buffer is trimmed as new text is appended, ensuring the buffer never displays more than the specified number of lines. The default maximum is 500 lines.

Parameters

| maxlines | Maximum number of lines kept on the terminal buffer history. Use -1 for an unlimited scroll history. A value of 0 is not recommended. |
### 34.130.2.18 normal_style_index() [1/2]

```cpp
int Fl_Simple_Terminal::normal_style_index ( ) const
```

Gets the style table index used by the ANSI terminal reset sequence `"\033[0m"`. This is the value last set by `normal_style_index(int)`, or as set by the 3rd argument to `style_table(Style_Table_Entry*,int,int)`. See also

- `normal_style_index(int)`, `ansi(bool)`, `style_table(Style_Table_Entry*,int,int)`

### 34.130.2.19 normal_style_index() [2/2]

```cpp
void Fl_Simple_Terminal::normal_style_index ( int val )
```

Sets the style table index used by the ANSI terminal reset sequence `"\033[0m"`, which resets the current drawing color/font/weight/size to "normal". Effective only when `ansi(bool)` is 'true'. See also

- `ansi(bool)`, `style_table(Style_Table_Entry*,int,int)`

**Note**

Changing this value does *not* change the current drawing color. To change that, use `current_style_index(int)`.

### 34.130.2.20 printf()

```cpp
void Fl_Simple_Terminal::printf ( const char * fmt, ... )
```

Appends printf formatted messages to the terminal. The string can contain UTF-8, crlf's, and ANSI sequences are also supported when `ansi(bool)` is set to 'true'. Example:

```cpp
#include <FL/Fl_Simple_Terminal.H>
int main(..) {;
  // Create a simple terminal, and append some messages to it
  Fl_Simple_Terminal *tty = new Fl_Simple_Terminal(..);
  // Append three lines of formatted text to the buffer
  tty->printf("The current date is: %s.\nThe time is: %s\n", date_str, time_str);
  tty->printf("The current PID is %ld.\n", (long)getpid());
}
```

**Note**

See `Fl_Text_Buffer::vprintf()` for limitations.

**Parameters**

- `fmt` is a printf format string for the message text.

### 34.130.2.21 remove_lines()

```cpp
void Fl_Simple_Terminal::remove_lines ( int start, int count )
```

Remove the specified range of lines from the terminal, starting with line 'start' and removing 'count' lines.
This method is used to enforce the history limit.

Parameters

| start | – starting line to remove |
| count | – number of lines to remove |

### 34.130.2.22 stay_at_bottom() [1/2]

```cpp
bool Fl_Simple_Terminal::stay_at_bottom() const
```

Gets the current value of the `stay_at_bottom(bool)` flag.
When true, the terminal tries to keep the scrollbar scrolled to the bottom when new text is added.

See also

`stay_at_bottom(bool)`

### 34.130.2.23 stay_at_bottom() [2/2]

```cpp
void Fl_Simple_Terminal::stay_at_bottom(bool val)
```

Configure the terminal to remain scrolled to the bottom when possible, chasing the end of the buffer whenever new text is added.
If disabled, the terminal behaves more like a text display widget; the scrollbar does not chase the bottom of the buffer.
If the user scrolls away from the bottom, this ’chasing’ feature is temporarily disabled. This prevents the user from having to fight the scrollbar chasing the end of the buffer while browsing when new text is also being added asynchronously. When the user returns the scroller to the bottom of the display, the chasing behavior resumes. The default is ’true’.

### 34.130.2.24 style_table() [1/2]

```cpp
const Fl_Text_Display::Style_Table_Entry * Fl_Simple_Terminal::style_table() const
```

Return the current style table being used.
This is the value last passed as the 1st argument to `style_table(Style_Table_Entry*,int,int)`. If no style table was defined, the built-in style table is returned.
`ansi(bool)` must be set to ’true’ for the style table to be used at all.

See also

`style_table(Style_Table_Entry*,int,int)`

### 34.130.2.25 style_table() [2/2]

```cpp
void Fl_Simple_Terminal::style_table(FL_Text_Display::Style_Table_Entry * stable,
                                   int stable_size,
                                   int normal_style_index = 0)
```

Set a user defined style table, which controls the font colors, faces, weights and sizes available for the terminal's text content.
`ansi(bool)` must be set to ’true’ for the defined style table to be used at all.
If ’stable’ is NULL, then the ”built in” style table is used. For info about the built-in colors, see `ansi(bool)`.
Which style table entry used for drawing depends on the value last set by `current_style_index()`, or by the ANSI sequence ”\033[#m”, where ’#’ is the index into the style table array, the index limited to the size of the array via modulus.
If the index passed via \texttt{"033\[#m"} is larger than the number of elements in the table, the value is clamped via modulus. So for a 10 element table, the following ANSI codes would all be equivalent, selecting the 5th element in the table: \texttt{"033[5m"}, \texttt{"033[15m"}, \texttt{"033[25m"}, etc. This is because 5\(=\)15\(=\)25\(\mod10\), etc.

A special exception is made for \texttt{"033[0m"}, which is supposed to "reset" the current style table to default color/font/weight/size, as last set by \texttt{normal_style_index} or by the API method \texttt{normal_style_index(int)}.

In cases like the built-in style table, where the 17th item is the "normal" color, the 'normal_style_index' is set to 17 so that \texttt{"033[0m"} resets to that color, instead of the first element in the table.

If you want \texttt{"033[0m"} to simply pick the first element in the table, then set 'normal_style_index' to 0.

An example of defining a custom style table (white courier 14, red courier 14, and white helvetica 14):

```c
int main() {

    // Our custom style table
    Fl_Text_Display::Style_Table_Entry mystyle[] = {
        // Font Color Font Face Font Size Index ANSI Sequence
        // ---------- ---------------- --------- ----- --------------
        { FL_WHITE, FL_COURIER_BOLD, 14 }, // 0 "\033[0m" (*default*)
        { FL_RED, FL_COURIER_BOLD, 14 }, // 1 "\033[1m"
        { FL_WHITE, FL_HELVETICA, 14 }  // 2 "\033[2m"
    };

    // Create terminal, enable ANSI and our style table
    tty = new Fl_Simple_Terminal(..);
    tty->ansi(true); // enable ANSI codes
    tty->style_table(&mystyle[0], sizeof(mystyle), 0); // use our custom style table

    // Now write to terminal, with ANSI that uses our style table
    tty->printf("\033[0mNormal Text\n\033[1mRed Courier Text\n\033[2mWhite Helvetica\n\033[0mBack to normal.\n");
}
```

Note

Changing the style table \texttt{clear()}s the terminal.

You currently can't control \texttt{/background/} color of text, a limitation of \texttt{Fl_Text_Display}'s current implementation.

The caller is responsible for managing the memory of the style table.

Until STR#3412 is repaired, \texttt{Fl_Text_Display} has scrolling bug if the style table's font size != textsize()

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>stable</td>
<td>the style table, an array of structs of the type \texttt{Fl_Text_Display::Style_Table_Entry}. Can be NULL to use the default style table (see \texttt{ansi(bool)}).</td>
</tr>
<tr>
<td>stable_size</td>
<td>the size of the style table (in bytes). Set this to 0 if 'stable' is NULL.</td>
</tr>
<tr>
<td>normal_style_index</td>
<td>the style table index used when the special ANSI sequence \texttt{&quot;033[0m&quot;} is encountered. Normally use 0 so that sequence selects the first item in the table. Only use different values if a different entry in the table should be the default. This value should not be larger than the number of items in the table, or it will be clamped with a modulus operation. This value is ignored if style is NULL.</td>
</tr>
</tbody>
</table>

### 34.130.2.26 style_table_size()

```c
int Fl_Simple_Terminal::style_table_size ( ) const
```

Return the current style table's size (in bytes).

This is the value last passed as the 2nd argument to \texttt{style_table(Style_Table_Entry*,int,int)}.

### 34.130.2.27 text() [1/2]

```c
const char * Fl_Simple_Terminal::text ( ) const
```

Returns entire text content of the terminal as a single string.

This includes the screen history, as well as the visible onscreen content.

### 34.130.2.28 text() [2/2]

```c
void Fl_Simple_Terminal::text ( 
```
const char * s,
int len = -1 )

Replaces the terminal with new text content in string ‘s’.
The string can contain UTF-8, crlf’s, and ANSI sequences are also supported when ansi(bool) is set to ‘true’.
Old terminal content is completely cleared.

Parameters

<table>
<thead>
<tr>
<th>s</th>
<th>string to append.</th>
</tr>
</thead>
<tbody>
<tr>
<td>len</td>
<td>optional length of string can be specified if known to save the internals from having to call strlen() If -1 is specified for len, strlen(s) is used to find the length.</td>
</tr>
</tbody>
</table>

See also

append(), printf(), vprintf(), clear()

34.130.2.29 vprintf()

void Fl_Simple_Terminal::vprintf (  
    const char * fmt,  
    va_list ap )

Appends printf formatted messages to the terminal.
Subclasses can use this to implement their own printf() functionality.
The string can contain UTF-8, crlf’s, and ANSI sequences are also supported when ansi(bool) is set to ‘true’.

Note

The expanded string is currently limited to 1024 characters.

Parameters

<table>
<thead>
<tr>
<th>fmt</th>
<th>is a printf format string for the message text.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ap</td>
<td>is a va_list created by va_start() and closed with va_end(), which the caller is responsible for handling.</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Simple_Terminal.H
- Fl_Simple_Terminal.cxx

34.131 Fl_Single_Window Class Reference

This is the same as Fl_Window.
#include <Fl_Single_Window.H>
Inheritance diagram for Fl_Single_Window:
Public Member Functions

- **Fl_Single_Window** (int W, int H, const char *l=0)
  Creates a new Fl_Single_Window widget using the given size, and label (title) string.

- **Fl_Single_Window** (int X, int Y, int W, int H, const char *l=0)
  Creates a new Fl_Single_Window widget using the given position, size, and label (title) string.

- **void show ()** FL_OVERRIDE
  Makes a widget visible.

- **void show (int a, char **b)**
  Same as Fl_Window::show(int a, char **b)

Additional Inherited Members

34.131.1 Detailed Description

This is the same as Fl_Window. However, it is possible that some implementations will provide double-buffered windows by default. This subclass can be used to force single-buffering. This may be useful for modifying existing programs that use incremental update, or for some types of image data, such as a movie flipbook.

34.131.2 Member Function Documentation

34.131.2.1 show()

```cpp
void Fl_Single_Window::show ( ) [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like FL_SHOW.

The `visible()` method returns true if the widget is set to be visible. The `visible_r()` method returns true if the widget and all of its parents are visible. A widget is only visible if `visible()` is true on it and all of its parents.

Changing it will send FL_SHOW or FL_HIDE events to the widget. Do not change it if the parent is not visible, as this will send false FL_SHOW or FL_HIDE events to the widget. `redraw()` is called if necessary on this or the parent.

See also

- `hide()`, `visible()`, `visible_r()`

Reimplemented from Fl_Widget.

The documentation for this class was generated from the following files:

- Fl_Single_Window.H
- Fl_Single_Window.cxx
The `Fl_Slider` widget contains a sliding knob inside a box.

```c
#include <Fl_Slider.H>
```

Inheritance diagram for `Fl_Slider`:

```
Fl_Widget
    ^
   |   Fl_Valuator
   |   ^
   |   |   Fl_Slider
   |   |   |
Fl_Fill_Slider Fl_Hor_Fill_Slider Fl_Hor_Nice_Slider Fl_Hor_Slider Fl_Nice_Slider Fl_Scrollbar Fl_Value_Slider
```

### Public Member Functions

- `void bounds (double a, double b)`
  - Sets the minimum (a) and maximum (b) values for the valuator widget.
- `Fl_Slider (int X, int Y, int W, int H, const char ∗L=0)`
  - Creates a new `Fl_Slider` widget using the given position, size, and label string.
- `Fl_Slider (uchar t, int X, int Y, int W, int H, const char ∗L)`
  - Creates a new `Fl_Slider` widget using the given type, position, size, and label string.
- `int handle (int) FL_OVERRIDE`
  - Handles the specified event.
- `int scrollvalue (int pos, int size, int first, int total)`
  - Sets the size and position of the sliding knob in the box.
- `Fl_Boxtype slider () const`
  - Gets the slider box type.
- `void slider (Fl_Boxtype c)`
  - Sets the slider box type.
- `float slider_size () const`
  - Get the dimensions of the moving piece of slider.
- `void slider_size (double v)`
  - Set the dimensions of the moving piece of slider.

### Protected Member Functions

- `void draw () FL_OVERRIDE`
  - Draws the widget.
- `void draw (int, int, int, int)`
- `int handle (int, int, int, int)`

### Additional Inherited Members

#### 34.132.1 Detailed Description

The `Fl_Slider` widget contains a sliding knob inside a box. It is often used as a scrollbar. Moving the box all the way to the top/left sets it to the `minimum()`, and to the bottom/right to the `maximum()`. The `minimum()` may be greater than the `maximum()` to reverse the slider direction. Use `void Fl_Widget::type(int)` to set how the slider is drawn, which can be one of the following:

- `FL_VERTICAL` - Draws a vertical slider (this is the default).
- `FL_HORIZONTAL` - Draws a horizontal slider.
- `FL_VERT_FILL_SLIDER` - Draws a filled vertical slider, useful as a progress or value meter.
• FL_HOR_FILL_SLIDER - Draws a filled horizontal slider, useful as a progress or value meter.
• FL_VERT_NICE_SLIDER - Draws a vertical slider with a nice looking control knob.
• FL_HOR_NICE_SLIDER - Draws a horizontal slider with a nice looking control knob.

Figure 34.45 Fl_Slider

34.132.2 Constructor & Destructor Documentation

34.132.2.1 Fl_Slider()

Fl_Slider::Fl_Slider (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char * L = 0 )

Creates a new Fl_Slider widget using the given position, size, and label string. The default boxtype is FL_DOWN_BOX.

34.132.3 Member Function Documentation

34.132.3.1 bounds()

void Fl_Slider::bounds (  
  double a,  
  double b )

Sets the minimum (a) and maximum (b) values for the valuator widget. If at least one of the values is changed, a partial redraw is asked.

34.132.3.2 draw()

void Fl_Slider::draw ( ) [protected], [virtual]

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:

Fl_Widget *s = scrollbar; // scrollbar is an embedded Fl_Scrollbar  
s->draw(); // calls Fl_Scrollbar::draw()

Implements Fl_Widget.
Reimplemented in Fl_Value_Slider.
34.132.3.3 handle()

```cpp
int Fl_Slider::handle ( int event ) [virtual]
```
Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

**Parameters**

- **event** the kind of event received

**Return values**

- **0** if the event was not used or understood
- **1** if the event was used and can be deleted

See also

- [Fl_Event](#)

Reimplemented from Fl_Widget.
Reimplemented in Fl_Value_Slider.

34.132.3.4 scrollvalue()

```cpp
int Fl_Slider::scrollvalue ( int pos,
    int size,
    int first,
    int total )
```
Sets the size and position of the sliding knob in the box.

**Parameters**

- **pos** position of first line displayed
- **size** size of window in lines
- **first** number of first line
- **total** total number of lines

Returns Fl_Valuator::value(p)

34.132.3.5 slider_size()

```cpp
void Fl_Slider::slider_size ( double v )
```
Set the dimensions of the moving piece of slider.
This is the fraction of the size of the entire widget. If you set this to 1 then the slider cannot move. The default value is .08.

For the "fill" sliders this is the size of the area around the end that causes a drag effect rather than causing the slider to jump to the mouse.

The documentation for this class was generated from the following files:

- Fl_Slider.H
- Fl_Slider.cxx

### Fl_Spinner Class Reference

This widget is a combination of a numerical input widget and repeat buttons.

```c
#include <Fl_Spinner.H>
```

Inheritance diagram for Fl_Spinner:

```
Fl_Widget
  ↓
Fl_Group
  ↓
Fl_Spinner
```

#### Classes

- class Fl_Spinner_Input

#### Public Member Functions

- **FL_Color color () const**
  
  *Returns the background color of the spinner widget's input field.*

- **void color (FL_Color v)**
  
  *Sets the background color of the spinner widget's input field.*

- **Fl_Spinner (int X, int Y, int W, int H, const char *L=0)**
  
  *Creates a new Fl_Spinner widget using the given position, size, and label string.*

- **const char * format () const**
  
  *Returns the format string for the value.*

- **void format (const char *f)**
  
  *Sets the format string for the value.*

- **int handle (int event) FL_OVERRIDE**
  
  *Handles the specified event.*

- **double maximum () const**
  
  *Gets the maximum value of the widget.*

- **void maximum (double m)**
  
  *Sets the maximum value of the widget.*

- **int maximum_size () const**
  
  *Returns the maximum width of the input field.*

- **void maximum_size (int m)**
  
  *Sets the maximum width of the input field.*

- **double minimum () const**
  
  *Gets the minimum value of the widget.*

- **void minimum (double m)**
  
  *Sets the minimum value of the widget.*
• **void** range (double a, double b)
  
  *Sets the minimum and maximum values for the widget.*

• **void** resize (int X, int Y, int W, int H) **FL_OVERRIDE**
  
  *Resizes the Fl_Group widget and all of its children.*

• **Fl_Color** selection_color () const
  
  *Returns the selection color of the spinner widget's input field.*

• **void** selection_color (Fl_Color val)
  
  *Sets the selection color of the spinner widget's input field.*

• double step () const
  
  *Gets the amount to change the value when the user clicks a button.*

• **void** step (double s)
  
  *Sets or returns the amount to change the value when the user clicks a button.*

• **Fl_Color** textcolor () const
  
  *Gets the color of the text in the input field.*

• **void** textcolor (Fl_Color c)
  
  *Sets the color of the text in the input field.*

• **Fl_Font** textfont () const
  
  *Gets the font of the text in the input field.*

• **void** textfont (Fl_Font f)
  
  *Sets the font of the text in the input field.*

• **Fl_Fontsize** textsize () const
  
  *Gets the size of the text in the input field.*

• **void** textsize (Fl_Fontsize s)
  
  *Sets the size of the text in the input field.*

• uchar type () const
  
  *Gets the numeric representation in the input field.*

• **void** type (uchar v)
  
  *Sets the numeric representation in the input field.*

• double value () const
  
  *Gets the current value of the widget.*

• **void** value (double v)
  
  *Sets the current value of the input widget.*

• int wrap () const
  
  *Gets the wrap mode of the Fl_Spinner widget.*

• **void** wrap (int set)
  
  *Sets whether the spinner wraps around at upper and lower bounds.*

### Protected Member Functions

• **void** draw () **FL_OVERRIDE**
  
  *Draws the widget.*

### Protected Attributes

- **Fl_Repeat_Button** down_button_
- **Fl_Spinner_Input** input_
- **Fl_Repeat_Button** up_button_
**Additional Inherited Members**

**34.133.1 Detailed Description**

This widget is a combination of a numerical input widget and repeat buttons. The user can either type into the input area or use the buttons to change the value.

![Figure 34.46 Fl_Spinner widget](image)

**34.133.2 Constructor & Destructor Documentation**

**34.133.2.1 Fl_Spinner()**

```cpp
Fl_Spinner::Fl_Spinner (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char * L = 0 )  
```

Creates a new Fl_Spinner widget using the given position, size, and label string. The inherited destructor destroys the widget and any value associated with it.

**34.133.3 Member Function Documentation**

**34.133.3.1 draw()**

```cpp
void Fl_Spinner::draw ( ) [protected], [virtual]  
```

Draws the widget. Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget’s draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar  
s->draw(); // calls Fl_Scrollbar::draw()  
```

Reimplemented from `Fl_Group`.

**34.133.3.2 handle()**

```cpp
int Fl_Spinner::handle (  
  int event ) [virtual]  
```

Handles the specified event. You normally don’t call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don’t short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

**Parameters**

- **in event** the kind of event received

**Return values**

- 0 if the event was not used or understood
- 1 if the event was used and can be deleted

**See also**

- Fl_Event

Reimplemented from Fl_Group.

### 34.133.3.3 resize()

```cpp
void Fl_Spinner::resize (int X, int Y, int W, int H) [virtual]
```

Resizes the Fl_Group widget and all of its children. The Fl_Group widget first resizes itself, and then it moves and resizes all its children according to the rules documented for Fl_Group::resizable(Fl_Widget *)

**See also**

- Fl_Group::resizable(Fl_Widget *)
- Fl_Group::resizable()
- Fl_Widget::resize(int,int,int,int)

Reimplemented from Fl_Group.

### 34.133.3.4 step() [1/2]

```cpp
double Fl_Spinner::step () const [inline]
```

Gets the amount to change the value when the user clicks a button.

**See also**

- Fl_Spinner::step(double)

### 34.133.3.5 step() [2/2]

```cpp
void Fl_Spinner::step (double s)
```

Sets or returns the amount to change the value when the user clicks a button. Before setting step to a non-integer value, the spinner type() should be changed to floating point.
See also

    double Fl_Spinner::step() const

34.133.3.6 type() [1/2]

uchar Fl_Spinner::type() const [inline]
Gets the numeric representation in the input field.

See also

    Fl_Spinner::type(uchar)

34.133.3.7 type() [2/2]

void Fl_Spinner::type (uchar v)
Sets the numeric representation in the input field.
Valid values are FL_INT_INPUT and FL_FLOAT_INPUT. Also changes the format() template. Setting a new spinner type via a superclass pointer will not work.

Note

type() is not a virtual function.

34.133.3.8 value()

void Fl_Spinner::value (double v) [inline]
Sets the current value of the input widget.
Before setting value to a non-integer value, the spinner type() should be changed to floating point.

34.133.3.9 wrap() [1/2]

int Fl_Spinner::wrap() const [inline]
Gets the wrap mode of the Fl_Spinner widget.

See also

    void wrap(int)

Since

    1.4.0

34.133.3.10 wrap() [2/2]

void Fl_Spinner::wrap (int set) [inline]
Sets whether the spinner wraps around at upper and lower bounds.
If wrap mode is on the spinner value is set to the minimum() or maximum() if the value exceeds the upper or lower bounds, resp., if it was changed by one of the buttons or the FL_Up or FL_Down keys.
The spinner stops at the upper and lower bounds if wrap mode is off.
The default wrap mode is on for backwards compatibility with FLTK 1.3.x and older versions.
Note

Wrap mode does not apply to the input field if the input value is edited directly as a number. The input value is always clipped to the allowed range as if wrap mode was off when the input field is left (i.e. loses focus).

See also

minimum(), maximum()

Parameters

in set non-zero sets wrap mode, zero resets wrap mode

Since

1.4.0

The documentation for this class was generated from the following files:

• Fl_Spinner.H
• Fl_Spinner.cxx

34.134 Fl_Spinner::Fl_Spinner_Input Class Reference

Inheritance diagram for Fl_Spinner::Fl_Spinner_Input:

34.134.1 Member Function Documentation

34.134.1.1 handle()

int Fl_Spinner::Fl_Spinner_Input::handle ( int event ) [virtual]
Handles events of Fl_Spinner's embedded input widget. Works like Fl_Input::handle() but ignores FL_Up and FL_Down keys so they can be handled by the parent widget (Fl_Spinner).
Reimplemented from Fl_Input.

Additional Inherited Members

34.134.1 Member Function Documentation
34.135  Fl_Surface_Device Class Reference

A drawing surface that's susceptible to receive graphical output.

#include <Fl_Device.H>

Inheritance diagram for Fl_Surface_Device:

\begin{center}
\begin{tikzpicture}
  \node (fl_surface_device) {Fl_Surface_Device};
  \node (fl_display_device) [below left of=fl_surface_device] {Fl_Display_Device};
  \node (fl_widget_surface) [below right of=fl_surface_device] {Fl_Widget_Surface};
  \node (fl_copy_surface) [below left of=fl_display_device] {Fl_Copy_Surface};
  \node (fl_esp_file_surface) [below right of=fl_display_device] {Fl_EPS_File_Surface};
  \node (fl_image_surface) [below right of=fl_widget_surface] {Fl_Image_Surface};
  \node (fl_paged_device) [below right of=fl_copy_surface] {Fl_Paged_Device};
  \node (fl_svg_file_surface) [below right of=fl_image_surface] {Fl_SVG_File_Surface};
  \node (fl_postscript_file_device) [below right of=fl_paged_device] {Fl_PostScript_File_Device};
  \node (fl_printer) [below right of=fl_svg_file_surface] {Fl_Printer};

  \draw [->] (fl_surface_device) -- (fl_display_device);
  \draw [->] (fl_surface_device) -- (fl_widget_surface);
  \draw [->] (fl_surface_device) -- (fl_copy_surface);
  \draw [->] (fl_surface_device) -- (fl_esp_file_surface);
  \draw [->] (fl_surface_device) -- (fl_image_surface);
  \draw [->] (fl_surface_device) -- (fl_paged_device);
  \draw [->] (fl_surface_device) -- (fl_svg_file_surface);
  \draw [->] (fl_surface_device) -- (fl_postscript_file_device);
  \draw [->] (fl_surface_device) -- (fl_printer);
\end{tikzpicture}
\end{center}

Public Member Functions

- **Fl_Graphics_Driver * driver ()**
  Returns the graphics driver of this drawing surface.
- **virtual bool is_current ()**
  Is this surface the current drawing surface?
- **virtual void set_current (void)**
  Make this surface the current drawing surface.
- **virtual ~Fl_Surface_Device ()**
  The destructor.

Static Public Member Functions

- **static Fl_Surface_Device * pop_current ()**
  Removes the top element from the current drawing surface stack, and makes the new top element current.
- **static void push_current (Fl_Surface_Device * new_current)**
  Pushes new_current on top of the stack of current drawing surfaces, and makes it current.
- **static Fl_Surface_Device * surface ()**
  The current drawing surface.

Protected Member Functions

- **void driver (Fl_Graphics_Driver * graphics_driver)**
  Sets the graphics driver of this drawing surface.
- **virtual void end_current ()**
  FLTK calls this each time a surface ceases to be the current drawing surface.
- **Fl_Surface_Device (Fl_Graphics_Driver * graphics_driver)**
  Constructor that sets the graphics driver to use for the created surface.

34.135.1 Detailed Description

A drawing surface that's susceptible to receive graphical output.

Any FLTK application has at any time a current drawing surface to which all drawing requests are directed. The current surface is given by Fl_Surface_Device::surface(). When main() begins running, the current drawing surface has been set to the computer's display, an instance of the Fl_Display_Device class.

A drawing surface other than the computer's display, is typically used as follows:
1. Create `surface`, an object from a particular `Fl_Surface_Device` derived class (e.g., `Fl_Copy_Surface`, `Fl_Printer`).

2. Call `Fl_Surface_Device::push_current(surface)` to redirect all graphics requests to `surface` which becomes the new current drawing surface (not necessary with classes `Fl_Printer` / `Fl_PostScript_File_Device` because it is done by `Fl_Paged_Device::begin_page()`).

3. At this point all of the Drawing functions (e.g., `fl_rect()`) or the Color & Font functions or Drawing Images functions (e.g., `fl_draw_image()`, `Fl_Image::draw()`) operate on the new current drawing surface. Drawing surfaces from `Fl_Widget_Surface` derived classes allow additional ways to draw to them (e.g., `Fl_Printer::print_widget()`, `Fl_Image_Surface::draw()`).

4. After all drawing requests have been performed, redirect graphics requests back to their previous destination with `Fl_Surface_Device::pop_current();` (not necessary with classes `Fl_Printer` / `Fl_PostScript_File_Device`).

5. Delete `surface`.

For back-compatibility, it is also possible to use the `Fl_Surface_Device::set_current()` member function to change the current drawing surface, once to the new surface, once to the previous one.

Class `Fl_Surface_Device` can also be derived to define new kinds of graphical output usable with FLTK drawing functions. An example would be to draw to a PDF file. This would require to create a new class, say `PDF_File_Surface`, derived from class `Fl_Surface_Device`, and another new class, say `PDF_Graphics_Driver`, derived from class `Fl_Graphics_Driver`. Class `PDF_Graphics_Driver` should implement all virtual methods of the `Fl_Graphics_Driver` class to support all FLTK drawing functions and have them draw into PDF files. Alternatively, class `PDF_Graphics_Driver` could implement only some virtual methods, and only part of the FLTK drawing API would be usable when drawing to PDF files.

### 34.135.2 Member Function Documentation

#### 34.135.2.1 end_current()

```cpp
virtual void Fl_Surface_Device::end_current ( ) [inline], [protected], [virtual]
```

FLTK calls this each time a surface ceases to be the current drawing surface. This member function is mostly of interest to developers of new `Fl_Surface_Device` derived classes. It allows to perform surface-specific operations necessary when this surface ceases to be current. Each implementation should end with a call to `Fl_Surface_Device::end_current()`.

Reimplemented in `Fl_PostScript_File_Device`.

#### 34.135.2.2 is_current()

```cpp
bool Fl_Surface_Device::is_current ( ) [virtual]
```

Is this surface the current drawing surface?

Reimplemented in `Fl_Copy_Surface`, `Fl_Image_Surface`, and `Fl_Printer`.

#### 34.135.2.3 pop_current()

```cpp
Fl_Surface_Device * Fl_Surface_Device::pop_current ( ) [static]
```

Removes the top element from the current drawing surface stack, and makes the new top element current.

Returns

A pointer to the new current drawing surface.

See also

`Fl_Surface_Device::push_current(Fl_Surface_Device *)`
34.135.2.4 push_current()

void Fl_Surface_Device::push_current ( 
        Fl_Surface_Device * new_current ) [static]

Pushes new_current on top of the stack of current drawing surfaces, and makes it current. 
new_current will receive all future graphics requests. 
Any call to push_current() must be matched by a subsequent call to Fl_Surface_Device::pop_current(). The max 
height of this stack is 16.

Version
1.4.0

34.135.2.5 set_current()

void Fl_Surface_Device::set_current ( 
        void ) [virtual]

Make this surface the current drawing surface. 
This surface will receive all future graphics requests. Starting from FLTK 1.4.0, the preferred API to change the 
current drawing surface is Fl_Surface_Device::push_current() / Fl_Surface_Device::pop_current().

Note
It's recommended to use this function only as follows:
- The current drawing surface is the display;
- make current another surface, e.g., an Fl_Printer or an Fl_Image_Surface object, calling set_current() 
on this object;
- draw to that surface;
- make the display current again with Fl_Display_Device::display_device()->set_current(); . Don't do any 
other call to set_current() before this one.

Other scenarios of drawing surface changes should be performed via Fl_Surface_Device::push_current() / 
Fl_Surface_Device::pop_current().

Reimplemented in Fl_Copy_Surface, Fl_Image_Surface, Fl_PostScript_File_Device, and Fl_Printer.

34.135.2.6 surface()

static Fl_Surface_Device * Fl_Surface_Device::surface ( ) [inline], [static]

The current drawing surface.
In other words, the Fl_Surface_Device object that currently receives all graphics requests.

Note
It's possible to transiently remove the GUI scaling factor in place in the current drawing surface with 
fl_override_scale().

The documentation for this class was generated from the following files:
- Fl_Device.H
- Fl_Device.cxx
A drawing surface producing a Scalable Vector Graphics (SVG) file.

```cpp
#include <Fl_SVG_File_Surface.H>
```

Inheritance diagram for Fl_SVG_File_Surface:

```
Fl_SVG_File_Surface
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
```

Public Member Functions

- `int close ()`
  Closes the FILE pointer where SVG data is output.
- `FILE * file ()`
  Returns the underlying FILE pointer.
- `Fl_SVG_File_Surface (int width, int height, FILE * svg, int(*closef)(FILE *))=NULL`  
  Constructor of the SVG drawing surface.
- `void origin (int *x, int *y) FL_OVERRIDE`
  Computes the coordinates of the current origin of graphics functions.
- `void origin (int x, int y) FL_OVERRIDE`
  Sets the position of the origin of graphics in the drawable part of the drawing surface.
- `int printable_rect (int *w, int *h) FL_OVERRIDE`
  Computes the width and height of the drawable area of the drawing surface.
- `void translate (int x, int y) FL_OVERRIDE`
  Translates the current graphics origin accounting for the current rotation.
- `void untranslate () FL_OVERRIDE`
  Undoes the effect of a previous translate() call.
- `~Fl_SVG_File_Surface ()`
  Destructor.

Additional Inherited Members

### 34.136.1 Detailed Description

This drawing surface allows to store any FLTK graphics in vectorial form in a "Scalable Vector Graphics" file.

Usage example:

```cpp
Fl_Window *win = ...; // Window to draw to a .svg file
int ww = win->decorated_w();
int wh = win->decorated_h();
FILE *svg = fl_fopen("/path/to/mywindow.svg", "w");
if (svg) {
    Fl_SVG_File_Surface *surface = new Fl_SVG_File_Surface(ww, wh, svg);
    Fl_Surface_Device::push_current(surface);
    fl_color(FL_WHITE);
    fl_rectf(0, 0, ww, wh);
    surface->draw_decorated_window(win);
    Fl_Surface_Device::pop_current();
    delete surface; // the .svg file is not complete until the destructor was run
    fclose(svg);
}
```

Generated by Doxygen
Note

FLTK uses the PNG and JPEG libraries to encode images to the SVG format. For this reason, class Fl_SVG_File_Surface is placed in the fltk_images library. If JPEG is not available at application build time, PNG is enough (but produces a quite larger output). If PNG isn’t available either, images don’t appear in the SVG output.

34.136.2 Constructor & Destructor Documentation

34.136.2.1 Fl_SVG_File_Surface()

Fl_SVG_File_Surface::Fl_SVG_File_Surface (  
  int width,  
  int height,  
  FILE * svg,  
  int(*)(FILE *) closef = NULL )

Constructor of the SVG drawing surface.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>width, height</td>
<td>Width and height of the graphics area in FLTK drawing units</td>
</tr>
<tr>
<td>svg</td>
<td>A writable FILE pointer where the SVG data are to be sent. The resulting SVG data are not complete until after destruction of the Fl_SVG_File_Surface object or after calling close().</td>
</tr>
<tr>
<td>closef</td>
<td>If not NULL, the destructor and close() will call closef(svg) after all SVG data has been sent. If NULL, fclose(svg) is called instead. This allows to close the FILE pointer by, e.g., pclose, or, using a function such as &quot;int keep_open(FILE*) {return 0;}&quot;, to keep it open after completion of all output to svg. Function closef should return non zero to indicate an error.</td>
</tr>
</tbody>
</table>

34.136.2.2 ~Fl_SVG_File_Surface()

Fl_SVG_File_Surface::~Fl_SVG_File_Surface ( )

Destructor.

The underlying FILE pointer is processed as by close().

34.136.3 Member Function Documentation

34.136.3.1 close()

int Fl_SVG_File_Surface::close ( )

Closes the FILE pointer where SVG data is output.

The underlying FILE is closed by function fclose() unless another function was set at object’s construction time. The only operation possible after this on the Fl_SVG_File_Surface object is its destruction.

Returns

The value returned by the closing function call.

34.136.3.2 origin() [1/2]

void Fl_SVG_File_Surface::origin (  
  int * x,  
  int * y ) [virtual]
Computes the coordinates of the current origin of graphics functions.

**Parameters**

| out | x, y | If non-null, +x and +y are set to the horizontal and vertical coordinates of the graphics origin. |

Reimplemented from `Fl_Widget_Surface`.

### 34.136.3.3 origin() [2/2]

```cpp
void Fl_SVG_File_Surface::origin ( int x, int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface. Arguments should be expressed relatively to the result of a previous `printable_rect()` call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive `origin()` calls don't combine their effects. Origin() calls are not affected by `rotate()` calls (for classes derived from `Fl_Paged_Device`).

**Parameters**

| in | x, y | Horizontal and vertical positions in the drawing surface of the desired origin of graphics. |

Reimplemented from `Fl_Widget_Surface`.

### 34.136.3.4 printable_rect()

```cpp
int Fl_SVG_File_Surface::printable_rect ( int *w, int *h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface. Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to `origin()`. If the object is derived from class `Fl_Paged_Device`, values account for the user-selected paper type and print orientation and are changed by `scale()` calls.

**Returns**

0 if OK, non-zero if any error

Reimplemented from `Fl_Widget_Surface`.

### 34.136.3.5 translate()

```cpp
void Fl_SVG_File_Surface::translate ( int x, int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation. Each `translate()` call must be matched by an `untranslate()` call. Successive `translate()` calls add up their effects.

Reimplemented from `Fl_Widget_Surface`.

### 34.136.3.6 untranslate()

```cpp
void Fl_SVG_File_Surface::untranslate ( void ) [virtual]
```

Undoes the effect of a previous `translate()` call.
Reimplemented from Fl_Widget_Surface.
The documentation for this class was generated from the following file:

- FL_SVG_File_Surface.H

34.137 FL_SVG_Image Class Reference

The FL_SVG_Image class supports loading, caching and drawing of scalable vector graphics (SVG) images.
#include <FL_SVG_Image.H>

Inheritance diagram for FL_SVG_Image:

```
Fl_SVG_Image
|    |
|    |
Fl_RGB_Image
|    |
|    |
Fl_Image
```

Public Member Functions

- FL_SVG_Image * as_svg_image () FL_OVERRIDE
  Returns whether an image is an FL_SVG_Image or not.
- void color_average (Fl_Color c, float i) FL_OVERRIDE
  The color_average() method averages the colors in the image with the provided FLTK color value.
- Fl_Image * copy () const
- Fl_Image * copy (int W, int H) const FL_OVERRIDE
  Creates a resized copy of the image.
- void desaturate () FL_OVERRIDE
  The desaturate() method converts an image to grayscale.
- void draw (int X, int Y)
- void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE
  Draws the image to the current drawing surface with a bounding box.
- FL_SVG_Image (const char *filename)
  Load an SVG image from a file.
- FL_SVG_Image (const char *sharedname, const char *svg_data)
  Load an SVG image from memory.
- FL_SVG_Image (const char *sharedname, const unsigned char *svg_data, size_t length)
  Load an SVG image from memory.
- void normalize () FL_OVERRIDE
  Makes sure the object is fully initialized.
- void resize (int width, int height)
  Have the svg data (re-)rasterized using the given width and height values.
- virtual ~FL_SVG_Image ()
  The destructor frees all memory and server resources that are used by the SVG image.

Public Attributes

- bool proportional
  Set this to false to allow image re-scaling that alters the image aspect ratio.
Additional Inherited Members

34.137.1 Detailed Description

The Fl_SVG_Image class supports loading, caching and drawing of scalable vector graphics (SVG) images. The FLTK library performs parsing and rasterization of SVG data using a modified version of the nanosvg software (https://github.com/memononen/nanosvg). The software modification allows the option to change the image ratio while performing rasterization.

Use Fl_Image::fail() to check if the Fl_SVG_Image failed to load. fail() returns ERR_FILE_ACCESS if the file could not be opened or read, and ERR_FORMAT if the SVG format could not be decoded. If the image has loaded correctly, w(), h(), and d() should return values greater than zero.

Rasterization is not done until the image is first drawn or resize() or normalize() is called. Therefore, array is NULL until then. The delayed rasterization ensures an Fl_SVG_Image is always rasterized to the exact screen resolution at which it is drawn.

The Fl_SVG_Image class draws images computed by nanosvg with the following known limitations

- text between <text> and </text> marks,
- image elements, and
- <use> statements

are not rendered.

The FLTK library can optionally be built without SVG support; in that case, class Fl_SVG_Image is unavailable.

Example of displaying a hard-coded svg file:

```c
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_SVG_Image.H>

const char *svg_data = "<svg viewBox="0 0 200 200" version = "1.1">
 <rect x="25" y="50" width="150" height="100" fill="black"
 transform="rotate(45 100 100)" /></svg>"
;

int main(int argc, char **argv) {
    Fl_SVG_Image *svg = new Fl_SVG_Image(0, svg_data); // create SVG object
    Fl_Window *win = new Fl_Window(720, 486, "svg test");
    Fl_Box *box = new Fl_Box(0, 0, win->w(), win->h());
    box->image(svg); // assign svg object to Fl_Box
    win->end();
    win->show(argc,argv);
    return(Fl::run());
}
```

Example of displaying an svg image from a file:

```c
#include <errno.h> // errno
#include <string.h> // strerror
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_SVG_Image.H>
#include <FL/fl_message.H>

int main(int argc, char **argv) {
    Fl_Window *win = new Fl_Window(720, 486, "svg test");
    Fl_Box *box = new Fl_Box(0, 0, win->w(), win->h());
    // Load svg image from disk, assign to a box
    const char *svgpath = "/var/tmp/simple.svg";
    Fl_SVG_Image *svg = new Fl_SVG_Image(svgpath); // load SVG object from disk
    switch (svg->fail()) {
    case Fl_Image::ERR_FILE_ACCESS:
        // File couldn't load? show path + os error to user
        fl_alert("%s: %s", svgpath, strerror(errno));
        return 1;
    case Fl_Image::ERR_FORMAT:
        // Parsing error
        fl_alert("%s: couldn't decode image", svgpath);
        return 1;
    }
    box->image(svg); // assign svg object to box
    win->end();
    win->show(argc,argv);
    return(Fl::run());
}
```

Example of fitting an svg image to a resizable Fl_Box:

```c
#include <FL/Fl_Window.H>
#include <FL/Fl_SVG_Image.H>
#include <FL/Fl_Box.H>

class resizable_box : public Fl_Box {
public:
```
resizable_box(int w, int h) : Fl_Box(0, 0, w, h, NULL) {}  
virtual void resize(int x, int y, int w, int h) {  
  image()->scale(w, h, 1, 1); // p3 = proportional, p4 = can_expand  
  Fl_Box::resize(x, y, w, h);  
};

int main(int argc, char **argv) {  
  Fl_Window *win = new Fl_Window(130, 130);  
  resizable_box *box = new resizable_box(win->w(), win->h());  
  Fl_SVG_Image *svg = new Fl_SVG_Image("/path/to/image.svg");  
  box->image(svg);  
  svg->scale(box->w(), box->h());  
  win->end();  
  win->resizable(win);  
  win->show(argc, argv);  
  return Fl::run();  
}

34.137.2 Constructor & Destructor Documentation

34.137.2.1 Fl_SVG_Image() [1/3]

Fl_SVG_Image::Fl_SVG_Image (  
  const char * filename )
Load an SVG image from a file.
This constructor loads the SVG image from a .svg or .svgz file. The reader recognizes if the data is compressed, and decompresses it if zlib is available (HAVE_LIBZ).

Parameters

| filename | the filename for a .svg or .svgz file |

34.137.2.2 Fl_SVG_Image() [2/3]

Fl_SVG_Image::Fl_SVG_Image (  
  const char * sharedname,  
  const char * svg_data )
Load an SVG image from memory.
This constructor loads the SVG image from a block of memory. This version is commonly used for uncompressed text data, but the reader recognizes if the data is compressed, and decompresses it if zlib is available (HAVE_LIBZ).

Parameters

| sharedname | if not NULL, a shared image will be generated with this name |
| svg_data | a pointer to the memory location of the SVG image data |

Note

In-memory SVG data is parsed by the object constructor and is no longer needed after construction.

34.137.2.3 Fl_SVG_Image() [3/3]

Fl_SVG_Image::Fl_SVG_Image (  
  const char * name,  
  const unsigned char * svg_data,  
  size_t length )
Load an SVG image from memory.
This constructor loads the SVG image from a block of memory. This version is commonly used for compressed binary data, but the reader recognizes if the data is uncompressed, and reads it as a text block.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>if not NULL, a shared image will be generated with this name</td>
</tr>
<tr>
<td>svg_data</td>
<td>a pointer to the memory location of the SVG image data</td>
</tr>
<tr>
<td>length</td>
<td>of svg_data or 0 if the length is unknown. This will protect memory outside of the svg_data array from illegal read operations for compressed SVG data</td>
</tr>
</tbody>
</table>

**Note**

In-memory SVG data is parsed by the object constructor and is no longer needed after construction.

### 34.137.3 Member Function Documentation

#### 34.137.3.1 as_svg_image()

**FL_SVG_Image** ∗ FL_SVG_Image::as_svg_image ( ) [inline], [virtual]

Returns whether an image is an FL_SVG_Image or not.

This virtual method returns a pointer to the FL_SVG_Image if this object is an instance of FL_SVG_Image or NULL if not.

Reimplemented from FL_RGB_Image.

#### 34.137.3.2 color_average()

void FL_SVG_Image::color_average (  
    FL_Color c,  
    float i ) [virtual]

The color_average() method averages the colors in the image with the provided FLTK color value.

The first argument specifies the FLTK color to be used.

The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from FL_RGB_Image.

#### 34.137.3.3 copy()

**FL_Image** ∗ FL_SVG_Image::copy (  
    int W,  
    int H ) const [virtual]

Creates a resized copy of the image.

The new image should be released when you are done with it.

**Note:** since FLTK 1.4.0 you can use FL_Image::release() for all types of images (i.e. all subclasses of FL_Image) instead of operator delete for FL_Image's and FL_Image::release() for FL_Shared_Image's.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by FL_Image::RGB_scaling().

For the new image the following equations are true:

- \( w() = data_w() = W \)
- \( h() = data_h() = H \)
Parameters

in | W,H | Requested width and height of the new image

Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of Fl_RGB_Image, Fl_SVG_Image, Fl_Pixmap, Fl_Bitmap, Fl_Tiled_Image, Fl_Anim_GIF_Image and Fl_Shared_Image. Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an Fl_GIF_Image is an object of class Fl_Pixmap.

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from Fl_Image or any subclass your overridden methods of 'Fl_Image::copy() const' and 'Fl_Image::copy(int, int) const' must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from Fl_RGB_Image.

34.137.3.4 desaturate()

void Fl_SVG_Image::desaturate ( ) [virtual]
The desaturate() method converts an image to grayscale.
If the image contains an alpha channel (depth = 4), the alpha channel is preserved.
An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
Reimplemented from Fl_RGB_Image.

34.137.3.5 draw()

void Fl_SVG_Image::draw ( int X, int Y, int W, int H, int cx = 0, int cy = 0 ) [virtual]
Draws the image to the current drawing surface with a bounding box.
Arguments X, Y, W, H specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the cx and cy arguments.
In other words: fl_push_clip(X,Y,W,H) is applied, the image is drawn with its upper-left corner at X-cx, Y-cy and its own width and height, fl_pop_clip() is applied.
Reimplemented from Fl_RGB_Image.

34.137.3.6 normalize()

void Fl_SVG_Image::normalize ( ) [virtual]
Makes sure the object is fully initialized.
This function rasterizes the SVG image, and consequently initializes its array member, if that was not done before.
Reimplemented from Fl_RGB_Image.

34.137.3.7 resize()

void Fl_SVG_Image::resize ( int width, int height )
Have the svg data (re-)rasterized using the given width and height values.
By default, the resulting image \(w()\) and \(h()\) will be close to \(\text{width}\) and \(\text{height}\) while preserving the width/height ratio of the SVG data. If \(\text{proportional}\) was set to \(\text{false}\), the image is rasterized to the exact \(\text{width}\) and \(\text{height}\) values. In both cases, \(\text{data}_w()\) and \(\text{data}_h()\) values are set to \(w()\) and \(h()\), respectively.

### 34.137.4 Member Data Documentation

#### 34.137.4.1 proportional

\texttt{bool Fl_SVG_Image::proportional}

Set this to \texttt{false} to allow image re-scaling that alters the image aspect ratio.

Upon object creation, \texttt{proportional} is set to \texttt{true}, and the aspect ratio is kept constant.

The documentation for this class was generated from the following files:

- \texttt{FL_SVG_Image.H}
- \texttt{FL_SVG_Image.cxx}

### 34.138 Fl_Sys_Menu_Bar Class Reference

A class to create and modify menus that appear on macOS in the menu bar at the top of the screen.

\texttt{#include \&lt;Fl_Sys_Menu_Bar.H&gt;}

Inheritance diagram for Fl_Sys_Menu_Bar:

```
Fl_Widget
   |
   v
Fl_Menu
   |
   v
Fl_Menu_Bar
   |
Fl_Sys_Menu_Bar
```

#### Public Types

- \texttt{enum window_menu_style_enum \{ no_window_menu = 0 , tabbing_mode_none , tabbing_mode_automatic , tabbing_mode_preferred \}}

  Possible styles of the Window menu in the system menu bar.

#### Public Member Functions

- \texttt{int add (const char \*label, const char \*shortcut, Fl_Callback \*cb, void \*user_data=0, int flags=0)}
  
  Adds a new menu item.

- \texttt{int add (const char \*label, int shortcut, Fl_Callback *, void \*user_data=0, int flags=0)}
  
  Add a new menu item to the system menu bar.

- \texttt{int add (const char \*str)}
  
  Forms-compatible procedure to add items to the system menu bar.

- \texttt{void clear ()}
  
  Set the \texttt{Fl_Menu_Item} array pointer to null, indicating a zero-length menu.

- \texttt{int clear_submenu (int index)}
  
  Clears the specified submenu pointed to by index of all menu items.

- \texttt{Fl_Sys_Menu_Bar (int x, int y, int w, int h, const char \*l=0)}
  
  The constructor.
• int insert (int index, const char *label, const char *shortcut, Fl_Callback *cb, void *user_data=0, int flags=0)
   Insert a new menu item.
• int insert (int index, const char *label, int shortcut, Fl_Callback *cb, void *user_data=0, int flags=0)
   Insert in the system menu bar a new menu item
• const Fl_Menu_Item * menu () const
   Return the system menu's array of Fl_Menu_Item's.
• void menu (const Fl_Menu_Item *m)
   Create a system menu bar using the given list of menu structs
• int mode (int i) const
   Gets the flags of item i.
• void mode (int i, int fl)
   Sets the flags of item i.
• void remove (int n)
   Remove an item from the system menu bar
• void replace (int index, const char *name)
   Rename an item from the system menu bar
• void setonly (Fl_Menu_Item *item)
   Turns the radio item "on" for the menu item and turns "off" adjacent radio items of the same group.
• void shortcut (int i, int s)
   Changes the shortcut of item i to n.
• void update () FL_OVERRIDE
   Updates the menu bar after any change to its items.
• virtual ~Fl_Sys_Menu_Bar ()
   The destructor.

Static Public Member Functions

• static void about (Fl_Callback *cb, void *data)
   Attaches a callback to the "About myprog" item of the system application menu.
• static void create_window_menu ()
   Adds a Window menu, to the end of the system menu bar.
• static window_menu_style_enum window_menu_style ()
   Get the style of the Window menu in the system menu bar.
• static void window_menu_style (window_menu_style_enum style)
   Set the desired style of the Window menu in the system menu bar.

Protected Member Functions

• void draw () FL_OVERRIDE
   Draws the widget.

Additional Inherited Members

34.138.1 Detailed Description

A class to create and modify menus that appear on macOS in the menu bar at the top of the screen. On other than macOS platforms, Fl_Sys_Menu_Bar is a synonym of class Fl_Menu_Bar.
On the macOS platform, replace Fl_Menu_Bar with Fl_Sys_Menu_Bar, and a system menu at the top of the screen will be available. This menu will match an array of Fl_Menu_Item's exactly as in all other FLTK menus (except for the submenu with the application's own name and the 'Window' menu; see below). There is, though, an important difference between an Fl_Sys_Menu_Bar object under macOS and under other platforms: only a single object from this class can be created, because macOS uses a single system menu bar. Therefore, porting to macOS an app that creates, on other platforms, several Fl_Menu_Bar objects, one for each of several windows, is more complex that just replacing Fl_Menu_Bar by Fl_Sys_Menu_Bar.
On the macOS platform, the system menu bar of any FLTK app begins with the Application menu which the FLTK library automatically constructs. Functions `Fl_Mac_App_Menu::custom_application_menu_items()` and `Fl_Sys_Menu_Bar::about()` can be used to further customize the Application menu. The FLTK library also automatically constructs and handles a Window menu which can be further customized (or even removed) calling `Fl_Sys_Menu_Bar::window_menu_style(window_menu_style_enum style)`. Other member functions of this class allow the app to generate the rest of the system menu bar. It is recommended to localize the system menu bar using the standard Mac OS X localization procedure (see Internationalization).

Changes to the menu state are immediately visible in the menubar when they are made using member functions of the `Fl_Sys_Menu_Bar` class. Other changes (e.g., by a call to `Fl_Menu_Item::set()`) should be followed by a call to `update()` to be visible in the menubar across all platforms. macOS global variable `fl_sys_menu_bar` points to the unique, current system menu bar.

A few FLTK menu features are not supported by the Mac System menu:

- no symbolic labels
- no embossed labels
- no font sizes

As described above, the submenu with the application's own name (usually the second submenu from the left, immediately following the "Apple" submenu) is a special case, and can be managed with `Fl_Mac_App_Menu::custom_application_menu_items()`. For example, to make your own "Appname -> Preferences" dialog, you might use:

```c
#include <FL/platform.H> // for Fl_Mac_App_Menu class
#include <FL/Fl_Sys_Menu_Bar.H> // for Fl_Menu_Item
:
void prefs_cb(Fl_Widget *w, void *data) {
    // ..Open your preferences dialog here..
}
:
int main(..) {
    // Items to add to the application menu
    static Fl_Menu_Item appitems[] = {
        { "Preferences", 0, prefs_cb, 0, 0 },
        { 0 }, { 0 }
    };
    Fl_Mac_App_Menu::custom_application_menu_items(appitems); // adds it
}
```

..the result being:

![Figure 34.47 Mac Application submenu](image)

34.138.2 Member Enumeration Documentation

34.138.2.1 window_menu_style_enum

```c
enum Fl_Sys_Menu_Bar::window_menu_style_enum
```

Possible styles of the Window menu in the system menu bar.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>no_window_menu</td>
<td>No Window menu in the system menu bar.</td>
</tr>
<tr>
<td>tabbing_mode_none</td>
<td>No tabbed windows, but the system menu bar contains a Window menu.</td>
</tr>
<tr>
<td>tabbing_modeAutomatic</td>
<td>Windows are created by themselves but can be tabbed later.</td>
</tr>
<tr>
<td>tabbing_modePreferred</td>
<td>Windows are tabbed when created.</td>
</tr>
</tbody>
</table>

Generated by Doxygen
34.138.3 Constructor & Destructor Documentation

34.138.3.1 Fl_Sys_Menu_Bar()

Fl_Sys_Menu_Bar::Fl_Sys_Menu_Bar (  
    int x,  
    int y,  
    int w,  
    int h,  
    const char ∗ l = 0 )

The constructor.
On Mac OS X, all arguments are unused. On other platforms they are used as by Fl_Menu_Bar::Fl_Menu_Bar().

34.138.4 Member Function Documentation

34.138.4.1 about()

void Fl_Sys_Menu_Bar::about (  
    Fl_Callback ∗ cb,  
    void ∗ data ) [static]

Attaches a callback to the "About myprog" item of the system application menu.
This cross-platform function is effective only under the MacOS platform.

Parameters

<table>
<thead>
<tr>
<th>cb</th>
<th>a callback that will be called by &quot;About myprog&quot; menu item with NULL 1st argument.</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>a pointer transmitted as 2nd argument to the callback.</td>
</tr>
</tbody>
</table>

34.138.4.2 add() [1/3]

int Fl_Sys_Menu_Bar::add (  
    const char ∗ label,  
    const char ∗ shortcut,  
    Fl_Callback ∗ cb,  
    void ∗ user_data = 0,  
    int flags = 0 ) [inline]

Adds a new menu item.
See also

Fl_Menu_::add(const char ∗ label, int shortcut, Fl_Callback ∗, void ∗user_data=0, int flags=0)

34.138.4.3 add() [2/3]

int Fl_Sys_Menu_Bar::add (  
    const char ∗ label,  
    int shortcut,  
    Fl_Callback ∗ cb,  
    void ∗ user_data = 0,  
    int flags = 0 )

Add a new menu item to the system menu bar.
Add to the system menu bar a new menu item, with a title string, shortcut int, callback, argument to the callback, and flags.
### Parameters

<table>
<thead>
<tr>
<th>label</th>
<th>- new menu item's label</th>
</tr>
</thead>
<tbody>
<tr>
<td>shortcut</td>
<td>- new menu item's integer shortcut (can be 0 for none, or e.g. FL_ALT+'x')</td>
</tr>
<tr>
<td>cb</td>
<td>- callback to be invoked when item selected (can be 0 for none, in which case the menubar's callback() can be used instead)</td>
</tr>
<tr>
<td>user_data</td>
<td>- argument to the callback</td>
</tr>
<tr>
<td>flags</td>
<td>- item's flags, e.g. FL_MENU_TOGGLE, etc.</td>
</tr>
</tbody>
</table>

### Returns

the index into the menu() array, where the entry was added

See also

Fl_Menu_::add(const char* label, int shortcut, Fl_Callback* cb, void* user_data, int flags)

### 34.138.4.4 add() [3/3]

```cpp
int Fl_Sys_Menu_Bar::add ( const char * str )
```

Forms-compatible procedure to add items to the system menu bar.

Returns

the index into the menu() array, where the entry was added

See also

Fl_Menu_::add(const char* str)

### 34.138.4.5 clear()  

```cpp
void Fl_Sys_Menu_Bar::clear ( void )
```

Set the Fl_Menu_Item array pointer to null, indicating a zero-length menu.

See also

Fl_Menu_::clear()

### 34.138.4.6 clear_submenu()

```cpp
int Fl_Sys_Menu_Bar::clear_submenu ( int index )
```

Clears the specified submenu pointed to by index of all menu items.

See also

Fl_Menu_::clear_submenu(int index)
34.138.4.7 create_window_menu()

```cpp
void Fl_Sys_Menu_Bar::create_window_menu () [static]
```

Adds a Window menu, to the end of the system menu bar.
FLTK apps typically don't need to call this function which is automatically called by the library the first time a window is shown. The default system menu bar contains a Window menu with a "Merge All Windows" item. Other Window menu styles can be obtained calling `Fl_Sys_Menu_Bar::window_menu_style(window_menu_style_enum)` before the first `Fl_Window::show()`. Alternatively, an app can call `create_window_menu()` after having populated the system menu bar, for example with `menu(const Fl_Menu_Item *)`, and before the first `Fl_Window::show()`.
This function does nothing on non MacOS platforms.

Version

1.4

34.138.4.8 draw()

```cpp
void Fl_Sys_Menu_Bar::draw () [protected], [virtual]
```

Draws the widget.
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.
Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:
```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```
Reimplemented from `Fl_Menu_Bar`.

34.138.4.9 insert [1/2]

```cpp
int Fl_Sys_Menu_Bar::insert (  
  int index,  
  const char * label,  
  const char * shortcut,  
  Fl_Callback * cb,  
  void * user_data = 0,  
  int flags = 0 ) [inline]
```

Insert a new menu item.

See also

```cpp
Fl_Menu_::insert(int index, const char * label, const char * shortcut, Fl_Callback * cb, void * user_data=0, int flags=0)
```

34.138.4.10 insert [2/2]

```cpp
int Fl_Sys_Menu_Bar::insert (  
  int index,  
  const char * label,  
  int shortcut,  
  Fl_Callback * cb,  
  void * user_data = 0,  
  int flags = 0 )
```

Insert in the system menu bar a new menu item

Insert in the system menu bar a new menu item, with a title string, shortcut int, callback, argument to the callback, and flags.
Returns

the index into the menu() array, where the entry was inserted

See also

Fl_Menu_::insert(int index, const char* label, int shortcut, Fl_Callback *cb, void *user_data, int flags)

34.138.4.11 menu()

void Fl_Sys_Menu_Bar::menu (const Fl_Menu_Item * m )

create a system menu bar using the given list of menu structs

Author

Matthias Melcher

Parameters

| m | Zero-ending list of Fl_Menu_Item's |

34.138.4.12 mode()

void Fl_Sys_Menu_Bar::mode (int i, int fl )

Sets the flags of item i.

See also

Fl_Menu_::mode(int i, int fl)

34.138.4.13 remove()

void Fl_Sys_Menu_Bar::remove (int index )

remove an item from the system menu bar

Parameters

| index | the index of the item to remove |

34.138.4.14 replace()

void Fl_Sys_Menu_Bar::replace (int index, const char * name )

rename an item from the system menu bar

Parameters

| index | the index of the item to rename |
Parameters

| name | the new item name as a UTF8 string |

34.138.4.15  update()

void Fl_Sys_Menu_Bar::update ( ) [virtual]
Updates the menu bar after any change to its items.
This is useful when the menu bar can be an Fl_Sys_Menu_Bar object.
Reimplemented from Fl_Menu_Bar.

34.138.4.16  window_menu_style()

void Fl_Sys_Menu_Bar::window_menu_style ( Fl_Sys_Menu_Bar::window_menu_style_enum style ) [static]
Set the desired style of the Window menu in the system menu bar.
This function, to be called before the first call to Fl_Window::show(), allows to control whether the system menu bar
should contain a Window menu, and if yes, whether new windows should be displayed in tabbed form. These are
the effects of various values for style:

- no_window_menu: don't add a Window menu to the system menu bar
- tabbing_mode_none: add a simple Window menu to the system menu bar
- tabbing_mode_automatic: the window menu also contains "Merge All Windows" to group all windows
  in a single tabbed display mode. This is the default Window menu style for FLTK apps.
- tabbing_mode_preferred: new windows are displayed in tabbed mode when first created

The Window menu, if present, is entirely created and controlled by the FLTK library. Mac OS version 10.12 or
later must be running for windows to be displayed in tabbed form. Under non MacOS platforms, this function does
nothing.

Version

1.4

The documentation for this class was generated from the following files:

- Fl_Sys_Menu_Bar.H
- Fl_Sys_Menu_Bar.cxx

34.139  Fl_Table Class Reference

A table of widgets or other content.
#include <Fl_Table.H>

Inheritance diagram for Fl_Table:

```
Fl_Widget
   |
   Fl_Group
   |
   Fl_Table
   |
Fl_Table_Row
```
Public Types

- enum TableContext {
  CONTEXT_NONE = 0 , CONTEXT_STARTPAGE = 0x01 , CONTEXT_ENDPAGE = 0x02 , CONTEXT_ROW_HEADER = 0x04 ,
  CONTEXT_COL_HEADER = 0x08 , CONTEXT_CELL = 0x10 , CONTEXT_TABLE = 0x20 , CONTEXT_RC_RESIZE = 0x40
}

The context bit flags for Fl_Table related callbacks.

Public Member Functions

- void add (Fl_Widget &wgt)
  The specified widget is removed from its current group (if any) and added to the end of Fl_Table’s group.

- void add (Fl_Widget *wgt)
  The specified widget is removed from its current group (if any) and added to the end of Fl_Table’s group.

- Fl_Widget *const *array ()
  Returns a pointer to the array of children.

- void begin ()

- void callback (Fl_Widget *, void *)
  Callbacks will be called depending on the setting of Fl_Widget::when().

- int callback_col ()
  Returns the current column the event occurred on.

- TableContext callback_context ()
  Returns the current ‘table context’.

- int callback_row ()
  Returns the current row the event occurred on.

- Fl_Widget * child (int n) const
  Returns the child widget by an index.

- int children () const
  Returns the number of children in the table.

- virtual void clear ()
  Clears the table to zero rows (rows(0)), zero columns (cols(0)), and clears any widgets (table->clear()) that were added with begin()/end() or add()/insert()/etc.

- int col_header ()
  Returns if column headers are enabled or not.

- void col_header (int flag)
  Enable or disable column headers.

- Fl_Color col_header_color ()
  Gets the color for column headers.

- void col_header_color (Fl_Color val)
  Sets the color for column headers and redraws the table.

- int col_header_height ()
  Gets the column header height.

- void col_header_height (int height)
  Sets the height in pixels for column headers and redraws the table.

- int col_position ()
  Returns the current column scroll position as a column number.

- void col_position (int col)
  Sets the horizontal scroll position so ‘col’ is at the left, and causes the screen to redraw.

- int col_resize ()
  Returns if column resizing by the user is allowed.

- void col_resize (int flag)
Allows/disallows column resizing by the user.

- **int col_resize_min ()**
  
  Returns the current column minimum resize value.

- **void col_resize_min (int val)**

  Sets the current column minimum resize value.

- **int col_width (int col)**

  Returns the current width of the specified column in pixels.

- **void col_width (int col, int width)**

  Sets the width of the specified column in pixels, and the table is redrawn.

- **void col_width_all (int width)**

  Convenience method to set the width of all columns to the same value, in pixels.

- **int cols ()**

  Get the number of columns in the table.

- **virtual void cols (int val)**

  Set the number of columns in the table and redraw.

- **void do_callback (TableContext context, int row, int col)**

  Calls the widget callback.

- **void end ()**

- **int find (const Fl_Widget &wgt) const**

- **int find (const Fl_Widget *wgt) const**

  The constructor for Fl_Table.

- **void get_selection (int &row_top, int &col_left, int &row_bot, int &col_right)**

  Gets the region of cells selected (highlighted).

- **void init_sizes ()**

  Resets the internal array of widget sizes and positions.

- **void insert (Fl_Widget &wgt, Fl_Widget *w2)**

  The specified widget is removed from its current group (if any) and inserted into Fl_Table’s group before widget ‘w2’.

- **void insert (Fl_Widget &wgt, int n)**

  The specified widget is removed from its current group (if any) and inserted into the Fl_Table’s group at position ‘n’.

- **int is_interactive_resize ()**

  Returns 1 if someone is interactively resizing a row or column.

- **int is_selected (int r, int c)**

  See if the cell at row r and column c is selected.

- **int move_cursor (int R, int C)**

  Same as move_cursor(R,C,1);

- **int move_cursor (int R, int C, int shiftselect)**

  Moves the selection cursor a relative number of rows/columns specified by R/C.

- **void remove (Fl_Widget &wgt)**

  The specified widget is removed from Fl_Table’s group.

- **void resize (int X, int Y, int W, int H) FL_OVERRIDE**

  Handle resize events if user resizes parent window.

- **int row_header ()**

  Returns if row headers are enabled or not.

- **void row_header (int flag)**

  Enables/disables showing the row headers.

- **Fl_Color row_header_color ()**

  Returns the current row header color.

- **void row_header_color (Fl_Color val)**

  Sets the row header color and causes the screen to redraw.

- **int row_header_width ()**
Returns the current row header width (in pixels).

- void **row_header_width**(int width)
  - Sets the row header width to n and causes the screen to redraw.

- int **row_height**(int row)
  - Returns the current height of the specified row as a value in pixels.

- void **row_height**(int row, int height)
  - Sets the height of the specified row in pixels, and the table is redrawn.

- void **row_height_all**(int height)
  - Convenience method to set the height of all rows to the same value, in pixels.

- int **row_position**()
  - Returns the current row scroll position as a row number.

- void **row_position**(int row)
  - Sets the vertical scroll position so 'row' is at the top, and causes the screen to redraw.

- int **row_resize**()
  - Returns if row resizing by the user is allowed.

- void **row_resize**(int flag)
  - Allows/disallows row resizing by the user.

- int **row_resize_min**()
  - Returns the current row minimum resize value.

- void **row_resize_min**(int val)
  - Sets the current row minimum resize value.

- int **rows**()
  - Returns the number of rows in the table.

- virtual void **rows**(int val)
  - Sets the number of rows in the table, and the table is redrawn.

- int **scrollbar_size**() const
  - Gets the current size of the scrollbars' troughs, in pixels.

- void **scrollbar_size**(int newSize)
  - Sets the pixel size of the scrollbars' troughs to newSize, in pixels.

- void **set_selection**(int row_top, int col_left, int row_bot, int col_right)
  - Sets the region of cells to be selected (highlighted).

- int **tab_cell_nav**() const
  - Gets state of table's 'Tab' key cell navigation flag.

- void **tab_cell_nav**(int val)
  - Flag to control if Tab navigates table cells or not.

- void **table_box**(Fl_Boxtype val)
  - Sets the kind of box drawn around the data table, the default being FL_NO_BOX.

- Fl_Boxtype **table_box**(){void)
  - Returns the current box type used for the data table.

- int **top_row**()
  - Returns the current top row shown in the table.

- void **top_row**(int row)
  - Sets which row should be at the top of the table, scrolling as necessary, and the table is redrawn.

- void **visible_cells**(int &r1, int &r2, int &c1, int &c2)
  - Returns the range of row and column numbers for all visible and partially visible cells in the table.

- void **when**(Fl_When flags)
  - The Fl_Widget::when() function is used to set a group of flags, determining when the widget callback is called:

- ~Fl_Table()()
  - The destructor for Fl_Table.
Protected Types

- enum ResizeFlag {
  RESIZE_NONE = 0, RESIZE_COL_LEFT = 1, RESIZE_COL_RIGHT = 2, RESIZE_ROW_ABOVE = 3, RESIZE_ROW_BELOW = 4
}

Protected Member Functions

- void change_cursor (Fl_Cursor newcursor)
  Change mouse cursor to different type.
- long col_scroll_position (int col)
  Returns the scroll position (in pixels) of the specified column 'col'.
- TableContext cursor2rowcol (int &R, int &C, ResizeFlag &resizeflag)
  Find row/col for the recent mouse event.
- void damage_zone (int r1, int c1, int r2, int c2, int r3=0, int c3=0)
  Sets the damage zone to the specified row/col values.
- void draw () FL OVERRIDE
  Draws the entire Fl_Table.
- virtual void draw_cell (TableContext context, int R=0, int C=0, int X=0, int Y=0, int W=0, int H=0)
  Subclass should override this method to handle drawing the cells.
- int find_cell (TableContext context, int R, int C, int &X, int &Y, int &W, int &H)
  Find a cell's X/Y/W/H region for the specified cell in row 'R', column 'C'.
- void get_bounds (TableContext context, int &R, int &C, int &X, int &Y, int &W, int &H)
  Returns the (X,Y,W,H) bounding region for the specified 'context'.
- int handle (int e) FL OVERRIDE
  Handle FLTK events.
- int is_fltk_container ()
  Does the table contain any child fltk widgets?
- void recalc_dimensions ()
  Recalculate the dimensions of the table, and affect any children.
- void redraw_range (int topRow, int botRow, int leftCol, int rightCol)
  Define region of cells to be redrawn by specified range of rows/cols, and then sets damage(DAMAGE_CHILD).
- int row_col_clamp (TableContext context, int &R, int &C)
  Return specified row/col values R and C to within the table's current row/col limits.
- long row_scroll_position (int row)
  Returns the scroll position (in pixels) of the specified 'row'.
- void table_resized ()
  Call this if table was resized, to recalculate internal data.
- void table_scrolled ()
  Recalculate internals after a scroll.

Static Protected Member Functions

- static void scroll_cb (Fl_Widget *, void *)
  Callback for when someone moves a scrollbar.
Protected Attributes

- int botrow
  bottom row# of currently visible table on screen

- int current_col
  selection cursor's current column (-1 if none)

- int current_row
  selection cursor's current row (-1 if none)

- Fl_Scrollbar * hscrollbar
  child horizontal scrollbar widget

- int leftcol
  left column# of currently visible table on screen

- int leftcol_scrollpos
  precomputed scroll position for left column

- int rightcol
  right column# of currently visible table on screen

- int select_col
  extended selection column (-1 if none)

- int select_row
  extended selection row (-1 if none)

- Fl_Scroll * table
  child Fl_Scroll widget container for child fltk widgets (if any)

- int table_h
  table's virtual height (in pixels)

- int table_w
  table's virtual width (in pixels)

- int tih
  Data table's inner h dimension, inside bounding box. See Table Dimension Diagram.

- int thw
  Data table's inner w dimension, inside bounding box. See Table Dimension Diagram.

- int tix
  Data table's inner x dimension, inside bounding box. See Table Dimension Diagram.

- int tiy
  Data table's inner y dimension, inside bounding box. See Table Dimension Diagram.

- int toh
  Data table's outer h dimension, outside bounding box. See Table Dimension Diagram.

- int toprow
  top row# of currently visible table on screen

- int toprow_scrollpos
  precomputed scroll position for top row

- int tow
  Data table's outer w dimension, outside bounding box. See Table Dimension Diagram.

- int tox
  Data table's outer x dimension, outside bounding box. See Table Dimension Diagram.

- int toy
  Data table's outer y dimension, outside bounding box. See Table Dimension Diagram.

- Fl_Scrollbar * vscrollbar
  child vertical scrollbar widget

- int wih
  Table widget's inner h dimension, inside bounding box. See Table Dimension Diagram.

- int wiw
Table widget's inner w dimension, inside bounding box. See Table Dimension Diagram.

- int \texttt{wix}

Table widget's inner x dimension, inside bounding box. See Table Dimension Diagram.

- int \texttt{wiy}

Table widget's inner y dimension, inside bounding box. See Table Dimension Diagram.

### Additional Inherited Members

#### 34.139.1 Detailed Description

A table of widgets or other content.

This is the base class for table widgets.

To be useful it must be subclassed and several virtual functions defined. Normally applications use widgets derived from this widget, and do not use this widget directly; this widget is usually too low level to be used directly by applications.

This widget does not handle the data in the table. The \texttt{draw_cell()} method must be overridden by a subclass to manage drawing the contents of the cells.

This widget can be used in several ways:

- As a custom widget; see examples/table-simple.cxx and test/table.cxx. Very optimal for even extremely large tables.

- As a table made up of a single FLTK widget instanced all over the table, simulating a numeric spreadsheet. See examples/table-spreadsheet.cxx and examples/table-spreadsheet-with-keyboard-nav.cxx. Optimal for large tables.

- As a regular container of FLTK widgets, one widget per cell. See examples/table-as-container.cxx. Not recommended for large tables.

![Figure 34.48 table-simple example](image1)

![Figure 34.49 table-as-container example](image2)

When acting as part of a custom widget, events on the cells and/or headings generate callbacks when they are clicked by the user. You control when events are generated based on the setting for \texttt{Fl_Table::when()}.

When acting as a container for FLTK widgets, the FLTK widgets maintain themselves. Although the \texttt{draw_cell()} method must be overridden, its contents can be very simple. See the \texttt{draw_cell()} code in examples/table-simple.cxx.
The following variables are available to classes deriving from Fl_Table:

![Figure 34.50 Fl_Table Dimensions](image)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x(y)/w(h)</td>
<td>Fl_Table widget's outer dimension. The outer edge of the border of the Fl_Table. (Red in the diagram above)</td>
</tr>
<tr>
<td>wix/wiy/wiw/wih</td>
<td>Fl_Table widget's inner dimension. The inner edge of the border of the Fl_Table. eg. if the Fl_Table's box() is FL_NO_BOX, these values are the same as x(y)/w(h). (Yellow in the diagram above)</td>
</tr>
<tr>
<td>tox/toy/tow/toh</td>
<td>The table's outer dimension. The outer edge of the border around the cells, but inside the row/col headings and scrollbars. (Green in the diagram above)</td>
</tr>
<tr>
<td>tix/iy/tiw/tih</td>
<td>The table's inner dimension. The inner edge of the border around the cells, but inside the row/col headings and scrollbars. AKA the table's clip region. eg. if the table_box() is FL_NO_BOX, these values are the same as tox/toy/tow/toh. (Blue in the diagram above)</td>
</tr>
</tbody>
</table>

CORE DEVELOPERS

- Greg Ercolano : 12/16/2002 - initial implementation 12/16/02. Fl_Table, Fl_Table_Row, docs.
- Jean-Marc Lienher : 02/22/2004 - added keyboard nav + mouse selection, and ported Fl_Table into fltk-utf8-1.1.4

OTHER CONTRIBUTORS

- Inspired by the Feb 2000 version of FLVW's Flvv_Table widget. Mucho thanks to those folks.
- Mister Satan : 04/07/2003 - MinGW porting mods, and singleinput.cxx; a cool Fl_Input oriented spreadsheet example
- Marek Paliwoda : 01/08/2003 - Porting mods for Borland
- Ori Berger : 03/16/2006 - Optimizations for >500k rows/cols

LICENSE

Greg kindly gave his permission to integrate Fl_Table and Fl_Table_Row into FLTK, allowing FLTK license to apply while his widgets are part of the library. [updated by Greg, 04/26/17]

34.139.2 Member Enumeration Documentation
34.139.2.1 TableContext

enum Fl_Table::TableContext
The context bit flags for Fl_Table related callbacks. Should be used in draw_cell() to determine what's being drawn, or in a callback() to determine where a recent event occurred.

Enumerator

<table>
<thead>
<tr>
<th>CONTEXT_NONE</th>
<th>no known context</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTEXT_STARTPAGE</td>
<td>before the table is redrawn</td>
</tr>
<tr>
<td>CONTEXT_ENDPAGE</td>
<td>after the table is redrawn</td>
</tr>
<tr>
<td>CONTEXT_ROW_HEADER</td>
<td>drawing or event occurred in the row header</td>
</tr>
<tr>
<td>CONTEXT_COL_HEADER</td>
<td>drawing or event occurred in the col header</td>
</tr>
<tr>
<td>CONTEXT_CELL</td>
<td>drawing or event occurred in a cell</td>
</tr>
<tr>
<td>CONTEXT_TABLE</td>
<td>drawing or event occurred in a dead zone of table</td>
</tr>
<tr>
<td>CONTEXT_RC_RESIZE</td>
<td>column or row is being resized</td>
</tr>
</tbody>
</table>

34.139.3 Constructor & Destructor Documentation

34.139.3.1 Fl_Table()

Fl_Table::Fl_Table (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char * l = 0 )

The constructor for Fl_Table. This creates an empty table with no rows or columns, with headers and row/column resize behavior disabled.

34.139.3.2 ~Fl_Table()

Fl_Table::~Fl_Table ( )
The destructor for Fl_Table. Destroys the table and its associated widgets.

34.139.4 Member Function Documentation

34.139.4.1 array()

Fl_Widget *const * Fl_Table::array ( ) [inline]
Returns a pointer to the array of children. 
This pointer is only valid until the next time a child is added or removed.

34.139.4.2 callback()

void Fl_Table::callback (  
  Fl_Widget *,  
  void * )
Callbacks will be called depending on the setting of Fl_Widget::when().
Callback functions should use the following functions to determine the context/row/column:
**callback_row()** and **callback_col()** will be set to the row and column number the event occurred on. If someone clicked on a row header, `col` will be 0. If someone clicked on a column header, `row` will be 0.

**callback_context()** will return one of the following:

<table>
<thead>
<tr>
<th>Context</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTEXT_ROW_HEADER</td>
<td>Someone clicked on a row header. Excludes resizing.</td>
</tr>
<tr>
<td>CONTEXT_COL_HEADER</td>
<td>Someone clicked on a column header. Excludes resizing.</td>
</tr>
<tr>
<td>CONTEXT_CELL</td>
<td>Someone clicked on a cell.</td>
</tr>
<tr>
<td>CONTEXT_RC_RESIZE</td>
<td>Someone is resizing rows/columns either interactively, or via the col_width() or row_height() API. Use is_interactive_resize() to determine interactive resizing. If resizing a column, R=0 and C=column being resized. If resizing a row, C=0 and R=row being resized. NOTE: To receive resize events, you must set when(FL_WHEN_CHANGED).</td>
</tr>
</tbody>
</table>

```cpp
class MyTable : public Fl_Table {
    // Handle events that happen on the table
    void event_callback2() {
        int R = callback_row(), // row where event occurred
            C = callback_col(); // column where event occurred
        TableContext context = callback_context(); // which part of table
        fprintf(stderr, "callback: Row=%d Col=%d Context=%d Event=%d\n",
            R, C, (int)context, (int)Fl::event());
    }

    // Actual static callback
    static void event_callback(Fl_Widget*, void* data) {
        MyTable* o = (MyTable*)data;
        o->event_callback2();
    }

public:
    // Constructor
    MyTable() {
        // ...
        table.callback(&event_callback, (void*)this); // setup callback
        table.when(FL_WHEN_CHANGED|FL_WHEN_RELEASE); // when to call it
    }
};
```

### 34.139.4.3 callback_col()

int Fl_Table::callback_col () [inline]

Returns the current column the event occurred on.
This function should only be used from within the user's callback function.

### 34.139.4.4 callback_context()

TableContext Fl_Table::callback_context () [inline]

Returns the current 'table context'.
This function should only be used from within the user's callback function.

### 34.139.4.5 callback_row()

int Fl_Table::callback_row () [inline]

Returns the current row the event occurred on.
This function should only be used from within the user's callback function.
34.139.4.6 child()

`Fl_Widget * Fl_Table::child ( int n ) const [inline]`

Returns the child widget by an index.

When using the `Fl_Table` as a container for FLTK widgets, this method returns the widget pointer from the internal array of widgets in the container.

Typically used in loops, eg:

```c
for ( int i=0; i<children(); i++ ) {
    Fl_Widget *w = child(i);
   [..]
}
```

34.139.4.7 children()

`int Fl_Table::children ( ) const [inline]`

Returns the number of children in the table.

When using the `Fl_Table` as a container for FLTK widgets, this method returns how many child widgets the table has.

See also

`child(int)`

34.139.4.8 clear()

`virtual void Fl_Table::clear ( ) [inline], [virtual]`

Clears the table to zero rows (`rows(0)`), zero columns (`cols(0)`), and clears any widgets (`table->clear()`) that were added with `begin()/end()` or `add()/insert()/etc.`

See also

`rows(int), cols(int)`

Reimplemented in `Fl_Table_Row`.

34.139.4.9 col_header()

`void Fl_Table::col_header ( int flag ) [inline]`

Enable or disable column headers. If changed, the table is redrawn.

34.139.4.10 col_resize()

`void Fl_Table::col_resize ( int flag ) [inline]`

Allows/disallows column resizing by the user. 1=allow interactive resizing, 0=disallow interactive resizing. Since interactive resizing is done via the column headers, `col_header()` must also be enabled to allow resizing.

34.139.4.11 col_resize_min()

`void Fl_Table::col_resize_min ( int val ) [inline]`

Sets the current column minimum resize value. This is used to prevent the user from interactively resizing any column to be smaller than 'pixels'. Must be a value >1.
34.139.4.12 col_width()  
void Fl_Table::col_width (  
    int col,  
    int width  )  
Sets the width of the specified column in pixels, and the table is redrawn.  
callback() will be invoked with CONTEXT_RC_RESIZE if the column's width was actually changed, and when() is  
FL_WHEN_CHANGED.

34.139.4.13 col_width_all()  
void Fl_Table::col_width_all (  
    int width ) [inline]  
Convenience method to set the width of all columns to the same value, in pixels.  
The screen is redrawn.

34.139.4.14 cursor2rowcol()  
Fl_Table::TableContext Fl_Table::cursor2rowcol (  
    int & R,  
    int & C,  
    ResizeFlag & resizeflag ) [protected]  
Find row/col for the recent mouse event.  
Returns the context, and the row/column values in R/C. Also returns 'resizeflag' if mouse is hovered over a resize  
boundary.

34.139.4.15 damage_zone()  
void Fl_Table::damage_zone (  
    int r1,  
    int c1,  
    int r2,  
    int c2,  
    int r3 = 0,  
    int c3 = 0 ) [protected]  
Sets the damage zone to the specified row/col values.  
calls redraw_range().

34.139.4.16 do_callback()  
void Fl_Table::do_callback (  
    TableContext context,  
    int row,  
    int col ) [inline]  
Calls the widget callback.  
Saves the specified 'context', 'row', and 'col' values, so that the user's callback can then access them with the  
member functions callback_context(), callback_row() and callback_col().

34.139.4.17 draw()  
void Fl_Table::draw (  
    void ) [protected], [virtual]  
Draws the entire Fl_Table.  
Lets fltk widgets draw themselves first, followed by the cells via calls to draw_cell().  
Reimplemented from Fl_Group.
34.139.4.18  draw_cell()

virtual void Fl_Table::draw_cell (  
    TableContext context,  
    int R = 0,  
    int C = 0,  
    int X = 0,  
    int Y = 0,  
    int W = 0,  
    int H = 0) [inline], [protected], [virtual]

Subclass should override this method to handle drawing the cells.  
This method will be called whenever the table is redrawn, once per cell.  
Only cells that are completely (or partially) visible will be told to draw. 
context will be one of the following:

| Fl_Table::CONTEXT_STARTPAGE | When table, or parts of the table, are about to be redrawn.  
|                            | Use to initialize static data, such as font selections.  
|                            | R/C will be zero,  
|                            | X/Y/W/H will be the dimensions of the table's entire data area.  
|                            | (Useful for locking a database before accessing; see also  
|                            | visible_cells()) |
| Fl_Table::CONTEXT_ENDPAGE  | When table has completed being redrawn.  
|                            | R/C will be zero, X/Y/W/H dimensions of table's data area.  
|                            | (Useful for unlocking a database after accessing) |
| Fl_Table::CONTEXT_ROW_HEADER | Whenever a row header cell needs to be drawn.  
|                            | R will be the row number of the header being redrawn,  
|                            | C will be zero,  
|                            | X/Y/W/H will be the fltk drawing area of the row header in the window |
| Fl_Table::CONTEXT_COL_HEADER | Whenever a column header cell needs to be drawn.  
|                            | R will be zero,  
|                            | C will be the column number of the header being redrawn,  
|                            | X/Y/W/H will be the fltk drawing area of the column header in the window |
| Fl_Table::CONTEXT_CELL     | Whenever a data cell in the table needs to be drawn.  
|                            | R/C will be the row/column of the cell to be drawn,  
|                            | X/Y/W/H will be the fltk drawing area of the cell in the window |
| Fl_Table::CONTEXT_RC_RESIZE | Whenever table or row/column is resized or scrolled, either inter-  
|                            | actively or via col_width() or row_height().  
|                            | R/C/X/Y/W/H will all be zero.  
|                            | Useful for fltk containers that need to resize or move the child fltk  
|                            | widgets. |

R and C will be set to the row and column number of the cell being drawn. In the case of row headers, C will be 0.  
In the case of column headers, R will be 0.  
X/Y/W/H will be the position and dimensions of where the cell should be drawn.  
In the case of custom widgets, a minimal draw_cell() override might look like the following. With custom widgets it  
is up to the caller to handle drawing everything within the dimensions of the cell, including handling the selection  
color. Note all clipping must be handled as well; this allows drawing outside the dimensions of the cell if so desired  
for 'custom effects'.

```c
// This is called whenever Fl_Table wants you to draw a cell
void MyTable::draw_cell(TableContext context, int R=0, int C=0, int X=0, int Y=0, int W=0, int H=0) {
    static char s[40];
    sprintf(s, "%d/%d", R, C); // text for each cell
    switch ( context ) {
        case CONTEXT_STARTPAGE: // Fl_Table telling us it’s starting to draw page
            fl_font(Fl_HELVETICA, 16);
            return;
        case CONTEXT_ROW_HEADER: // Fl_Table telling us to draw row/col headers
            fl_push_clip(X, Y, W, H);
            {  
                fl_draw_box(Fl_THIN_UP_BOX, X, Y, W, H, color());
            }
            break;
        case CONTEXT_COL_HEADER:
            fl_draw_box(Fl_THIN_UP_BOX, X, Y, W, H, color());
```
34.139  Fl_Table Class Reference

$$\text{fl\color(FL\_BLACK);}$$

$$\text{fl\_draw(s, X, Y, W, H, FL\_ALIGN\_CENTER);}$$

$$\text{}}$$

$$\text{fl\_pop\_clip();}$$

$$\text{return;}$$

$$\text{case CONTEXT\_CELL:}$$

$$\text{// Fl\_Table telling us to draw cells}$$

$$\text{fl\_push\_clip(X, Y, W, H);}$$

$$\text{\{}$$

$$\text{// BG COLOR}$$

$$\text{fl\_color(row\_selected(R) ? selection\_color() : FL\_WHITE);}$$

$$\text{fl\_rectf(X, Y, W, H);}$$

$$\text{// TEXT}$$

$$\text{fl\_color(FL\_BLACK);}$$

$$\text{fl\_draw(s, X, Y, W, H, FL\_ALIGN\_CENTER);}$$

$$\text{// BORDER}$$

$$\text{fl\_color(FL\_LIGHT2);}$$

$$\text{fl\_rect(X, Y, W, H);}$$

$$\text{\}}$$

$$\text{fl\_pop\_clip();}$$

$$\text{return;}$$

$$\text{default:}$$

$$\text{return;}$$

$$\text{// NOTREACHED}$$

$$\text{\}}$$

34.139.4.19  find_cell()

$$\text{int Fl\_Table::find\_cell (}$$

$$\text{TableContext context,}$$

$$\text{int R,}$$

$$\text{int C,}$$

$$\text{int & X,}$$

$$\text{int & Y,}$$

$$\text{int & W,}$$

$$\text{int & H \}) [\text{protected}]$$

Find a cell’s X/Y/W/H region for the specified cell in row ‘R’, column ‘C’.

Returns

- 0 – on success, XYWH returns the region of the specified cell.
- -1 – if R or C are out of range, and X/Y/W/H will be set to zero.

34.139.4.20  get_selection()

$$\text{void Fl\_Table::get\_selection (}$$

$$\text{int & row\_top,}$$

$$\text{int & col\_left,}$$

$$\text{int & row\_bot,}$$

$$\text{int & col\_right \})$$

Gets the region of cells selected (highlighted).

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>row_top</th>
<th>Returns the top row of selection area</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>col_left</td>
<td>Returns the left column of selection area</td>
</tr>
<tr>
<td>in</td>
<td>row_bot</td>
<td>Returns the bottom row of selection area</td>
</tr>
<tr>
<td>in</td>
<td>col_right</td>
<td>Returns the right column of selection area</td>
</tr>
</tbody>
</table>

34.139.4.21  handle()

$$\text{int Fl\_Table::handle (}$$

Generated by Doxygen
int e) [protected], [virtual]

Handle FLTK events.
Reimplemented from Fl_Group.
Reimplemented in Fl_Table_Row.

34.139.4.22 init_sizes()

void Fl_Table::init_sizes() [inline]
Resets the internal array of widget sizes and positions.
See also

Fl_Group::init_sizes()

34.139.4.23 insert()

void Fl_Table::insert( Fl_Widget & wgt,
                      Fl_Widget * w2 ) [inline]
The specified widget is removed from its current group (if any) and inserted into Fl_Table's group before widget 'w2'. This will append if 'w2' is not in Fl_Table's group.

34.139.4.24 is_interactive_resize()

int Fl_Table::is_interactive_resize() [inline]
Returns 1 if someone is interactively resizing a row or column.
You can currently call this only from within your callback().

34.139.4.25 is_selected()

int Fl_Table::is_selected( int r,
                          int c )
See if the cell at row r and column c is selected.
Returns

1 if the cell is selected, 0 if not.

34.139.4.26 move_cursor()

int Fl_Table::move_cursor( int R,
                          int C,
                          int shiftselect )
Moves the selection cursor a relative number of rows/columns specified by R/C.
R/C can be positive or negative, depending on the direction to move. A value of 0 for R or C prevents cursor movement on that axis.
If shiftselect is set, the selection range is extended to the new cursor position. If clear, the cursor is simply moved, and any previous selection is cancelled.
Used mainly by keyboard events (e.g. Fl_Right, FL_HOME, FL_END..) to let the user keyboard navigate the selection cursor around.
The scroll positions may be modified if the selection cursor traverses into cells off the screen's edge.
Internal variables select_row/select_col and current_row/current_col are modified, among others.
Examples:
 R=1, C=0 -- moves the selection cursor one row downward.
 R=5, C=0 -- moves the selection cursor 5 rows downward.
 R=5, C=0 -- moves the cursor 5 rows upward.
 R=2, C=2 -- moves the cursor 2 rows down and 2 columns to the right.
34.139.4.27  recalc_dimensions()

void FL_Table::recalc_dimensions () [protected]
Recalculate the dimensions of the table, and affect any children.
Internally, FL_Group::resize() and init_sizes() are called.

34.139.4.28  redraw_range()

void FL_Table::redraw_range (
  int topRow,
  int botRow,
  int leftCol,
  int rightCol ) [inline], [protected]
Define region of cells to be redrawn by specified range of rows/cols, and then sets damage(DAMAGE_CHILD).
Extends any previously defined range to redraw.

34.139.4.29  resize()

void FL_Table::resize ( 
  int X,
  int Y,
  int W,
  int H ) [virtual]
Handle resize events if user resizes parent window.
This changes the size of FL_Table, causing it to redraw.
Reimplemented from FL_Group.

34.139.4.30  row_col_clamp()

int FL_Table::row_col_clamp ( 
  TableContext context,
  int & R,
  int & C ) [protected]
Return specified row/col values R and C to within the table's current row/col limits.
Returns
  0 if no changes were made, or 1 if they were.

34.139.4.31  row_header()

void FL_Table::row_header ( 
  int flag ) [inline]
Enables/disables showing the row headers.
1=enabled, 0=disabled. If changed, the table is redrawn.

34.139.4.32  row_height()

void FL_Table::row_height ( 
  int row,
  int height )
Sets the height of the specified row in pixels, and the table is redrawn.
callback() will be invoked with CONTEXT_RC_RESIZE if the row's height was actually changed, and when() is
FL_WHEN_CHANGED.
34.139.4.33  row_height_all()

void Fl_Table::row_height_all (  
    int height   ) [inline]
Convenience method to set the height of all rows to the same value, in pixels.  
The screen is redrawn.

34.139.4.34  row_resize()

void Fl_Table::row_resize (  
    int flag     ) [inline]
Allows/disallows row resizing by the user.  
1=allow interactive resizing, 0=disallow interactive resizing. Since interactive resizing is done via the row headers, row_header() must also be enabled to allow resizing.

34.139.4.35  row_resize_min()

void Fl_Table::row_resize_min (  
    int val      ) [inline]
Sets the current row minimum resize value.  
This is used to prevent the user from interactively resizing any row to be smaller than 'pixels'. Must be a value >=1.

34.139.4.36  rows()

void Fl_Table::rows (  
    int val      ) [virtual]
Sets the number of rows in the table, and the table is redrawn.  
Reimplemented in Fl_Table_Row.

34.139.4.37  scrollbar_size() [1/2]

int Fl_Table::scrollbar_size ( ) const [inline]
Gets the current size of the scrollbars' troughs, in pixels.  
If this value is zero (default), this widget will use the Fl::scrollbar_size() value as the scrollbar's width.  
Returns  
    Scrollbar size in pixels, or 0 if the global Fl::scrollbar_size() is being used.  
See also  
    Fl::scrollbar_size(int)

34.139.4.38  scrollbar_size() [2/2]

void Fl_Table::scrollbar_size (  
    int newSize   ) [inline]
Sets the pixel size of the scrollbars' troughs to newSize, in pixels.  
Normally you should not need this method, and should use Fl::scrollbar_size(int) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.  
Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare. Setting newSize to the special value of 0 causes the widget to track the global Fl::scrollbar_size(), which is the default.
34.139 Fl_Table Class Reference

Parameters

| in  | newName | Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global Fl::scrollbar_size() |

See also

Fl::scrollbar_size()

34.139.4.39 set_selection()

```cpp
void Fl_Table::set_selection ( int row_top,
                               int col_left,
                               int row_bot,
                               int col_right )
```

Sets the region of cells to be selected (highlighted). So for instance, set_selection(0,0,0,0) selects the top/left cell in the table. And set_selection(0,0,1,1) selects the four cells in rows 0 and 1, column 0 and 1. To deselect all cells, use set_selection(-1,-1,-1,-1);

Parameters

| in  | row_top   | Top row of selection area |
| in  | col_left  | Left column of selection area |
| in  | row_bot   | Bottom row of selection area |
| in  | col_right | Right column of selection area |

34.139.4.40 tab_cell_nav()[1/2]

```cpp
int Fl_Table::tab_cell_nav ( ) const [inline]
```

Get state of table's 'Tab' key cell navigation flag.

Returns

1 if Tab configured to navigate cells in table
0 to navigate widget focus (default)

See also

tab_cell_nav(int)

34.139.4.41 tab_cell_nav()[2/2]

```cpp
void Fl_Table::tab_cell_nav ( int val ) [inline]
```

Flag to control if Tab navigates table cells or not. If on, Tab key navigates table cells. If off, Tab key navigates fltk widget focus. (default) As of fltk 1.3, the default behavior of the Tab key is to navigate focus off of the current widget, and on to the next one. But in some applications, it's useful for Tab to be used to navigate cells in the Fl_Table.
### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>val</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

#### 34.139.4.42 table_box()

```cpp
void Fl_Table::table_box ( 
    Fl_Boxtype val ) [inline]
```

Sets the kind of box drawn around the data table, the default being FL_NO_BOX. Changing this value will cause the table to redraw.

#### 34.139.4.43 table_resized()

```cpp
void Fl_Table::table_resized ( ) [protected]
```

Call this if table was resized to recalculate internal data. Calls recall_dimensions(), and recalculates scrollbar sizes.

#### 34.139.4.44 table_scrolled()

```cpp
void Fl_Table::table_scrolled ( ) [protected]
```

Recalculate internals after a scroll. Call this if table has been scrolled or resized. Does not handle **redraw**. TODO: Assumes t[x,y,w,h] has already been recalculated.

#### 34.139.4.45 top_row() [1/2]

```cpp
int Fl_Table::top_row ( ) [inline]
```

Returns the current top row shown in the table. This row may be partially obscured.

#### 34.139.4.46 top_row() [2/2]

```cpp
void Fl_Table::top_row ( int row ) [inline]
```

Sets which row should be at the top of the table, scrolling as necessary, and the table is redrawn. If the table cannot be scrolled that far, it is scrolled as far as possible.

#### 34.139.4.47 visible_cells()

```cpp
void Fl_Table::visible_cells ( 
    int & r1, 
    int & r2, 
    int & c1, 
    int & c2 ) [inline]
```

Returns the range of row and column numbers for all visible and partially visible cells in the table. These values can be used e.g. by your **draw_cell()** routine during CONTEXT_STARTPAGE to figure out what cells are about to be redrawn for the purposes of locking the data from a database before it's drawn.

```
leftcol   rightcol 
| toprow .. '-------------------' |
|       |  V I S I B L E  |
|       |  T A B L E   |
| botrow .. '-------------------' |
```
e.g. in a table where the visible rows are 5-20, and the visible columns are 100-120, then those variables would be:

- toprow = 5
• botrow = 20
• leftcol = 100
• rightcol = 120

34.139.4.48 when()

```cpp
void Fl_Table::when (Fl_When flags)
```

The `Fl_Widget::when()` function is used to set a group of flags, determining when the widget callback is called:

<table>
<thead>
<tr>
<th>Flag</th>
<th>Callback Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_WHEN_CHANGED</td>
<td><code>callback()</code> will be called when rows or columns are resized (interactively or via</td>
</tr>
<tr>
<td></td>
<td><code>col_width()</code> or <code>row_height()</code>), passing CONTEXT_RC_RESIZE via callback_context().</td>
</tr>
<tr>
<td>FL_WHEN_RELEASE</td>
<td><code>callback()</code> will be called during FL_RELEASE events, such as when someone releases</td>
</tr>
<tr>
<td></td>
<td>a mouse button somewhere on the table.</td>
</tr>
</tbody>
</table>

The `callback()` routine is sent a TableContext that indicates the context the event occurred in, such as in a cell, in a header, or elsewhere on the table. When an event occurs in a cell or header, `callback_row()` and `callback_col()` can be used to determine the row and column. The callback can also look at the regular fltk event values (i.e., `Fl::event()` and `Fl::event_button()`) to determine what kind of event is occurring.

The documentation for this class was generated from the following files:

- Fl_Table.H
- Fl_Table.cxx

34.140 Fl_Table_Row Class Reference

A table with row selection capabilities.

```cpp
#include <Fl_Table_Row.H>
```

Inheritance diagram for Fl_Table_Row:

```
Fl_Widget
    ↓
Fl_Group
    ↓
Fl_Table
    ↓
Fl_Table_Row
```

Public Types

```cpp
enum TableRowSelectMode { SELECT_NONE, SELECT_SINGLE, SELECT_MULTI }
```

Public Member Functions

```cpp
void clear() FL_OVERRIDE
```

Clears the table to zero rows (rows(0)), zero columns (cols(0)), and clears any widgets (table->clear()) that were added with begin()/end() or add()/insert()/etc.

```cpp
Fl_Table_Row (int X, int Y, int W, int H, const char *l=0)
```

The constructor for the `Fl_Table_Row`.

```cpp
int row_selected (int row)
```

Generated by Doxygen
Checks to see if 'row' is selected.

- **int rows ()**
  - Returns the number of rows in the table.

- **void rows (int val) FL_OVERRIDE**
  - Sets the number of rows in the table, and the table is redrawn.

- **void select_all_rows (int flag=1)**
  - This convenience function changes the selection state for all rows based on 'flag'.

- **int select_row (int row, int flag=1)**
  - Changes the selection state for 'row', depending on the value of 'flag'.

- **TableRowSelectMode type () const**
  - Returns the current table selection mode.

- **void type (TableRowSelectMode val)**
  - Sets the table selection mode.

- **~Fl_Table_Row ()**
  - The destructor for the Fl_Table_Row.

### Protected Member Functions

- **int find_cell (TableContext context, int R, int C, int &X, int &Y, int &W, int &H)**
  - Used to find cells in the table.

- **int handle (int event) FL_OVERRIDE**
  - Handle FLTK events.

### Additional Inherited Members

#### 34.140.1 Detailed Description

A table with row selection capabilities.

This class implements a simple table with the ability to select rows. This widget is similar to an Fl_Browser with columns. Most methods of importance will be found in the Fl_Table widget, such as Fl_Table::rows() and Fl_Table::cols().

To be useful it must be subclassed and at minimum the draw_cell() method must be overridden to provide the content of the cells. This widget does not manage the cell's data content; it is up to the parent class's draw_cell() method override to provide this.

Events on the cells and/or headings generate callbacks when they are clicked by the user. You control when events are generated based on the values you supply for Fl_Table::when().

#### 34.140.2 Constructor & Destructor Documentation

##### 34.140.2.1 Fl_Table_Row()

Fl_Table_Row::Fl_Table_Row (int X, int Y, int W, int H, const char * l = 0) [inline]

The constructor for the Fl_Table_Row.

This creates an empty table with no rows or columns, with headers and row/column resize behavior disabled.

##### 34.140.2.2 ~Fl_Table_Row()

Fl_Table_Row::~Fl_Table_Row ( ) [inline]

The destructor for the Fl_Table_Row.

Destroys the table and its associated widgets.

##### 34.140.3 Member Function Documentation
34.140.3.1 clear()

```cpp
void Fl_Table_Row::clear (  
  void  ) [inline], [virtual]
```

Clears the table to zero rows (rows(0)), zero columns (cols(0)), and clears any widgets (table->clear()) that were added with begin()/end() or add()/insert()/etc.

See also 
rows(int), cols(int)

Reimplemented from Fl_Table.

34.140.3.2 handle()

```cpp
int Fl_Table_Row::handle (  
  int e  ) [protected], [virtual]
```

Handle FLTK events.

Reimplemented from Fl_Table.

34.140.3.3 row_selected()

```cpp
int Fl_Table_Row::row_selected (  
  int row  )
```

Checks to see if 'row' is selected.

Returns 1 if selected, 0 if not. You can change the selection of a row by clicking on it, or by using select_row(row, flag)

34.140.3.4 rows()

```cpp
void Fl_Table_Row::rows (  
  int val  ) [virtual]
```

Sets the number of rows in the table, and the table is redrawn.

Reimplemented from Fl_Table.

34.140.3.5 select_all_rows()

```cpp
void Fl_Table_Row::select_all_rows (  
  int flag = 1  )
```

This convenience function changes the selection state for all rows based on 'flag'.
0=deselect, 1=select, 2=toggle existing state.

34.140.3.6 select_row()

```cpp
int Fl_Table_Row::select_row (  
  int row,  
  int flag = 1  )
```

Changes the selection state for 'row', depending on the value of 'flag'.
0=deselected, 1=select, 2=toggle existing state.

34.140.3.7 type()

```cpp
void Fl_Table_Row::type (  
  TableRowSelectMode val  )
```

Sets the table selection mode.

- Fl_Table_Row::SELECT_NONE - No selection allowed
- Fl_Table_Row::SELECT_SINGLE - Only single rows can be selected
• Fl_Table_Row::SELECT_MULTI - Multiple rows can be selected

The documentation for this class was generated from the following files:

• Fl_Table_Row.H
• Fl_Table_Row.cxx

34.141 Fl_Tabs Class Reference

The Fl_Tabs widget is a container widget that displays a set of tabs, with each tab representing a different child widget.

#include <Fl_Tabs.H>

Inheritance diagram for Fl_Tabs:

```
Fl_Widget
  ↓
Fl_Group
  ↓
Fl_Tabs
```

Public Types

• enum { OVERFLOW_COMPRESS = 0, OVERFLOW_CLIP, OVERFLOW_PULLDOWN, OVERFLOW_DRAG }

Public Member Functions

• void client_area (int &rx, int &ry, int &rw, int &rh, int tabh=0)
  
  Returns the position and size available to be used by its children.

• Fl_Tabs (int X, int Y, int W, int H, const char ∗L=0)

  Creates a new Fl_Tabs widget using the given position, size, and label string.

• int handle (int) FL_OVERRIDE

  Handle all events in the tabs area and forward the rest to the selected child.

• void handle_overflow (int ov)

  Sets a method to handle an overflowing tab bar.

• Fl_Widget ∗ push () const

  Returns the tab group for the tab the user has currently down-clicked on and remains over until FL_RELEASE.

• int push (Fl_Widget ∗)

  This is called by the tab widget’s handle() method to set the tab group widget the user last FL_PUSH’ed on.

• Fl_Align tab_align () const

  Gets the tab label alignment.

• void tab_align (Fl_Align a)

  Sets the tab label alignment.

• Fl_Widget ∗ value ()

  Gets the currently visible widget/tab.

• int value (Fl_Widget ∗)

  Sets the widget to become the current visible widget/tab.

• virtual Fl_Widget ∗ which (int event_x, int event_y)

  Return a pointer to the child widget with a tab at the given coordinates.

• virtual ~Fl_Tabs ()

  Delete allocated resources and destroy all children.
Protected Member Functions

- void check_overflow_menu ()
  Check if the tabs overflow and sets the has_overflow_menu flag accordingly.
- virtual void clear_tab_positions ()
  Clear internal array of tab positions and widths.
- void draw () FL_OVERRIDE
  Draw the tabs area, the optional pulldown button, and all children.
- void draw_overflow_menu_button ()
  Draw square button-like graphics with a down arrow in the top or bottom right corner.
- virtual void draw_tab (int x1, int x2, int W, int H, Fl_Widget ∗o, int flags, int sel)
  Draw a tab in the top or bottom tabs area.
- void handle_overflow_menu ()
  This is called when the user clicks the overflow pulldown menu button.
- virtual int hit_close (Fl_Widget ∗o, int event_x, int event_y)
  Check whether the coordinates fall within the "close" button area of the tab.
- virtual int hit_overflow_menu (int event_x, int event_y)
  Determine if the coordinates are in the area of the overflow menu button.
- virtual int hit_tabs_area (int event_x, int event_y)
  Determine if the coordinates are within the tabs area.
- int on_insert (Fl_Widget ∗, int) FL_OVERRIDE
  Make sure that we redraw all tabs when new children are added.
- int on_move (int, int) FL_OVERRIDE
  Make sure that we redraw all tabs when children are moved.
- void on_remove (int) FL_OVERRIDE
  Make sure that we redraw all tabs when new children are removed.
- virtual void redraw_tabs ()
  Redraw all tabs (and only the tabs).
- void resize (int, int, int, int) FL_OVERRIDE
  Make sure that we redraw all tabs when the widget size changes.
- virtual int tab_height ()
  Return space (height) in pixels usable for tabs.
- virtual int tab_positions ()
  Calculate tab positions and widths.

Protected Attributes

- int has_overflow_menu
  set in OVERFLOW_PULLDOWN mode if tabs overflow. The actual menu array is created only on demand
- int overflow_type
- Fl_Align tab_align_
  tab label alignment
- int tab_count
  Array size of tab positions etc.
- int ∗tab_flags
  Array of tab flag of tabs per child.
- int tab_offset
  for pulldown and drag overflow, this is the horizontal offset when the tabs bar is dragged by the user
- int ∗tab_pos
  Array of x-offsets of tabs per child + 1.
- int ∗tab_width
  Array of widths of tabs per child.
Additional Inherited Members

34.141.1 Detailed Description

The Fl_Tabs widget is a container widget that displays a set of tabs, with each tab representing a different child widget.

The user can select a tab by clicking on it, and the corresponding child widget will be displayed. The Fl_Tabs widget is useful for organizing a large number of controls or other widgets into a compact space, allowing the user to switch between different sets of controls as needed.

![Figure 34.51 Fl_Tabs](image)

Clicking the tab makes a child visible() by calling show() on it, and all other children are made invisible by calling hide() on them. Usually the children are Fl_Group widgets containing several widgets themselves.

Each child makes a card, and its label() is printed on the card tab, including the label font and style. The selection color of that child is used to color the tab, while the color of the child determines the background color of the pane. '!' in labels are used to prefix a shortcut that is drawn underlined and that activates the corresponding tab; repeated '&&' avoids that.

The size of the tabs is controlled by the bounding box of the children (there should be some space between the children and the edge of the Fl_Tabs), and the tabs may be placed "inverted" on the bottom - this is determined by which gap is larger. It is easiest to lay this out in FLUID, using the FLUID browser to select each child group and resize them until the tabs look the way you want them to.

The background area behind and to the right of the tabs is "transparent", exposing the background detail of the parent. The value of Fl_Tabs::box() does not affect this area. So if Fl_Tabs is resized by itself without the parent, force the appropriate parent (visible behind the tabs) to redraw() to prevent artifacts.

See "Resizing Caveats" below on how to keep tab heights constant. See "Callback's Use Of when()" on how to control the details of how clicks invoke the callback().

A typical use of the Fl_Tabs widget:

```cpp
// Typical use of Fl_Tabs
Fl_Tabs *tabs = new Fl_Tabs(10,10,300,200);
{
    Fl_Group *grp1 = new Fl_Group(20,30,280,170,"Tab1");
    [...] //widgets that go in tab#1...
    grp1->end();
    Fl_Group *grp2 = new Fl_Group(20,30,280,170,"Tab2");
    [...] //widgets that go in tab#2...
    grp2->end();
    tabs->end();
}
```

Default Appearance

The appearance of each "tab" is taken from the label() and color() of the child group corresponding to that "tab" and panel. Where the "tabs" appear depends on the position and size of the child groups that make up the panels within the Fl_Tabs widget, i.e. whether there is more space above or below them. The height of the "tabs" depends on how much free space is available.
Highlighting The Selected Tab

The selected "tab" can be highlighted further by setting the selection_color() of the Fl_Tab itself, e.g.

```cpp
tabs = new Fl_Tabs(..);
tabs->selection_color(FL_DARK3);
```

The result of the above looks like:

![Figure 34.53 Highlighting the selected tab](image)

Uniform Tab and Panel Appearance

In order to have uniform tab and panel appearance, not only must the color() and selection_color() for each child group be set, but also the selection_color() of the Fl_Tab itself any time a new "tab" is selected. This can be achieved within the Fl_Tab callback, e.g.

```cpp
void MyTabCallback(Fl_Widget *w, void*) {
    Fl_Tabs *tabs = (Fl_Tabs*)w;
    // When tab changed, make sure it has same color as its group
    tabs->selection_color( (tabs->value())->color() );
}

int main(..) {
    // Define tabs widget
    tabs = new Fl_Tabs(..);
    tabs->callback(MyTabCallback);
    // Create three tabs each colored differently
    grp1 = new Fl_Group1.. "One";
    grp1->color(9);
    grp1->selection_color(9);
    grp1->end();
    grp2 = new Fl_Group1.. "Two";
    grp2->color(10);
    grp2->selection_color(10);
    grp2->end();
    grp3 = new Fl_Group1.. "Three";
    grp3->color(14);
    grp3->selection_color(14);
    grp3->end();
    // Make sure default tab has same color as its group
    tabs->selection_color( (tab->value())->color() );
    ...
    return Fl::run();
}
```

The result of the above looks like:

![Figure 34.54 Fl_Tabs with uniform colors](image)
If Fl_Tabs has no children, the widget will be drawn as a flat rectangle in the background color set by color().

Close Button on Tabs
The Fl_Tabs widget allows you to specify that a child widget should display a close button in its tab. If the FL_WHEN_CLOSED flag is set for the child widget, an "X" symbol will be displayed to the left of the label text in the tab. When the close button is clicked, the child widget's callback function will be called with the FL_REASON_CLOSED reason. It is then the responsibility of the child widget to remove itself from the Fl_Tabs container.

Tabs that are in a compressed state will not display a close button until they are fully expanded.

Overflowing Tabs
When the combined width of the tabs exceeds that of the Fl_Tabs widget, the tabs will overflow. Fl_Tabs provides four options for managing tabs overflow:

- Fl_Tabs::OVERFLOW_COMPRESS: proportionally compress the tabs to the left and right of the selected tab until they all fit within the widget.
- Fl_Tabs::OVERFLOW_CLIP: clips any tabs that extend beyond the right edge of the Fl_Tabs widget, making some tabs unreachable.
- Fl_Tabs::OVERFLOW_PULLDOWN: doesn't compress the tabs but instead generates a pulldown menu at the right end of the tabs area, displaying all available tabs.
- Fl_Tabs::OVERFLOW_DRAG: maintains the tabs' original sizes, allowing horizontal dragging of the tabs area using the mouse, a horizontal mouse wheel, or the horizontal scrolling gesture on touchpads.

Resizing Caveats
When Fl_Tabs is resized vertically, the default behavior scales the tab's height as well as its children. To keep the tab height constant during resizing, set the tab widget's resizable() to one of the tab's child groups, i.e.

```
tabs = new Fl_Tabs(..);
grp1 = new Fl_Group(..);
...
grp2 = new Fl_Group(..);
...
tabs->end();
tabs->resizable(grp1); // keeps tab height constant
```

Callback's Use Of when()

As of FLTK 1.3.3, Fl_Tabs() supports the following flags for when():

- FL_WHEN_NEVER – callback never invoked (all flags off)
- FL_WHEN_CHANGED – if flag set, invokes callback when a tab has been changed (on click or keyboard navigation)
- FL_WHEN_NOT_CHANGED – if flag set, invokes callback when the tabs remain unchanged (on click or keyboard navigation)
- FL_WHEN_RELEASE – if flag set, invokes callback on RELEASE of mouse button or keyboard navigation

Notes:
1. The above flags can be logically OR-ed (|) or added (+) to combine behaviors.
2. The default value for when() is FL_WHEN_RELEASE (inherited from Fl_Widget).
3. If FL_WHEN_RELEASE is the only flag specified, the behavior will be as if (FL_WHEN_RELEASE|FL_WHEN_CHANGED) was specified.
4. The value of changed() will be valid during the callback.
5. If both FL_WHEN_CHANGED and FL_WHEN_NOT_CHANGED are specified, the callback is invoked whether the tab has been changed or not. The changed() method can be used to determine the cause.
6. FL_WHEN_NOT_CHANGED can happen if someone clicks on an already selected tab, or if a keyboard navigation attempt results in no change to the tabs, such as using the arrow keys while at the left or right end of the tabs.
7. Fl::callback_reason() returns FL_REASON_SELECTED or FL_REASON_RESELECTED
34.141.2 Member Enumeration Documentation

34.141.2.1 anonymous enum

anonymous enum

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERFLOW_COMPRESS</td>
<td>Tabs will be compressed and overlaid on top of each other.</td>
</tr>
<tr>
<td>OVERFLOW_CLIP</td>
<td>Only the first tabs that fit will be displayed.</td>
</tr>
<tr>
<td>OVERFLOW_PULLDOWN</td>
<td>Tabs that do not fit will be placed in a pull-down menu.</td>
</tr>
<tr>
<td>OVERFLOW_DRAG</td>
<td>The tab bar can be dragged horizontally to reveal additional tabs.</td>
</tr>
</tbody>
</table>

34.141.3 Constructor & Destructor Documentation

34.141.3.1 Fl_Tabs()

Fl_Tabs::Fl_Tabs (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ L = 0 )

Creates a new Fl_Tabs widget using the given position, size, and label string. The default boxtype is FL_THIN_UP_BOX.

Use add(Fl_Widget ∗) to add each child, which are usually Fl_Group widgets. The children should be sized to stay away from the top or bottom edge of the Fl_Tabs widget, which is where the tabs will be drawn. All children of Fl_Tabs should have the same size and exactly fit on top of each other. They should only leave space above or below where the tabs will go, but not on the sides. If the first child of Fl_Tabs is set to "resizable()", the riders will not resize when the tabs are resized.

The destructor also deletes all the children. This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the Fl_Tabs and all of its children can be automatic (local) variables, but you must declare the Fl_Tabs widget first so that it is destroyed last.

34.141.4 Member Function Documentation

34.141.4.1 clear_tab_positions()

void Fl_Tabs::clear_tab_positions ( ) [protected], [virtual]

Clear internal array of tab positions and widths.

See also

         tab_positions().

34.141.4.2 client_area()

void Fl_Tabs::client_area (  
    int ∗ rx,  
    int ∗ ry,  
    int ∗ rw,  
    int ∗ rh,  
    int ∗ rh,
    int ∗ rh,
Returns the position and size available to be used by its children. If there isn't any child yet the tabh parameter will be used to calculate the return values. This assumes that the children's labelsize is the same as the Fl_Tabs' labelsize and adds a small border. If there are already children, the values of child(0) are returned, and tabh is ignored.

Note
Children should always use the same positions and sizes.

tabh can be one of

- 0: calculate label size, tabs on top
- -1: calculate label size, tabs on bottom
- > 0: use given tabh value, tabs on top (height = tabh)
- < -1: use given tabh value, tabs on bottom (height = -tabh)

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>tabh</th>
<th>position and optional height of tabs (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>rx,ry,rw,rh</td>
<td>(x,y,w,h) of client area for children</td>
</tr>
</tbody>
</table>

Since
FLTK 1.3.0

34.141.4.3 draw()

void Fl_Tabs::draw (
    void ) [protected], [virtual]

Draw the tabs area, the optional pulldown button, and all children. Reimplemented from Fl_Group.

34.141.4.4 draw_tab()

void Fl_Tabs::draw_tab {
    int x1,
    int x2,
    int W,
    int H,
    Fl_Widget * o,
    int flags,
    int what ) [protected], [virtual]

Draw a tab in the top or bottom tabs area.
Tabs can be selected, or on the left or right side of the selected tab. If overlapping, left tabs are drawn bottom to top using clipping. The selected tab is then the topmost, followed by the right side tabs drawn top to bottom.
Tabs with the FL_WHEN_CLOSE bit set will draw a cross on their left side only if they are not compressed/overlapping.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>x1</th>
<th>horizontal position of the left visible edge of the tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x2</td>
<td>horizontal position of the following tab</td>
</tr>
</tbody>
</table>

Generated by Doxygen
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>W,H</th>
<th>width and height of the tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>o</td>
<td>the child widget that corresponds to this tab</td>
</tr>
<tr>
<td>in</td>
<td>flags</td>
<td>if bit 1 is set, this tab is overlapped by another tab</td>
</tr>
<tr>
<td>in</td>
<td>what</td>
<td>can be LEFT, SELECTED, or RIGHT to indicate if the tab is to the left side or the right side of the selected tab, or the selected tab itself</td>
</tr>
</tbody>
</table>

34.141.4.5 handle()

int Fl_Tabs::handle (int event) [virtual]
Handle all events in the tabs area and forward the rest to the selected child.

Parameters

| in  | event | handle this event |

Returns

1 if the event was handled

Reimplemented from Fl_Group.

34.141.4.6 handle_overflow()

void Fl_Tabs::handle_overflow (int ov)
Set a method to handle an overflowing tab bar.
The Fl_Tabs widget allows you to specify how to handle the situation where there are more tabs than can be displayed at once. The available options are:

- OVERFLOW_COMPRESS: Tabs will be compressed and overlaid on top of each other.
- OVERFLOW_CLIP: Only the first tabs that fit will be displayed.
- OVERFLOW_PULLDOWN: Tabs that do not fit will be placed in a pull-down menu.
- OVERFLOW_DRAG: The tab bar can be dragged horizontally to reveal additional tabs.

You can set the desired behavior using the overflow() method.

Parameters

| ov  | overflow type |

See also

OVERFLOW_COMPRESS, OVERFLOW_CLIP, OVERFLOW_PULLDOWN, OVERFLOW_DRAG

34.141.4.7 handle_overflow_menu()

void Fl_Tabs::handle_overflow_menu () [protected]
This is called when the user clicks the overflow pulldown menu button.
This method creates a menu item array that contains the titles of all tabs in the Fl_Tabs group. Visible and invisible tabs are separated by dividers to indicate their state. The menu is then presented until the user selects an item or cancels. The chosen tab is then selected and made visible. The menu item array is the deleted.

34.141.4.8 hit_close()

```c
int Fl_Tabs::hit_close {
    Fl_Widget ∗ o,
    int event_x,
    int event_y) [protected], [virtual]
```

Check whether the coordinates fall within the "close" button area of the tab. The Fl_Tabs::hit_close() method checks whether the given event coordinates fall within the area of the "close" button on the tab of the specified child widget. This method should be called after the Fl_Tabs::which() method, which updates a lookup table used to determine the width of each tab.

Parameters

<table>
<thead>
<tr>
<th>o</th>
<th>check the tab of this widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>event_x</td>
<td>event coordinates</td>
</tr>
<tr>
<td>event_y</td>
<td>event coordinates</td>
</tr>
</tbody>
</table>

Returns

1 if we hit the close button, and 0 otherwise

34.141.4.9 hit_overflow_menu()

```c
int Fl_Tabs::hit_overflow_menu {
    int event_x,
    int event_y) [protected], [virtual]
```

Determine if the coordinates are in the area of the overflow menu button.

Parameters

<table>
<thead>
<tr>
<th>event_x</th>
<th>event coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>event_y</td>
<td>event coordinates</td>
</tr>
</tbody>
</table>

Returns

1 if we hit the overflow menu button, and 0 otherwise

34.141.4.10 hit_tabs_area()

```c
int Fl_Tabs::hit_tabs_area {
    int event_x,
    int event_y) [protected], [virtual]
```

Determine if the coordinates are within the tabs area.

Parameters

<table>
<thead>
<tr>
<th>event_x</th>
<th>event coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>event_y</td>
<td>event coordinates</td>
</tr>
</tbody>
</table>
Returns

1 if we hit the tabs area, and 0 otherwise

34.141.4.11 on_insert()

```cpp
int Fl_Tabs::on_insert (Fl_Widget * candidate,
                        int index) [protected], [virtual]
```

Make sure that we redraw all tabs when new children are added.
Reimplemented from Fl_Group.

34.141.4.12 on_move()

```cpp
int Fl_Tabs::on_move (int a,
                      int b) [protected], [virtual]
```

Make sure that we redraw all tabs when children are moved.
Reimplemented from Fl_Group.

34.141.4.13 on_remove()

```cpp
void Fl_Tabs::on_remove (int index) [protected], [virtual]
```

Make sure that we redraw all tabs when new children are removed.
Reimplemented from Fl_Group.

34.141.4.14 push() [1/2]

```cpp
Fl_Widget * Fl_Tabs::push () const [inline]
```

Returns the tab group for the tab the user has currently down-clicked on and remains over until FL_RELEASE.
Otherwise, returns NULL.
While the user is down-clicked on a tab, the return value is the tab group for that tab. But as soon as the user releases, or drags off the tab with the button still down, the return value will be NULL.

See also

push(Fl_Widget*).

34.141.4.15 push() [2/2]

```cpp
int Fl_Tabs::push (Fl_Widget * o)
```

This is called by the tab widget's handle() method to set the tab group widget the user last FL_PUSH'ed on.
Set back to zero on FL_RELEASE.
As of this writing, the value is mainly used by draw_tab() to determine whether or not to draw a 'down' box for the tab when it's clicked, and to turn it off if the user drags off it.

See also

push().
34.141.4.16 redraw_tabs()

void Fl_Tabs::redraw_tabs ( ) [protected], [virtual]
Redraw all tabs (and only the tabs).
This method sets the Fl_Tab's damage flags so the tab area is redrawn.

34.141.4.17 resize()

void Fl_Tabs::resize ( int X, int Y, int W, int H ) [protected], [virtual]
Make sure that we redraw all tabs when the widget size changes.
Reimplemented from Fl_Group.

34.141.4.18 tab_align() [1/2]

Fl_Align Fl_Tabs::tab_align ( ) const [inline]
Gets the tab label alignment.
See also

    tab_align(Fl_Align)

34.141.4.19 tab_align() [2/2]

void Fl_Tabs::tab_align ( Fl_Align a ) [inline]
Sets the tab label alignment.
The default is FL_ALIGN_CENTER so tab labels are centered, but since the label space is measured (per label) to
fit the labels, there wouldn't be any difference if labels were aligned left or right.
If you want to show an image (icon) next to the group's label you can set a different label alignment. FL_ALIGN_←
IMAGE_NEXT_TO_TEXT is the recommended alignment to show the icon left of the text.

34.141.4.20 tab_height()

int Fl_Tabs::tab_height ( ) [protected], [virtual]
Return space (height) in pixels usable for tabs.
The calculated height is the largest space between all children and the upper and lower widget boundaries, respectively. If the space at the bottom is larger than at the top, the value will be negative and the tabs should be placed at the bottom.

Returns

    Vertical space that can be used for the tabs.

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;</td>
<td>0 To put the tabs at the top of the widget.</td>
</tr>
<tr>
<td>&lt;</td>
<td>0 To put the tabs on the bottom.</td>
</tr>
<tr>
<td>Full</td>
<td>height, if children() == 0.</td>
</tr>
</tbody>
</table>
34.141.4.21 tab_positions()

```
int Fl_Tabs::tab_positions ( ) [protected], [virtual]
Calculate tab positions and widths.
This protected method calculates the horizontal display positions and widths of all tabs. If the number of children
'nc' (see below) is > 0 three internal arrays are allocated, otherwise the arrays are free'd and the pointers are set
to NULL. Note that the first array is larger (nc+1).

- tab_pos[nc+1] : The left edges of each tab plus a fake left edge for a tab past the right-hand one.
- tab_width[nc] : The width of each tab
- tab_flags[nc] : Flags, bit 0 is set if the tab is compressed
```

If needed, these arrays are (re)allocated.
These positions are actually of the left edge of the slope. They are either separated by the correct distance or by
EXTRASPACE or by zero.
In OVERFLOW_COMPRESS mode, tab positions and widths are compressed to make the entire tabs bar fit into
the width of Fl_Tabs while keeping the selected tab fully visible.
In other overflow modes, the tabs area may be dragged horizontally using tab_offset. The tab_pos array is not
adjusted to the horizontal offset, but starts at this->x() plus the box's left margin.
The protected variable tab_count is set to the currently allocated size, i.e. the number of children (nc).

Returns
Index of the selected item

Return values

-1 If the number of children is 0 (zero).

Note
Return values in 1.3 were not documented. Return values before Sep 2023 were documented as 1 based
index and 0 if there were no children. This was actually never the case. It always returned a 0 based index and
the (useless) value of also 0 if there were no children. The current version return -1 if there are no children.
For this method to work, only on single child should be selected. Calling the method value() before calling
tab_positions() will ensure that exactly one child is selected and return a pointer to that child.

See also
clear_tab_positions()

34.141.4.22 value() [1/2]

```
Fl_Widget * Fl_Tabs::value ( )
Gets the currently visible widget/tab.
The Fl_Tabs::value() method returns a pointer to the currently visible child widget of the Fl_Tabs container. The
visible child is the first child that is currently being displayed, or the last child if none of the children are being
displayed.
If child widgets have been added, moved, or deleted, this method ensures that only one tab is visible at a time.

Returns
a pointer to the currently visible child
34.141.4.23  value() [2/2]

```cpp
int Fl_Tabs::value ( Fl_Widget * newvalue )
```

Sets the widget to become the current visible widget/tab.
The `Fl_Tabs::value()` method allows you to set a particular child widget of the `Fl_Tabs` container to be the currently visible widget. If the specified widget is a child of the `Fl_Tabs` container, it will be made visible and all other children will be hidden. The method returns 1 if the value was changed, and 0 if the specified value was already set.

**Parameters**

| in | newvalue | a pointer to a child widget |

**Returns**

- 1 if a different tab was chosen
- 0 if there was no change (new value already set)

34.141.4.24  which()

```cpp
Fl_Widget * Fl_Tabs::which ( int event_x, int event_y ) [virtual]
```

Return a pointer to the child widget with a tab at the given coordinates.
The `Fl_Tabs::which()` method returns a pointer to the child widget of the `Fl_Tabs` container that corresponds to the tab at the given event coordinates. If the event coordinates are outside the area of the tabs or if the `Fl_Tabs` container has no children, the method returns NULL.

**Parameters**

| event_x, event_y | event coordinates |

**Returns**

- pointer to the selected child widget, or NULL

34.141.5  Member Data Documentation

34.141.5.1  overflow_type

```cpp
int Fl_Tabs::overflow_type  [protected]
```

See also

- `OVERFLOW_COMPRESS`, `OVERFLOW_CLIP`, etc.

34.141.5.2  tab_count

```cpp
int Fl_Tabs::tab_count  [protected]
```

Array size of tab positions etc.

See also

- `tab_positions()`
34.141.5.3 tab_flags

int* Fl_Tabs::tab_flags [protected]
Array of tab flag of tabs per child.

See also

   tab_positions()

34.141.5.4 tab_pos

int* Fl_Tabs::tab_pos [protected]
Array of x-offsets of tabs per child + 1.

See also

   tab_positions()

34.141.5.5 tab_width

int* Fl_Tabs::tab_width [protected]
Array of widths of tabs per child.

See also

   tab_positions()

The documentation for this class was generated from the following files:

   • Fl_Tabs.H
   • Fl_Tabs.cxx

34.142 Fl_Terminal Class Reference

Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control.
#include <Fl_Terminal.H>

Inheritance diagram for Fl_Terminal:

```
Fl_Widget
   |
   v
Fl_Group
   |
   v
Fl_Terminal
```

Classes

   • class CharStyle
   • class Cursor
   • class EscapeSeq
   • class Margin
   • class PartialUtf8Buf
   • class RingBuffer
   • class Selection
   • class Utf8Char
Public Types

- enum Attrib {
  NORMAL = 0x00, BOLD = 0x01, DIM = 0x02, ITALIC = 0x04,
  UNDERLINE = 0x08, _RESERVED_1 = 0x10, INVERSE = 0x20, _RESERVED_2 = 0x40,
  STRIKEOUT = 0x80 }
  
  Bits for the per-character attributes, which control text features such as italic, bold, underlined text, etc.

- enum CharFlags {
  FG_XTERM = 0x01, BG_XTERM = 0x02, EOL = 0x04,
  RESV_A = 0x08, RESV_B = 0x10, RESV_C = 0x20, RESV_D = 0x40, RESV_E = 0x80,
  COLORMASK = (FG_XTERM | BG_XTERM) }
  
  Per-character 8 bit flags (uchar) used to manage special states for characters.

- enum OutFlags { OFF = 0x00, CR_TO_LF = 0x01, LF_TO_CR = 0x02, LF_TO_CRLF = 0x04 }
  
  Output translation flags for special control character translations.

- enum RedrawStyle { NO_REDRAW = 0, RATE_LIMITED, PER_WRITE }
  
  Determines when Fl_Terminal calls redraw() if new text is added.

Public Member Functions

- void ansi (bool val)
  
  Enable/disable the ANSI mode flag.

- bool ansi (void) const
  
  Return the state of the ANSI flag.

- void append (const char ∗s, int len=-1)
  
  Appends string s to the terminal at the current cursor position using the current text color/attributes.

- void append_ascii (const char ∗s)
  
  Append NULL terminated ASCII string to terminal, slightly more efficient than append_utf8().

- void append_utf8 (const char ∗buf, int len=-1)
  
  Append NULL terminated UTF-8 string to terminal.

- void box (Fl_Boxtype val)
  
  Sets the box type, updates terminal margins et al.

- Fl_Boxtype box (void) const
  
  Returns the current box type.

- void clear (Fl_Color val)
  
  Clears the screen to a specific color val and homes the cursor.

- void clear (void)
  
  Clears the screen to the current textbgcolor(), and homes the cursor.

- void clear_history (void)
  
  Clears the scroll history buffer and adjusts scrollbar, forcing it to redraw().

- void clear_screen (bool scroll_to_hist=true)
  
  Clear the terminal screen only; does not affect the cursor position.

- void clear_screen_home (bool scroll_to_hist=true)
  
  Clear the terminal screen and home the cursor.

- void color (Fl_Color val)
  
  Sets the background color for the terminal's Fl_Group::box().

- Fl_Color color (void) const
  
  Return base widget Fl_Group's box() color()

- int cursor_col (void) const
  
  Return the cursor's current column position on the screen.

- void cursor_home (void)
  
  Move cursor to the home position (top/left).

- int cursor_row (void) const
Return the cursor's current row position on the screen.

- **void** `cursorbgcolor` (`Fl_Color` val)
  
  Set the cursor's background color used for the cursor itself.

- **Fl_Color** `cursorbgcolor` (void) const
  
  Get the cursor's background color used for the cursor itself.

- **void** `cursorfgcolor` (`Fl_Color` val)
  
  Set the cursor's foreground color used for text under the cursor.

- **Fl_Color** `cursorfgcolor` (void) const
  
  Get the cursor's foreground color used for text under the cursor.

- **void** `display_columns` (int val)
  
  Set terminal's display width in columns of text characters.

- **int** `display_columns` (void) const
  
  Return terminal's display width in columns of text characters.

- **void** `display_rows` (int val)
  
  Set terminal's display height in lines of text (rows).

- **int** `display_rows` (void) const
  
  Return terminal's display height in lines of text (rows).

- **void** `draw` (void) `FL_OVERRIDE`
  
  Draws the entire `Fl_Terminal`

- **Fl_Terminal** (int X, int Y, int W, int H, const char ∗L, int rows, int cols, int hist)
  
  Same as the default FLTK constructor, but lets the user force the rows, columns and history to specific sizes on creation.

- **Fl_Terminal** (int X, int Y, int W, int H, const char ∗L=0)
  
  The constructor for `Fl_Terminal`

- **int** `handle` (int e) `FL_OVERRIDE`
  
  Handle FLTK events.

- **void** `history_lines` (int val)
  
  Set the number of lines of screen history.

- **int** `history_lines` (void) const
  
  Return the number of lines of screen history.

- **void** `history_rows` (int val)
  
  Set terminal's scrollback history buffer size in lines of text (rows).

- **int** `history_rows` (void) const
  
  Return terminal's scrollback history buffer size in lines of text (rows).

- **int** `history_use` (void) const
  
  Returns how many lines are "in use" by the screen history buffer.

- **void** `margin_bottom` (int val)
  
  Set the bottom margin; see Margins.

- **int** `margin_bottom` (void) const
  
  Return the bottom margin; see Margins.

- **void** `margin_left` (int val)
  
  Set the left margin; see Margins.

- **int** `margin_left` (void) const
  
  Return the left margin; see Margins.

- **void** `margin_right` (int val)
  
  Set the right margin; see Margins.

- **int** `margin_right` (void) const
  
  Return the right margin; see Margins.

- **void** `margin_top` (int val)
  
  Set the top margin; see Margins.

- **int** `margin_top` (void) const
• void output_translate (Fl_Terminal::OutFlags val)
  Sets the combined output translation flags to val.

• Fl_Terminal::OutFlags output_translate (void) const
  Return the current combined output translation flags.

• void print_char (char c)
  Prints single ASCII char c at current cursor position, and advances the cursor.

• void print_char (const char* text, int len=-1)
  Prints single UTF-8 char text of optional byte length len at current cursor position, and advances the cursor if the character is printable.

• void printf (const char* fmt,...)
  Appends printf formatted messages to the terminal.

• void putchar (char c, int drow, int dcol)
  Print the ASCII character c at the terminal's display position (drow, dcol).

• void putchar (const char* text, int len, int drow, int dcol)
  Print UTF-8 character text of length len at display position (drow, dcol).

• void redraw_rate (float val)
  Set the maximum rate redraw speed in floating point seconds if redraw_style() is set to RATELIMITED.

• float redraw_rate (void) const
  Get max rate redraw speed in floating point seconds.

• void redraw_style (RedrawStyle val)
  Set how Fl_Terminal manages screen redrawing.

• RedrawStyle redraw_style (void) const
  Get the redraw style.

• void reset_terminal (void)
  Resets terminal to default colors, clears screen, history and mouse selection, homes cursor, resets tabstops.

• void scrollbar_size (int val)
  Set the width of the scrollbar's trough to val, in pixels.

• int scrollbar_size (void) const
  Get the current size of the scrollbar's trough, in pixels.

• void selectionbgcolor (Fl_Color val)
  Set mouse selection background color.

• Fl_Color selectionbgcolor (void) const
  Get mouse selection background color.

• void selectionfgcolor (Fl_Color val)
  Set mouse selection foreground color.

• Fl_Color selectionfgcolor (void) const
  Get mouse selection foreground color.

• void show_unknown (bool val)
  Set the "show unknown" flag.

• bool show_unknown (void) const
  Return the "show unknown" flag.

• void textattrib (uchar val)
  Set text attribute bits (underline, inverse, etc).

• void textbgcolor (Fl_Color val)
  Set text background color to fltk color val used by any new text added.

• Fl_Color textbgcolor (void) const
Return text's current background color.
• void textbgcolor_default (Fl_Color val)
  Set the default text background color used by any new text added after a reset (<ESC>c, <ESC>[0m, or reset_terminal()).
• Fl_Color textbgcolor_default (void) const
  Return text's default background color.
• void textbgcolor_xterm (uchar val)
  Sets the background text color as one of the 8 'xterm color' values.
• void textcolor (Fl_Color val)
  Set the text color for the terminal.
• Fl_Color textcolor (void) const
  Return textcolor(). This is a convenience method that returns textfgcolor_default()!
• void textfgcolor (Fl_Color val)
  Set text foreground drawing color to ftk color val used by any new text added.
• Fl_Color textfgcolor (void) const
  Return text's current foreground color.
• void textfgcolor_default (Fl_Color val)
  Set the default text foreground color used by <ESC>c, <ESC>[0m, and reset_terminal()!
• Fl_Color textfgcolor_default (void) const
  Return text's default foreground color.
• void textfgcolor_xterm (uchar val)
  Sets the foreground text color as one of the 8 'xterm color' values.

Public Attributes
• Fl_Scrollbar * scrollbar
  Vertical scrollbar.

Protected Member Functions
• void clear_eod (void)
  Clear from cursor to End Of Display (EOD), like "<ESC>\J<ESC>\[0J".
• void clear_eol (void)
  Clear from cursor to End Of Line (EOL), like "<ESC>\K".
• void clear_line (int row)
  Clear entire line for specified row.
• void clear_line (void)
  Clear entire line cursor is currently on.
• void clear_mouse_selection (void)
  Clear any current mouse selection.
• void **clear_sod** (void)
  Clear from cursor to Start Of Display (EOD), like "<ESC>[1J".

• void **clear_sol** (void)
  Clear from cursor to Start Of Line (SOL), like "<ESC>[1K".

• void **current_style** (const CharStyle &sty)
  Set current style for rendering text.

• const CharStyle & **current_style** (void) const
  Return current style for rendering text.

• void **cursor_col** (int col)
  Move cursor to the specified column col.

• void **cursor_cr** (void)
  Move cursor as if a CR (\r) was received.

• void **cursor_crlf** (int count=1)
  Move cursor as if a CR/LF pair (\r\n) was received.

• void **cursor_down** (int count=1, bool do_scroll=false)
  Moves cursor down count lines.

• void **cursor_eol** (void)
  Move cursor to the last column (at the far right) on the current line.

• void **cursor_left** (int count=1)
  Moves cursor left count columns, and cursor stops (does not wrap) if it hits screen edge.

• void **cursor_right** (int count=1, bool do_scroll=false)
  Moves cursor right count columns.

• void **cursor_row** (int row)
  Move cursor to the specified row row.

• void **cursor_sol** (void)
  Move cursor as if a CR (\r) was received.

• void **cursor_tab_left** (int count=1)
  Tab left, do not wrap beyond left edge.

• void **cursor_tab_right** (int count=1)
  Tab right, do not wrap beyond right edge.

• void **cursor_up** (int count=1, bool do_scroll=false)
  Moves cursor up count lines.

• void **delete_chars** (int drow, int dcol, int rep)
  Delete char(s) at (drow,dcol) for 'rep' times.

• void **delete_chars** (int rep)
  Delete char(s) at cursor position for 'rep' times.

• void **delete_rows** (int count)
  Delete (count) rows at cursor position.

• int **disp_cols** (void) const
  Return the number of columns in the display area.

• int **disp_ecol** (void) const
  Return the ending row# in the display area.

• int **disp_rows** (void) const
  Return the number of rows in the display area.

• int **disp_srow** (void) const
  Return the starting row# in the display area.

• void **draw_buff** (int Y) const
  Draws the buffer position we are scrolled to onto the FLTK screen starting at pixel position Y.

• void **draw_row** (int grow, int Y) const
  Draw the specified global row, which is the row in ring_chars[].

• void **draw_row_bg** (int grow, int X, int Y) const
  Draw the specified global row, which is the row in ring_chars[].
Draw the background for the specified ring_chars[] global row growing starting at FLTK coords X and Y.

- **bool get_selection (int &srow, int &scol, int &erow, int &ecol) const**
  
  Return mouse selection’s start/end position in the ring buffer, if any.

- **int h_to_row (int H) const**
  
  Given a height in pixels, return number of rows that “fits” into that area.

- **int handle_unknown_char (void)**
  
  Handle an unknown char by either emitting an error symbol to the tty, or do nothing, depending on the user configurable value of show unknown()?

- **int hist_cols (void) const**
  
  Return the number of columns in the scrollback history.

- **int hist_erow (void) const**
  
  Return the ending row# of the scrollback history.

- **int hist_rows (void) const**
  
  Return the number of rows in the scrollback history.

- **int hist_srow (void) const**
  
  Return the starting row# of the scrollback history.

- **int hist_use (void) const**
  
  Return number of rows in use by the scrollback history.

- **int hist_use_srow (void) const**
  
  Return the starting row of the “in use” scrollback history.

- **void insert_char (char c, int rep)**
  
  Insert char ‘c’ at the current cursor position for ‘rep’ times.

- **void insert_char_eol (char c, int drow, int dcol, int rep)**
  
  Insert char ‘c’ for ‘rep’ times at display row ‘drow’ and column ‘dcol’.

- **void insert_rows (int count)**
  
  Insert (count) rows at current cursor position.

- **bool is_inside_selection (int row, int col) const**
  
  Is global row/column inside the current mouse selection?

- **bool is_selection (void) const**
  
  Returns true if there’s a mouse selection.

- **int offset (void) const**
  
  Returns the current offset into the ring buffer.

- **void restore_cursor (void)**
  
  Restore previously saved cursor position, if any. Used by ESC [ u.

- **int ring_cols (void) const**
  
  Return the number of columns in the ring buffer.

- **int ring_erow (void) const**
  
  Return the ending row# in the ring buffer (Always ring_rows()-1).

- **int ring_rows (void) const**
  
  Return the number of rows in the ring buffer.

- **int ring_srow (void) const**
  
  Return the starting row# in the ring buffer. (Always 0)

- **void save_cursor (void)**
  
  Save current cursor position. Used by ESC [ s.

- **void scroll (int rows)**
  
  Scroll the display up(+) or down(-) the specified rows.

- **int scrollbar_width (void) const**
  
  Return scrollbar width if visible, or 0 if not visible.

- **bool selection_extend (int X, int Y)**
  
  Extend selection to FLTK coords X,Y.

- **const char * selection_text (void) const**
Return text selection (for copy()/paste() operations)

- `int selection_text_len (void) const`
  Return byte length of all UTF-8 chars in selection, or 0 if no selection.

- `Utf8Char * u8c_cursor (void)`
  Return the Utf8Char for character under cursor.

- `Utf8Char * u8c_disp_row (int drow)`
  Return pointer to the first u8c character in row `drow` of the display.
  See docs for non-const version of `u8c_disp_row(int)`

- `Utf8Char * u8c_hist_row (int hrow)`
  Return u8c for beginning of a row inside the scrollback history.
  See docs for non-const version of `u8c_hist_row(int)`

- `Utf8Char * u8c_hist_use_row (int hurow)`
  Return u8c for beginning of row `hurow` inside the 'in use' part of the scrollback history.

- `Utf8Char * u8c_ring_row (int grow)`
  Return UTF-8 char for row `grow` in the ring buffer.
  See docs for non-const version of `u8c_ring_row(int)`

- `int w_to_col (int W) const`
  Given a width in pixels, return number of columns that "fits" into that area.

- `const Utf8Char * walk_selection (const Utf8Char *u8c, int &row, int &col)`
  Walk the mouse selection one character at a time from beginning to end, returning a Utf8Char to the next character in the selection, or NULL if the end was reached, or if there's no selection.

### Additional Inherited Members

#### 34.142.1 Detailed Description

Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control.

#### 34.142.2 Fl_Terminal

Fl_Terminal is an output-only text widget supporting ASCII and UTF-8/Unicode. It supports most terminal text features, such as most VT100/xterm style escape sequences (see The Escape Codes Fl_Terminal Supports), text colors/attributes, scrollback history, mouse selection, etc.

It is recommended that accessing features such as setting text colors and cursor positioning is best done with ANSI/XTERM escape sequences. But if one sets ansi(false) then this is not possible, so the public API can be used for common operations, e.g.
### Public API

<table>
<thead>
<tr>
<th>Function</th>
<th>ESC code equivalent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clear_screen_home()</td>
<td>ESC [ H ESC [ 2 J</td>
<td>Clear screen, home cursor</td>
</tr>
<tr>
<td>cursor_home()</td>
<td>ESC [ H</td>
<td>Home the cursor</td>
</tr>
<tr>
<td>clear_history()</td>
<td>ESC [ 3 J</td>
<td>Clear scrollback history</td>
</tr>
<tr>
<td>reset_terminal()</td>
<td>ESC [ c</td>
<td>Reset terminal</td>
</tr>
</tbody>
</table>

To access more advanced API calls, one can derive a class from Fl_Terminal to access protected methods manipulate the terminal more directly, e.g.

### Protected API

<table>
<thead>
<tr>
<th>Function</th>
<th>ESC code equiv.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>current_style()</td>
<td>ESC [ # m</td>
<td>Set text attributes</td>
</tr>
<tr>
<td>clear_eod()</td>
<td>ESC [ 0 J</td>
<td>Clear from cursor to end of display</td>
</tr>
<tr>
<td>clear_sod()</td>
<td>ESC [ 1 J</td>
<td>Clear from cursor to start of display</td>
</tr>
<tr>
<td>clear_eol()</td>
<td>ESC [ 0 K</td>
<td>Clear from cursor to end of line</td>
</tr>
<tr>
<td>clear_sol()</td>
<td>ESC [ 1 K</td>
<td>Clear from cursor to start of line</td>
</tr>
<tr>
<td>clear_line()</td>
<td>ESC [ 2 K</td>
<td>Clear line cursor is on</td>
</tr>
<tr>
<td>scroll(int) ( \geq 0 )</td>
<td>ESC [ 1 S</td>
<td>Scroll up one line</td>
</tr>
<tr>
<td>scroll(int) ( \leq 0 )</td>
<td>ESC [ 1 T</td>
<td>Scroll down one line</td>
</tr>
<tr>
<td>cursor_left()</td>
<td>ESC [ 1 D</td>
<td>Move cursor left (no wrap)</td>
</tr>
<tr>
<td>cursor_right()</td>
<td>ESC [ 1 C</td>
<td>Move cursor right (no wrap)</td>
</tr>
<tr>
<td>cursor_up()</td>
<td>ESC [ 1 B</td>
<td>Move cursor up (no scroll or wrap)</td>
</tr>
<tr>
<td>cursor_down()</td>
<td>ESC [ 1 A</td>
<td>Move cursor down (no scroll or wrap)</td>
</tr>
<tr>
<td>cursor_row() cursor_col()</td>
<td>ESC [ # ; # H</td>
<td>Move cursor to row# / column#</td>
</tr>
<tr>
<td>insert_char()</td>
<td>ESC [ # @</td>
<td>Insert a char at cursor position</td>
</tr>
<tr>
<td>delete_chars()</td>
<td>ESC [ # P</td>
<td>Delete chars at cursor position</td>
</tr>
<tr>
<td>insert_rows()</td>
<td>ESC [ # L</td>
<td>Insert rows at cursor position</td>
</tr>
<tr>
<td>delete_rows()</td>
<td>ESC [ # M</td>
<td>Delete rows at cursor position</td>
</tr>
</tbody>
</table>

Many commonly used API functions are public, such as textfgcolor() for setting text colors. Others, such as cursor_up() are protected to prevent common misuse, and are available only to subclasses.

For applications that need input support, the widget can be subclassed to provide keyboard input, and advanced features like pseudo ttys, termio, serial port I/O, etc., as such features are beyond the scope of FLTK.

#### Examples

```cpp
// Fl_Terminal: Simple Use
//
Fl_Terminal *tty = new Fl_Terminal(...);

tty->append("Hello world.\n");  // simple strings
tty->append("\033[31mThis text is red.\033[0m\n");  // colored text
tty->append("\033[32mThis text is green.\033[0m\n");
tty->printf("The value of x is %.02f\n", x);  // printf() formatting
```

There are also public methods for doing what most "\033[ escape codes do, so that if ansi(bool) is set to "false", one can still change text colors or clear the screen via application control, e.g.
tty->home(); // home the cursor
tty->clear_screen(); // clear the screen
tty->textfgcolor(0xff000000); // change the text color to RED
tty->textbgcolor(0x0000ff00); // change the background color to BLUE

When creating the widget, the width/height determine the default column and row count for the terminal's display based on the current font size. The column width determines where text will wrap.

You can specify wider column sizes than the screen using display_columns(colwidth). When this value is larger than the widget's width, text will wrap off-screen, and can be revealed by resizing the widget wider.

### 34.142.2.2 Writing To Terminal From Applications

An application needing terminal output as part of its user interface can instance Fl_Terminal, and write text strings with:

- `append()` to append strings
- `printf()` to append formatted strings

Single character output can be done with:

- `print_char()` to print a single ASCII/UTF-8 char at the cursor
- `putchar()` to put single ASCII/UTF-8 char at an x,y position

### 34.142.2.3 Text Attributes

The terminal's text supports these attributes:

- **Italic** - italicized text: \033[3m
- **Bold** - brighter/thicker text: \033[1m
- **Dim** - lower brightness text: \033[2m
- **Underline** - text that is underlined: \033[4m
- **Strikeout** - text that has a line through the text: \033[9m
- **Inverse** - text whose background and foreground colors are swapped: \033[7m
- **Normal** - normal text: \033[0m

![Figure 34.56 Fl_Terminal screen](image-url)
34.142.2.4 Text and Background Colors

There’s at least two ways to specify colors for text and background colors:

- 3 bit / 8 Color Values
- Full 24 bit R/G/B colors

Example of 3 bit colors:

```
// Text colors
//
tty->append("\033[31m Red text.\033[0m\n"); // Print red text..
 tty->append("\033[32m Green text.\033[0m\n");
 tty->append("\033[36m Cyan text.\033[0m\n");
 tty->append("\033[37m White text.\033[0m\n");

// Background colors
//
tty->append("\033[41m Red Background.\033[0m\n"); // background will be red
 tty->append("\033[42m Green Background.\033[0m\n");
 tty->append("\033[46m Cyan Background.\033[0m\n");
tty->append("\033[47m White Background.\033[0m\n");
```

Example of 24 bit colors:

```
```

Figure 34.57 Fl_Terminal 3 bit colors

Figure 34.58 Fl_Terminal 24 bit colors
Example application source code using 24 bit colors:

```cpp
// 24 bit Text Color
tty->append("\033[38;2;0;0;255m Text is BLUE.\033[0m\n"); // RGB: R=0, G=0, B=255
tty->append("\033[38;2;255;0;0m Text is RED.\033[0m\n"); // RGB: R=255, G=0, B=0
tty->append("\033[38;2;127;64;0m Text is DARK ORANGE.\033[0m\n"); // RGB: R=127, G=64, B=0

// 24 bit Background Color
tty->append("\033[48;2;0;0;255m Background is BLUE.\033[0m\n"); // RGB: R=0, G=0, B=255
tty->append("\033[48;2;255;0;0m Background is RED.\033[0m\n"); // RGB: R=255, G=0, B=0
tty->append("\033[48;2;127;64;0m Background is DARK ORANGE.\033[0m\n"); // RGB: R=127, G=64, B=0
```

For more on the ANSI escape codes, see [The Escape Codes Fl_Terminal Supports](#).

### 34.142.2.5 Features

Most standard terminal behaviors are supported, e.g.

- ASCII + UTF-8/Unicode
- scrollback history management
- mouse selection + copy/paste (`^C, ^A`)
- autoscroll during selection

Most popular ANSI/DEC VT100/Xterm escape sequences are supported (see [The Escape Codes Fl_Terminal Supports](#)), including:

- per-character colors for text and background
- per-character text attributes: bold/dim, underline, strikeout
- scrolling up/down
- character insert/delete for characters/rows/screen
- clearing characters/rows/screen

Does not (yet) support:

- programmable regions (scroll regions and attribute blocks)
- dynamic line wrap (where resizing display dynamically re-wraps long lines)

Will likely never implement as part of this widget:

- pty/termio management (such features should be subclassed)
- Different per-character font family + sizes (font family/size is global only)
- variable width fonts

Regarding the font family+size; the way the terminal is currently designed, the font family and size must not vary within text; rows have to be consistent height. Varying widths are tricky too, esp. when it comes to moving the cursor up/down within a column; varying widths are supported (due to Unicode characters sometimes being "wide", but not heights.)
34.142.2.6 Margins

The margins define the amount of space (in pixels) around the outside of the text display area, the space between the widget's inner edge (inside the box()) and the text display area's outer edge. The margins can be inspected and changed with the margin_left(), margin_right(), margin_top() and margin_bottom() methods.

34.142.2.7 Caveats

- This widget is not a full terminal emulator; it does not do stdio redirection, pseudo ttys/termios/character cooking, keyboard input processing, full curses(3) support. However, such features CAN be implemented with subclassing.

- The printf() and vprintf() functions are limited to strings no longer than 1024 characters (including NULL). For printing longer strings, use append() which has no string limits.

- For background colors textbgcolor() and textbgcolor_default(), the special color value 0xffffffff lets the widget's box() color() show through behind the text.

34.142.3 Member Enumeration Documentation

34.142.3.1 Attrib

enum Fl_Terminal::Attrib

Bits for the per-character attributes, which control text features such as italic, bold, underlined text, etc. NOTE: enum names with a leading underscore must not be used, and are reserved for future use.
34.142.3.2 CharFlags

enumerator Fl_Terminal::CharFlags
Per-character 8 bit flags (uchar) used to manage special states for characters.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG_XTERM</td>
<td>this char's fg color is an XTERM color; can be affected by Dim+Bold</td>
</tr>
<tr>
<td>BG_XTERM</td>
<td>this char's bg color is an XTERM color; can be affected by Dim+Bold</td>
</tr>
<tr>
<td>EOL</td>
<td>TODO: char at EOL, used for line re-wrap during screen resizing.</td>
</tr>
</tbody>
</table>

34.142.3.3 OutFlags

enumerator Fl_Terminal::OutFlags
Output translation flags for special control character translations.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>no output translation</td>
</tr>
<tr>
<td>CR_TO_LF</td>
<td>carriage return generates a vertical line-feed (\r -&gt; \n)</td>
</tr>
<tr>
<td>LF_TO_CR</td>
<td>line-feed generates a carriage return (\n -&gt; \r)</td>
</tr>
<tr>
<td>LF_TO_CRLF</td>
<td>line-feed generates a carriage return line-feed (\n -&gt; \r\n)</td>
</tr>
</tbody>
</table>

34.142.3.4 RedrawStyle

enumerator Fl_Terminal::RedrawStyle
Determines when Fl_Terminal calls redraw() if new text is added.
RATE_LIMITED is the recommended setting, using redraw_rate(float) to determine the maximum rate of redraws.

See also
- redraw_style(), redraw_rate()

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO_REDRAW</td>
<td>app must call redraw() as needed to update text to screen</td>
</tr>
</tbody>
</table>
### 34.142.4 Constructor & Destructor Documentation

#### 34.142.4.1 Fl_Terminal() [1/2]

Fl_Terminal::Fl_Terminal (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char * L = 0  
)

The constructor for Fl_Terminal.
This creates an empty terminal with defaults:

- white on black text; see textfgcolor(Fl_Color), textbgcolor(Fl_Color)
- rows/cols based on the \( W \) and \( H \) values, see display_rows(), display_columns()
- scrollback history of 100 lines, see history_rows()
- redraw_style() set to RATE_LIMITED, redraw_rate() set to 0.10 seconds

Note: While Fl_Terminal derives from Fl_Group, it's not intended for user code to use it as a parent for other widgets, so end() is called.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>X, Y, W, H</th>
<th>position and size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>label string (optional), may be NULL.</td>
</tr>
</tbody>
</table>

#### 34.142.4.2 Fl_Terminal() [2/2]

Fl_Terminal::Fl_Terminal (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char * L,  
  int rows,  
  int cols,  
  int hist  
)

Same as the default FLTK constructor, but lets the user force the rows, columns and history to specific sizes on creation.

Since the row/cols_hist are specified directly, this prevents the widget from auto-calculating the initial text buffer size based on the widget's pixel width/height, bypassing calls to the font system before the widget is displayed.

**Note**

fluid uses this constructor internally to avoid font calculations that opens the display, useful for when running in a headless context. (issue 837)
34.142.3  \texttt{\textasciitilde Fl\_Terminal()}  

	exttt{Fl\_Terminal::\textasciitilde Fl\_Terminal (}

\begin{verbatim}
  void
\end{verbatim}

The destructor for \texttt{Fl\_Terminal}.  
Destroys the terminal display, scroll history, and associated widgets.

34.142.5  Member Function Documentation

34.142.5.1  \texttt{ansi()} [1/2]  

\begin{verbatim}
void Fl\_Terminal::ansi ( bool val )
\end{verbatim}

Enable/disable the ANSI mode flag.  
If true, ANSI and VT100/xterm codes will be processed.  If false, these codes won't be processed and will either be ignored or print the error character \texttt{¿}, depending on the value of \texttt{show\_unknown()}.

See also  
\texttt{show\_unknown()}, \texttt{The Escape Codes Fl\_Terminal Supports}

34.142.5.2  \texttt{ansi()} [2/2]  

\begin{verbatim}
bool Fl\_Terminal::ansi ( void ) const
\end{verbatim}

Return the state of the ANSI flag.

See also  
\texttt{ansi(bool)}

34.142.5.3  \texttt{append()}  

\begin{verbatim}
void Fl\_Terminal::append ( const char * s, int len = -1 )
\end{verbatim}

Appends string \texttt{s} to the terminal at the current cursor position using the current text color/attributes.  
If \texttt{s} is NULL, the UTF-8 character cache is cleared, which is recommended before starting a block reading loop, and again after the block loop has completed.  
If \texttt{len} is not specified, it's assumed \texttt{s} is a NULL terminated string.  If \texttt{len} is specified, it can be used for writing strings that aren't NULL terminated, such as block reads on a pipe, network, or other block oriented data source.  
Redraws of the terminal widget are by default handled automatically, but can be changed with \texttt{redraw\_rate()} and \texttt{redraw\_style()}.  

Block I/O  
When reading block oriented sources (such as pipes), \texttt{append()} will handle partial UTF-8 chars straddling the block boundaries.  It does this using an internal byte cache, which should be cleared before and after block I/O loops by calling \texttt{append(NULL)} as shown in the example below, to prevent the possibilities of partial UTF-8 characters left behind by an interrupted or incomplete block loop.

\begin{verbatim}
// Example block reading a command pipe in Unix
// Run command and read as a pipe
FILE *fp = popen("ls -la", "r");
if (!fp) { ..error\_handling.. }  
// Enable non-blocking I/O
int fd = fileno(fp);
fcntl(fd, F_SETFL, O\_NONBLOCK);
// Clear UTF-8 character cache before starting block loop
G\_tty->append(NULL)  // prevents leftover partial UTF-8 bytes
\end{verbatim}
// Block read loop
while (1) {
  Fl::wait(0.05); // give fltk .05 secs of cpu to manage UI
  ssize_t bytes = read(fd, s, sizeof(s)); // read block from pipe
  if (bytes == -1 && errno == EAGAIN) continue; // no data yet? continue
  if (bytes > 0) G_tty->append(s); // append output to terminal
  else break; // end of pipe?
}
// Flush cache again after block loop completes
G_tty->append(NULL);
// Close pipe, done
pclose(fp);

Note

• String can contain ASCII or UTF-8 chars
• len is optional; if unspecified, expects s to be a NULL terminated string
• Handles partial UTF-8 chars split between calls (e.g. block oriented writes)
• If s is NULL, this clears the "partial UTF-8" character cache
• Redraws are managed automatically by default; see redraw_style()

34.142.44 append_ascii()

void Fl_Terminal::append_ascii (const char * s )

Append NULL terminated ASCII string to terminal, slightly more efficient than append_utf8().

• If s is NULL, behavior is to do nothing
• Redraws are triggered automatically, depending on redraw_style()

34.142.55 append_utf8()

void Fl_Terminal::append_utf8 (const char * buf, int len = -1 )

Append NULL terminated UTF-8 string to terminal.

• If buf is NULL, UTF-8 cache buffer is cleared
• If optional len isn't specified or is -1, strlen(text) is used.
• If len is 0 or < -1, no changes are made
• Handles UTF-8 chars split across calls (e.g. block writes from pipes, etc)
• Redraws are triggered automatically, depending on redraw_style()

34.142.66 box()

void Fl_Terminal::box (Fl_Boxtype val ) [inline]

Sets the box type, updates terminal margins et al.
Default is FL_DOWN_FRAME.
FL_XXX_FRAME types are handled in a special way by this widget, and guarantee the background is a flat field.
FL_XXX_BOX may draw gradients as inherited by Fl::scheme().
34.142.5.7 clear() [1/2]

void Fl_Terminal::clear (  
    Fl_Color val  
)  
Clears the screen to a specific color val and homes the cursor.

See also
    clear_screen(), clear_screen_home(), cursor_home()

34.142.5.8 clear() [2/2]

void Fl_Terminal::clear (  
    void  
)  
Clears the screen to the current textbgcolor(), and homes the cursor.

See also
    clear_screen(), clear_screen_home(), cursor_home()

34.142.5.9 clear_screen()

void Fl_Terminal::clear_screen (  
    bool scroll_to_hist = true  
)  
Clear the terminal screen only; does not affect the cursor position.  
Also clears the current mouse selection.
If 'scroll_to_hist' is true, the screen is cleared by scrolling the contents into the 
scrollback history, where it can be retrieved with the scrollbar. This is the default behavior. If false, the screen is cleared and 
the scrollback history is unchanged.
Similar to the escape sequence "<ESC>[2J".

See also
    clear_screen_home()

34.142.5.10 clear_screen_home()

void Fl_Terminal::clear_screen_home (  
    bool scroll_to_hist = true  
)  
Clear the terminal screen and home the cursor.
Also clears the current mouse selection.
If 'scroll_to_hist' is true, the screen is cleared by scrolling the contents into the scrollback history, where it 
can be retrieved with the scrollbar. This is the default behavior. If false, the screen is cleared and the scrollback 
history is unchanged.
Similar to the escape sequence "<ESC>[2J<ESC>[H".

See also
    clear_screen()

34.142.5.11 color()

void Fl_Terminal::color (  
    Fl_Color val  
)  
Sets the background color for the terminal's Fl_Group::box().
If the `textbgcolor()` and `textbgcolor_default()` are set to the special "see through" color 0xffffffff when any text was added, changing `color()` affects the color that shows through behind that existing text. Otherwise, whatever specific background color was set for existing text will persist after changing `color()`. To see the effects of a change to `color()`, follow up with a call to `redraw()`. The default value is 0x0.

### 34.142.5.12 cursor_col()

```c
void Fl_Terminal::cursor_col (int col) [protected]
```

Move cursor to the specified column `col`. This value is clamped to the range (0..display_columns()-1).

### 34.142.5.13 cursor_cr()

```c
void Fl_Terminal::cursor_cr (void) [protected]
```

Move cursor as if a CR (\r) was received. Same as `cursor_sol()`

### 34.142.5.14 cursor_down()

```c
void Fl_Terminal::cursor_down (int count = 1, bool do_scroll = false) [protected]
```

Moves cursor down `count` lines. If cursor hits screen bottom, it either stops (does not wrap) if `do_scroll` is false, or wraps and scrolls up if `do_scroll` is true.

#### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>count</code></td>
<td>Number of lines to move cursor down</td>
</tr>
<tr>
<td><code>do_scroll</code></td>
<td>Enable scrolling if set to true</td>
</tr>
</tbody>
</table>

### 34.142.5.15 cursor_right()

```c
void Fl_Terminal::cursor_right (int count = 1, bool do_scroll = false) [protected]
```

Moves cursor right `count` columns. If cursor hits right edge of screen, it either stops (does not wrap) if `do_scroll` is false, or wraps and scrolls up one line if `do_scroll` is true.

### 34.142.5.16 cursor_row()

```c
void Fl_Terminal::cursor_row (int row) [protected]
```

Move cursor to the specified row `row`. This value is clamped to the range (0..display_rows()-1).

### 34.142.5.17 cursor_up()

```c
void Fl_Terminal::cursor_up (int count = 1, bool do_scroll = false) [protected]
```

Moves cursor up `count` lines.
If cursor hits screen top, it either stops (does not wrap) if do_scroll is false, or scrolls down if do_scroll is true.

34.142.5.18 delete_rows()

`void Fl_Terminal::delete_rows ( int count ) [protected]`

Delete (count) rows at cursor position. Causes rows to scroll up, and empty lines created at bottom of screen. Lines deleted by scroll up are NOT moved into the scroll history.

34.142.5.19 display_columns() [1/2]

`void Fl_Terminal::display_columns ( int dcols )`

Set terminal's display width in columns of text characters. This value is normally managed automatically by resize() based on the current font size, and should not be changed. You CAN make the display_columns() larger than the width of the widget; text in the terminal will simply run off the screen edge and be clipped; the only way to reveal that text is if the user enlarges the widget, or the font size made smaller.

To change the display width, it is best to use resize() instead.

34.142.5.20 display_columns() [2/2]

`int Fl_Terminal::display_columns ( void ) const`

Return terminal's display width in columns of text characters. This value is normally managed automatically by resize() based on the current font size.

34.142.5.21 display_rows() [1/2]

`void Fl_Terminal::display_rows ( int drows )`

Set terminal's display height in lines of text (rows). This value is normally managed automatically by resize() based on the current font size, and should not be changed. To change the display height, use resize() instead.

34.142.5.22 display_rows() [2/2]

`int Fl_Terminal::display_rows ( void ) const`

Return terminal's display height in lines of text (rows). This value is normally managed automatically by resize() based on the current font size.

34.142.5.23 draw()

`void Fl_Terminal::draw ( void ) [virtual]`

Draws the entire Fl_Terminal. Lets the group draw itself first (scrollbar should be only member), followed by the terminal's screen contents. Reimplemented from Fl_Group.

34.142.5.24 draw_buff()

`void Fl_Terminal::draw_buff ( int Y ) const [protected]`

Draws the buffer position we are scrolled to onto the FLTK screen starting at pixel position Y. This can be anywhere in the ring buffer, not just the 'active display'; depends on what position the scrollbar is set to. Handles attributes, colors, text selections, cursor.
### 34.142.5.25 draw_row()

```cpp
class Fl_Terminal:
  void draw_row (int grow, int Y) const [protected]
```

Draw the specified global row, which is the row in `ring_chars[]`. The global row includes history + display buffers.

### 34.142.5.26 draw_row_bg()

```cpp
class Fl_Terminal:
  void draw_row_bg (int grow, int X, int Y) const [protected]
```

Draw the background for the specified `ring_chars[]` global row `grow` starting at FLTK coords `X` and `Y`. Note we may be called to draw display, or even history if we're scrolled back. If there's any change in bg color, we draw the filled rects here.

If the bg color for a character is the special "see through" color 0xffffffff, no pixels are drawn.

### 34.142.5.27 get_selection()

```cpp
class Fl_Terminal:
  bool get_selection (int &srow, int &scol, int &erow, int &ecol) const [protected]
```

Return mouse selection's start/end position in the ring buffer, if any. Ensures (start < end) to allow walking 'forward' thru selection, left-to-right, top-to-bottom. The row/col values are indexes into the entire ring buffer.

Example: walk the characters of the mouse selection:

```cpp
// Get selection
int srow, scol, erow, ecol;
if (get_selection(srow, scol, erow, ecol)) { // mouse selection exists?
  // Walk entire selection from start to end
  for (int row=srow; row<=erow; row++) { // walk rows of selection
    const Utf8Char *u8c = u8c_ring_row(row); // ptr to first character in row
    int col_start = (row==srow) ? scol : 0; // start row? start at scol
    int col_end = (row==erow) ? ecol : ring_cols(); // end row? end at ecol
    u8c += col_start; // include col offset (if any)
    for (int col=col_start; col<=col_end; col++, u8c++) { // walk columns
      // do something with each char at *u8c..
    }
  }
}
```

Returns:

- true – valid selection values returned
- false – no selection was made, returned values undefined

See also

walk_selection(), is_selection()

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>srow</td>
<td>starting row for selection</td>
</tr>
<tr>
<td>scol</td>
<td>starting column for selection</td>
</tr>
<tr>
<td>erow</td>
<td>ending row for selection</td>
</tr>
<tr>
<td>ecol</td>
<td>ending column for selection</td>
</tr>
</tbody>
</table>
34.142.5.28  h_to_row()

int Fl_Terminal::h_to_row (  
  int H ) const [protected]

Given a height in pixels, return number of rows that "fits" into that area.  
This is used by the constructor to size the row/cols to fit the widget size.

34.142.5.29  handle()

int Fl_Terminal::handle (  
  int e ) [virtual]

Handle FLTK events.  
Reimplemented from Fl_Group.

34.142.5.30  handle_unknown_char()

int Fl_Terminal::handle_unknown_char (  
  void ) [protected]  

Handle an unknown char by either emitting an error symbol to the tty, or do nothing, depending on the user configurable value of show_unknown().  
Returns 1 if tty modified, 0 if not.

See also  
  show_unknown()

34.142.5.31  history_lines()

void Fl_Terminal::history_lines (  
  int val)  

Set the number of lines of screen history.  
Large values can be briefly heavy on cpu and memory usage.

34.142.5.32  history_use()

int Fl_Terminal::history_use (  
  void ) const  

Returns how many lines are "in use" by the screen history buffer.  
This value will be 0 if history was recently cleared with e.g. clear_history() or "<ESC>c".  
Return value will be in the range 0 .. (history_lines()-1).

34.142.5.33  insert_char()

void Fl_Terminal::insert_char (  
  char c,  
  int rep ) [protected]  

Insert char 'c' at the current cursor position for 'rep' times.  
Does not wrap; characters at end of line are lost.

34.142.5.34  insert_rows()

void Fl_Terminal::insert_rows (  
  int count ) [protected]  

Insert (count) rows at current cursor position.  
Causes rows below to scroll down, and empty lines created. Lines deleted by scroll down are NOT moved into the scroll history.
### 34.142.5.35  is_inside_selection()

```cpp
bool Fl_Terminal::is_inside_selection (  
    int grow,  
    int gcol ) const [protected]
```

Is global row/column inside the current mouse selection?

Returns

- **true** – \((grow, gcol)\) is inside a valid selection.
- **false** – \((grow, gcol)\) is outside, or no valid selection.

### 34.142.5.36  output_translate()

```cpp
void Fl_Terminal::output_translate (  
    Fl_Terminal::OutFlags val  
)
```

Sets the combined output translation flags to \(val\).

- \(val\) can be sensible combinations of the OutFlags bit flags.
- The default is LF_TO_CRLF, so that \(\texttt{\l}}\) will generate both carriage-return (CR) and line-feed (LF).
- For \(\texttt{\r}}\) and \(\texttt{\l}}\) to be handled literally, use output_translate(Fl_Terminal::OutFlags::OFF);
- To disable all output translations, use 0 or Fl_Terminal::OutFlags::OFF.

### 34.142.5.37  print_char() [1/2]

```cpp
void Fl_Terminal::print_char (  
    char c  
)
```

Prints single ASCII char \(c\) at current cursor position, and advances the cursor.

- \(c\) must be ASCII, not utf-8
- Does not trigger redraws

### 34.142.5.38  print_char() [2/2]

```cpp
void Fl_Terminal::print_char (  
    const char * text,  
    int len = -1  
)
```

Prints single UTF-8 char \(text\) of optional byte length \(len\) at current cursor position, and advances the cursor if the character is printable.

- Handles ASCII and control codes (CR, LF, etc).
- The character is displayed at the current cursor position using the current text color/attributes.
- Handles control codes and can be used to construct ANSI/XTERM escape sequences.
- If optional \(len\) isn't specified or \(<0\), strlen(text) is used.
- \(text\) must not be NULL.
- \(len\) must not be 0.
- \(text\) must be a single char only (whether UTF-8 or ASCII)
- \(text\) can be an ASCII character, though not as efficent as print_char()
- Invalid UTF-8 chars show the error character (¿) depending on show_unknown(bool).
- Does not trigger redraws

See also:

- show_unknown(bool), handle_unknown_char()
34.142.5.39  printf()

void Fl_Terminal::printf (  
    const char * fmt,  
    ...  )

Appends printf formatted messages to the terminal.
The string can contain UTF-8, crlf’s, and ANSI sequences are also supported. Example:

```c
#include <FL/Fl_Terminal.H>
int main(..) {  
    // Create a terminal, and append some messages to it  
    Fl_Terminal *tty = new Fl_Terminal(..);  
    // Append three lines of formatted text to the buffer  
    tty->printf("The current date is: %s
The time is: %s\n", date_str, time_str);  
    tty->printf("The current PID is %ld\n", (long)getpid());  
}
```

Note
The expanded string is currently limited to 1024 characters (including NULL). For longer strings use append() which has no string limits.

34.142.5.40  putchar() [1/2]

void Fl_Terminal::putchar (  
    char c,  
    int drow,  
    int dcol )

Print the ASCII character c at the terminal’s display position (drow,dcol).
The character MUST be printable (in range 0x20 - 0x7e), and is displayed using the current text color/attributes. Characters outside that range are either ignored or print the error character (¿), depending on show_unknown(bool).
This is a very low level method.
No range checking is done on drow,dcol:

• drow must be in range 0..(display_rows()-1)
• dcol must be in range 0..(display_columns()-1)
• Does not trigger redraws
• Does NOT handle control codes, ANSI or XTERM escape sequences.

See also
show_unknown(bool), handle_unknown_char(), is_printable()

34.142.5.41  putchar() [2/2]

void Fl_Terminal::putchar (  
    const char * text,  
    int len,  
    int drow,  
    int dcol )

Print UTF-8 character text of length len at display position (drow,dcol).
The character is displayed using the current text color/attributes.
This is a very low level method.
No range checking is done on drow,dcol:

• drow must be in range 0..(display_rows()-1)
• `dcol` must be in range `0..(display_columns()-1)`
• Does not trigger redraws
• Does not handle ANSI or XTERM escape sequences
• Invalid UTF-8 chars show the error character (¿) depending on `show_unknown(bool)`.

See also

`handle_unknown_char()`

### 34.142.5.42 redraw_rate()

```cpp
void Fl_Terminal::redraw_rate (float val)
```

Set the maximum rate redraw speed in floating point seconds if `redraw_style()` is set to RATE_LIMITED. When output is sent to the terminal, rather than calling `redraw()` right away, a timer is started with this value indicating how long to wait before calling `redraw()`, causing the output to be shown. 0.10 is recommended (1/10th of a second), to limit redraws to no more than 10 redraws per second.

The value that works best depends on how fast data arrives, and how fast the font system can draw text at runtime. Values too small cause too many redraws to occur, causing the terminal to get backlogged if large bursts of data arrive quickly. Values too large cause realtime output to be too "choppy".

### 34.142.5.43 redraw_style() [1/2]

```cpp
void Fl_Terminal::redraw_style (RedrawStyle val)
```

Set how `Fl_Terminal` manages screen redrawing.

This setting is relevant when `Fl_Terminal` is used for high bandwidth data; too many redraws will slow things down, too few cause redraws to be 'choppy' when realtime data comes in.

Redrawing can be cpu intensive, depending on how many rows/cols are being displayed; worst case: large display + small font. Speed largely depends on the end user's graphics hardware and font drawing system.

<table>
<thead>
<tr>
<th>RedrawStyle enum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO_REDRAW</td>
<td>App must call <code>redraw()</code> as needed to update text to screen</td>
</tr>
<tr>
<td>RATE_LIMITED</td>
<td>Rate limited, timer controlled redraws. (DEFAULT) See <code>redraw_rate()</code></td>
</tr>
<tr>
<td>PER_WRITE</td>
<td>Redraw triggered every call to <code>append() / printf()</code> / etc.</td>
</tr>
</tbody>
</table>

The default style is RATE_LIMITED, which is the easiest to use, and automates redraws to be capped at 10 redraws per second max. See `redraw_rate(float)` to control this automated redraw speed.

See also

`redraw_rate(), RedrawStyle`

### 34.142.5.44 redraw_style() [2/2]

```cpp
Fl_Terminal::RedrawStyle Fl_Terminal::redraw_style (void ) const
```

Get the redraw style.

This determines when the terminal redraws itself while text is being added to it. Value will be one of the `Fl_Terminal::RedrawStyle` enum values.
See also

redraw_style(Fl_Terminal::RedrawStyle)

### reset_terminal()

```cpp
void Fl_Terminal::reset_terminal ( void )
```

Resets terminal to default colors, clears screen, history and mouse selection, homes cursor, resets tabstops. Same as "<ESC>c"

### resize()

```cpp
void Fl_Terminal::resize ( int X, int Y, int W, int H ) [virtual]
```

Handle widget resizing, such as if user resizes parent window. This may increase the column width of the widget if the width of the widget is made larger than it was.

**Note**

Resizing currently does not rewrap existing text. Currently enlarging makes room for longer lines, and shrinking the size lets long lines run off the right edge of the display, hidden from view. This behavior may change in the future to rewrap.

Reimplemented from Fl_Group.

### scroll()

```cpp
void Fl_Terminal::scroll ( int rows ) [protected]
```

Scroll the display up(+) or down(-) the specified `rows`.

- Negative value scrolls "down", clearing top line, and history unaffected.
- Positive value scrolls "up", clearing bottom line, rotating top line into history.

### scrollbar_size [1/2]

```cpp
void Fl_Terminal::scrollbar_size ( int val )
```

Set the width of the scrollbar's trough to `val`, in pixels. Only use this method if you need to override the global scrollbar size. Setting `val` to the special value 0 causes the widget to track the global Fl::scrollbar_size().

See also

Fl::scrollbar_size()

### scrollbar_size [2/2]

```cpp
int Fl_Terminal::scrollbar_size ( void ) const
```

Get the current size of the scrollbar's trough, in pixels. If this value is zero (default), this widget will use the Fl::scrollbar_size() value as the scrollbar's width.
Returns

Scrollbar size in pixels, or 0 if the global Fl::scrollbar_size() is being used.

See also

Fl::scrollbar_size(int)

34.142.5.50 selection_extend()

bool Fl_Terminal::selection_extend ( int X, int Y ) [protected]

Extend selection to FLTK coords X,Y.
Returns true if extended, false if nothing done (X,Y offscreen)

34.142.5.51 selection_text()

const char * Fl_Terminal::selection_text ( void ) const [protected]

Return text selection (for copy()/paste() operations)

• Returns allocated NULL terminated string for entire selection.
• Caller must free() this memory when done.
• Unicode safe.

34.142.5.52 selection_text_len()

int Fl_Terminal::selection_text_len ( void ) const [protected]

Return byte length of all UTF-8 chars in selection, or 0 if no selection.
NOTE: Length includes trailing white on each line.

34.142.5.53 show_unknown() [1/2]

void Fl_Terminal::show_unknown ( bool val )

Set the "show unknown" flag.
If true, unknown escape sequences and unprintable control characters will be shown with the error character "¿".
If false, those sequences and characters will be ignored.

See also

handle_unknown_char()

34.142.5.54 show_unknown() [2/2]

bool Fl_Terminal::show_unknown ( void ) const

Return the "show unknown" flag.
See show_unknown(bool) for more info.
34.142.5.55  textattrib()

void Fl_Terminal::textattrib (uchar val)
Set text attribute bits (underline, inverse, etc).
This will be the default attribute used for all newly printed text.

See also
   Fl_Terminal::Attrib

34.142.5.56  textbgcolor()

void Fl_Terminal::textbgcolor (Fl_Color val)
Set text background color to fltk color val used by any new text added.
Use this for temporary color changes, similar to <ESC>[48;2;<R>;<G>;<B>m
This setting does not affect the 'default' text colors used by <ESC>[0m, <ESC>c, reset_terminal(), etc. To set that
too, also set textbgcolor_default(Fl_Color), e.g.

    // Set both 'current' and 'default' colors
    Fl_Color darkamber = 0x20100000;
    tty->textbgcolor(darkamber); // set 'current' bg color
    tty->textbgcolor_default(darkamber); // set 'default' bg color used by ESC[0m reset

The special color value 0xffffffff (all ff's) is the "see through" color, which lets the widget's own Fl_Group::color()
show through behind the text. This special text background color is the default, and is what most situations need.

See also
   textbgcolor_default(Fl_Color)

34.142.5.57  textbgcolor_default() [1/2]

void Fl_Terminal::textbgcolor_default (Fl_Color val)
Set the default text background color used by any new text added after a reset (<ESC>c, <ESC>[0m, or
reset_terminal()).
Does not affect the 'current' text background color; use textbgcolor(Fl_Color) to set that.
The special color value 0xffffffff (all ff's) is the "see through" color, which lets the widget's own Fl_Group::color()
show through behind the text. This special text background color is the default, and is what most situations need.

See also
   textbgcolor(Fl_Color)

34.142.5.58  textbgcolor_default() [2/2]

Fl_Color Fl_Terminal::textbgcolor_default (void ) const [inline]
Return text's default background color.

See also
   textbgcolor()
34.142.5.59  textbgcolor_xterm()

```
void Fl_Terminal::textbgcolor_xterm (
    uchar val )
```

Sets the background text color as one of the 8 'xterm color' values.
This will be the foreground color used for all newly printed text, similar to the
<ESC>[#m escape sequence, where # is between 40 and 47.
This color will be reset to the default bg color if reset_terminal() is called, or by
<ESC>c, <ESC>[0m, etc.
The xterm color intensity values can be influenced by the Dim/Bold/Normal modes
(which can be set with e.g. <ESC>[1m, textattrib(), etc), so the actual RGB values of these colors allow room for Dim/Bold to influence their
brightness. For instance, "Normal Red" is not full brightness to allow "Bold Red" to be brighter. This goes for all
colors except 'Black', which is not influenced by Dim or Bold; Black is always Black.
The 8 color xterm values are:

- 0 = Black
- 1 = Red
- 2 = Green
- 3 = Yellow
- 4 = Blue
- 5 = Magenta
- 6 = Cyan
- 7 = White

See also

```
textbgcolor_default(Fl_Color)
```

34.142.5.60  textcolor()

```
void Fl_Terminal::textcolor ( 
    Fl_Color val )
```

Set the text color for the terminal.
This is a convenience method that sets both textfgcolor() and textfgcolor_default(), ensuring both are set to the
same value.

34.142.5.61  textfgcolor()

```
void Fl_Terminal::textfgcolor ( 
    Fl_Color val )
```

Set text foreground drawing color to fltk color val used by any new text added.
Use this for temporary color changes, similar to <ESC>[38;2;<R>;<G>;<B>m
This setting does not affect the 'default' text colors used by <ESC>[0m, <ESC>c, reset_terminal(), etc. To change
both the current and default fg color, also use textfgcolor_default(Fl_Color). Example:

```cpp
// Set both 'current' and 'default' colors
Fl_Color amber = 0xd0704000;
tty->textfgcolor(amber); // set 'current' fg color
tty->textfgcolor_default(amber); // set 'default' fg color used by ESC[0m reset
```

See also

```
textfgcolor_default(Fl_Color)
```
void Fl_Terminal::textfgcolor_default (Fl_Color val)
Set the default text foreground color used by \texttt{<ESC>}c, \texttt{<ESC>}[0m, and \texttt{reset_terminal()}. Does not affect the 'current' text foreground color; use \texttt{textfgcolor(Fl\_Color)} to set that.

See also
\texttt{textfgcolor(Fl\_Color)}

Fl\_Color Fl_Terminal::textfgcolor_default () const [inline]
Return text's default foreground color.

See also
\texttt{textfgcolor()}

void Fl_Terminal::textfgcolor_xterm (uchar val)
Sets the foreground text color as one of the 8 'xterm color' values. This will be the foreground color used for all newly printed text, similar to the \texttt{<ESC>}[#m escape sequence, where # is between 30 and 37. This color will be reset to the default fg color if \texttt{reset_terminal()} is called, or by \texttt{<ESC>}c, \texttt{<ESC>}[0m, etc. The xterm color intensity values can be influenced by the Dim/Bold/Normal modes (which can be set with e.g. \texttt{<ESC>}[1m, \texttt{textattrib()}, etc), so the actual RGB values of these colors allow room for Dim/Bold to influence their brightness. For instance, "Normal Red" is not full brightness to allow "Bold Red" to be brighter. This goes for all colors except 'Black', which is not influenced by Dim or Bold; Black is always Black.
The 8 color xterm values are:

- 0 = Black
- 1 = Red
- 2 = Green
- 3 = Yellow
- 4 = Blue
- 5 = Magenta
- 6 = Cyan
- 7 = White

See also
\texttt{textfgcolor\_default(Fl\_Color)}
textfont()

void Fl_Terminal::textfont (Fl_Font val)

Sets the font used for all text displayed in the terminal.
This affects all existing text (in display and history) as well as any newly printed text.
Only monospace fonts are recommended, such as FL_COURIER or FL_SCREEN. Custom fonts configured with
Fl::set_font() will also work, as long as they are monospace.

textsize()

void Fl_Terminal::textsize (Fl_Fontsize val)

Sets the font size used for all text displayed in the terminal.
This affects all existing text (in display and history) as well as any newly printed text.
Changing this will affect the display_rows() and display_columns().

u8c_disp_row()

Fl_Terminal::Utf8Char * Fl_Terminal::u8c_disp_row (int drow) [protected]

Return pointer to the first u8c character in row drow of the display.

- 'drow' is indexed relative to the beginning of the display buffer.
- This can be used to walk all columns in the specified row, e.g.

```
// Print all chars in first row of display (ASCII and UTF-8)
Utf8Char *u8c = u8c_disp_row(0);       // first char of first display row
int scol = 0, ecol = disp_cols();     // start/end for column loop
for (int col=scol; col<ecol; col++, u8c++) { // loop from first char to last
    char *text = u8c->text_utf8();   // text string for char
    int len = u8c->length();        // text string length for char
    ::printf("%.*s", len, text);   // print potentially multibyte char
}
```

u8c_hist_row()

Fl_Terminal::Utf8Char * Fl_Terminal::u8c_hist_row (int hrow) [protected]

Return u8c for beginning of a row inside the scrollback history.
'hrow' is indexed relative to the beginning of the scrollback history buffer.

See also

u8c_disp_row(int) for example use.

u8c_hist_use_row()

Fl_Terminal::Utf8Char * Fl_Terminal::u8c_hist_use_row (int hurow) [protected]

Return u8c for beginning of row hurow inside the 'in use' part of the scrollback history.
'hurow' is indexed relative to the beginning of the 'in use' part of the scrollback history buffer. This may be a different
from u8c_hist_row(int) if the history was recently cleared, and there aren't many (or any) rows in the history buffer
that have been populated with scrollback text yet.

See also

u8c_disp_row(int) for example use.
34.142.5.70  u8c_ring_row()

Fl_Terminal::Utf8Char * Fl_Terminal::u8c_ring_row (int grow) [protected]

Return UTF-8 char for row grow in the ring buffer.
grow is globally indexed relative to the beginning of the ring buffer, so this method can access ANY character in
the entire ring buffer (hist or disp) by the global index.
Scrolling offset is NOT applied; this is raw access to the ring’s rows.
Should really ONLY be used for making a complete copy of the ring.
Example:
// Walk ALL rows and cols in the ring buffer..
for (int row=0; row<ring.rows(); row++) {
    Utf8Char u8c = ring.u8c_ring_row(row);
    for (int col=0; col<ring.cols(); col++,u8c++) {
        ..make use of u8c->xxx() methods..
    }
}

34.142.5.71  vprintf()

void Fl_Terminal::vprintf (const char * fmt, va_list ap)

Appends printf formatted messages to the terminal.
Subclasses can use this to implement their own printf() functionality.
The string can contain UTF-8, crlf's, and ANSI sequences are also supported when ansi(bool) is set to ‘true’.

Note
The expanded string is currently limited to 1024 characters (including NULL). For longer strings use append()
which has no string limits.

Parameters

<table>
<thead>
<tr>
<th></th>
<th>is a printf format string for the message text.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ap</td>
<td>is a va_list created by va_start() and closed with va_end(), which the caller is responsible for handling.</td>
</tr>
</tbody>
</table>

34.142.5.72  w_to_col()

int Fl_Terminal::w_to_col (int W) const [protected]

Given a width in pixels, return number of columns that “fits” into that area.
This is used by the constructor to size the row/cols to fit the widget size.

34.142.5.73  walk_selection()

const Fl_Terminal::Utf8Char * Fl_Terminal::walk_selection (const Utf8Char * u8c, int & row, int & col) const [protected]

Walk the mouse selection one character at a time from beginning to end, returning a Utf8Char+ to the next character
in the selection, or NULL if the end was reached, or if there’s no selection.
This is easier to use for walking the selection than get_selection().
u8c should start out as NULL, rewinding to the beginning of the selection. If the returned Utf8Char+ is not NULL,
row and col return the character’s row/column position in the ring buffer.
// EXAMPLE: Walk the entire mouse selection, if any
int row, col; // the returned row/col for each char
Utf8Char *u8c = NULL; // start with NULL to begin walk
while ((u8c = walk_selection(u8c, row, col))) { // loop until end char reached
  ..do something with +u8c..
}

See also
get_selection(), is_selection()

Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>u8c</td>
<td>NULL on first iter</td>
</tr>
<tr>
<td>row</td>
<td>returned row#</td>
</tr>
<tr>
<td>col</td>
<td>returned col#</td>
</tr>
</tbody>
</table>

34.142.6 Member Data Documentation

34.142.6.1 scrollbar

Fl_Scrollbar* Fl_Terminal::scrollbar
Vertical scrollbar.
Public, so that it can be accessed directly.

Todo Support scrollbar_left/right() - See Fl_Browser::scrollbar docs

The documentation for this class was generated from the following files:

- Fl_Terminal.H
- Fl_Terminal.hxx

34.143 Fl_Text_Buffer Class Reference

This class manages Unicode text displayed in one or more Fl_Text_Display widgets.
#include <Fl_Text_Buffer.H>

Public Member Functions

- void add_modify_callback (Fl_Text_Modify_Cb bufModifiedCB, void *cbArg)
  Adds a callback function that is called whenever the text buffer is modified.
- void add_predelete_callback (Fl_Text_Predelete_Cb bufPredelCB, void *cbArg)
  Adds a callback routine to be called before text is deleted from the buffer.
- char * address (int pos)
  Convert a byte offset in buffer into a memory address.
- const char * address (int pos) const
  Convert a byte offset in buffer into a memory address.
- void append (const char *t, int addedLength=-1)
  Appends the text string to the end of the buffer.
- int appendfile (const char *file, int buflen=128 *1024)
  Appends the named file to the end of the buffer.
- char byte_at (int pos) const
  Returns the raw byte at the specified position pos in the buffer.
• void **call_modify_callbacks** ()
  
  Calls all modify callbacks that have been registered using the **add_modify_callback()** method.

• void **call_predelete_callbacks** ()
  
  Calls the stored pre-delete callback procedure(s) for this buffer to update the changed area(s) on the screen and any other listeners.

• bool **can_redo** () const
  
  Check if undo is enabled and if the last undo action can be redone.

• bool **can_undo** () const
  
  Check if undo is enabled and if the last action can be undone.

• void **canUndo** (char flag=1)
  
  Enable or disable undo actions for this text buffer.

• unsigned int **char_at** (int pos) const
  
  Returns the character at the specified position pos in the buffer.

• void **copy** (Fl_Text_Buffer ∗fromBuf, int fromStart, int fromEnd, int toPos)
  
  Copies text from another Fl_Text_Buffer to this one.

• int **count_displayed_characters** (int lineStartPos, int targetPos) const
  
  Count the number of displayed characters between buffer position lineStartPos and targetPos.

• int **count_lines** (int startPos, int endPos) const
  
  Counts the number of newlines between startPos and endPos in buffer.

• int **findchar_backward** (int startPos, unsigned int searchChar, int ∗foundPos) const
  
  Search backwards in buffer buf for character searchChar, starting with the character before startPos, returning the result in foundPos.

• int **findchar_forward** (int startPos, unsigned searchChar, int ∗foundPos) const
  
  Finds the next occurrence of the specified character.

• Fl_Text_Buffer (int requestedSize=0, int preferredGapSize=1024)
  
  Create an empty text buffer of a pre-determined size.

• int **highlight** ()
  
  Returns a non-zero value if text has been highlighted, 0 otherwise.

• void **highlight** (int start, int end)
  
  Highlights the specified text within the buffer.

• int **highlight_position** (int ∗start, int ∗end)
  
  Highlights the specified text between start and end within the buffer.

• const Fl_Text_Selection ∗**highlight_selection** () const
  
  Returns the current highlight selection.

• char ∗**highlight_text** ()
  
  Returns the highlighted text.

• void **insert** (int pos, const char ∗text, int insertedLength=-1)
  
  Inserts null-terminated string text at position pos.

• int **insertfile** (const char ∗file, int pos, int buflen=128 ∗1024)
  
  Inserts a file at the specified position.

• bool **is_word_separator** (int pos) const
  
  Returns whether character at position pos is a word separator.

• int **length** () const
  
  Returns the number of bytes in the buffer.

• int **line_end** (int pos) const
  
  Finds and returns the position of the end of the line containing position pos (which is either a pointer to the newline character ending the line or a pointer to one character beyond the end of the buffer).

• int **line_start** (int pos) const
  
  Returns the position of the start of the line containing position pos.

• char ∗**line_text** (int pos) const
  
  Returns the text from the entire line containing the specified character position.
• int loadfile (const char *file, int buflen=128 *1024)
  Loads a text file into the buffer.

• int next_char (int ix) const
  Returns the index of the next character.

• int next_char_clipped (int ix) const

• int outputfile (const char *file, int start, int end, int buflen=128 *1024)
  Writes the specified portions of the text buffer to a file.

• int prev_char (int ix) const
  Returns the index of the previous character.

• int prev_char_clipped (int ix) const

• Fl_Text_Selection * primary_selection ()
  Returns the primary selection.

• const Fl_Text_Selection * primary_selection () const
  Returns the primary selection.

• void printf (const char *fmt,...)
  Appends printf formatted messages to the end of the buffer.

• int redo (int *cp=0)
  Redo previous undo action.

• void remove (int start, int end)
  Deletes a range of characters in the buffer.

• void remove_modify_callback (Fl_Text_Modify_Cb bufModifiedCB, void *cbArg)
  Removes a modify callback.

• void remove_predelete_callback (Fl_Text_Predelete_Cb predelCB, void *cbArg)
  Removes a callback routine bufPreDeleteCB associated with argument cbArg to be called before text is deleted
  from the buffer.

• void remove_secondary_selection ()
  Removes the text from the buffer corresponding to the secondary text selection object.

• void remove_selection ()
  Removes the text in the primary selection.

• void replace (int start, int end, const char *text, int insertedLength=-1)
  Deletes the characters between start and end, and inserts the null-terminated string text in their place in the
  buffer.

• void replace_secondary_selection (const char *text)
  Replaces the text from the buffer corresponding to the secondary text selection object with the new string text.

• void replace_selection (const char *text)
  Replaces the text in the primary selection.

• int rewind_lines (int startPos, int nLines)
  Finds and returns the position of the first character of the line nLines backwards from startPos (not counting the
  character pointed to by startPos if that is a newline) in the buffer.

• int savefile (const char *file, int buflen=128 *1024)
  Saves a text file from the current buffer.

• int search_backward (int startPos, const char *searchString, int *foundPos, int matchCase=0) const
  Search backwards in buffer for string searchString, starting with the character at startPos, returning the result
  in foundPos.

• int search_forward (int startPos, const char *searchString, int *foundPos, int matchCase=0) const
  Search forwards in buffer for string searchString, starting with the character startPos, and returning the result
  in foundPos.

• void secondary_select (int start, int end)
  Selects a range of characters in the secondary selection.

• int secondary_selected ()
  Returns a non-zero value if text has been selected in the secondary text selection, 0 otherwise.

• const Fl_Text_Selection * secondary_selection () const
Returns the secondary selection.

- **int secondary_selection_position (int *start, int *end)**
  Returns the current selection in the secondary text selection object.

- **char * secondary_selection_text ()**
  Returns the text in the secondary selection.

- **void secondary_unselect ()**
  Clears any selection in the secondary text selection object.

- **void select (int start, int end)**
  Selects a range of characters in the buffer.

- **int selected () const**
  Returns a non-zero value if text has been selected, 0 otherwise.

- **int selection_position (int *start, int *end)**
  Gets the selection position.

- **char * selection_text ()**
  Returns the currently selected text.

- **int skip_displayed_characters (int lineStartPos, int nChars)**
  Count forward from buffer position startPos in displayed characters.

- **int skip_lines (int startPos, int nLines)**
  Finds the first character of the line nLines forward from startPos in the buffer and returns its position.

- **int tab_distance () const**
  Gets the tab width.

- **void tab_distance (int tabDist)**
  Set the hardware tab distance (width) used by all displays for this buffer, and used in computing offsets for rectangular selection operations.

- **char * text () const**
  Get a copy of the entire contents of the text buffer.

- **void text (const char *text)**
  Replaces the entire contents of the text buffer.

- **char * text_range (int start, int end) const**
  Get a copy of a part of the text buffer.

- **int undo (int *cp=0)**
  Undo text modification according to the undo variables or insert text from the undo buffer.

- **void unhighlight ()**
  Unhighlights text in the buffer.

- **void unselect ()**
  Cancels any previous selection on the primary text selection object.

- **int utf8_align (int) const**
  Align an index into the buffer to the current or previous UTF-8 boundary.

- **void vprintf (const char *fmt, va_list ap)**
  Can be used by subclasses that need their own printf() style functionality.

- **int word_end (int pos) const**
  Returns the position corresponding to the end of the word.

- **int word_start (int pos) const**
  Returns the position corresponding to the start of the word.

- **~Fl_Text_Buffer ()**
  Frees a text buffer.

**Public Attributes**

- **int input_file_was_transcoded**
  true if the loaded file has been transcoded to UTF-8.

- **void(* transcoding_warning_action )(Fl_Text_Buffer *)**
  Pointer to a function called after reading a non UTF-8 encoded file.
Static Public Attributes

• static const char * file_encoding_warning_message

This message may be displayed using the fl_alert() function when a file which was not UTF-8 encoded is input.

Protected Member Functions

• int apply_undo (Fl_Text_Undo_Action *action, int *cursorPos)

Apply the current undo/redo operation, called from undo() or redo().

• void call_modify_callbacks (int pos, int nDeleted, int nInserted, int nRestyled, const char *deletedText) const

Calls the stored modify callback procedure(s) for this buffer to update the changed area(s) on the screen and any other listeners.

• void call_predelete_callbacks (int pos, int nDeleted) const

Calls the stored pre-delete callback procedure(s) for this buffer to update the changed area(s) on the screen and any other listeners.

• int insert_ (int pos, const char * text, int insertedLength=-1)

Internal (non-redisplaying) version of insert().

• void move_gap (int pos)

Move the gap to start at a new position.

• void reallocate_with_gap (int newGapStart, int newGapLen)

Reallocates the text storage in the buffer to have a gap starting at newGapStart and a gap size of newGapLen, preserving the buffer's current contents.

• void redisplay_selection (Fl_Text_Selection *oldSelection, Fl_Text_Selection *newSelection) const

Calls the stored redisplay procedure(s) for this buffer to update the screen for a change in a selection.

• void remove_ (int start, int end)

Internal (non-redisplaying) version of remove().

• void remove_selection_ (Fl_Text_Selection *sel)

Removes the text from the buffer corresponding to sel.

• void replace_selection_ (Fl_Text_Selection *sel, const char * text)

Replaces the text in selection sel.

• char * selection_text_ (Fl_Text_Selection *sel) const

• void update_selections (int pos, int nDeleted, int nInserted)

Updates all of the selections in the buffer for changes in the buffer's text.

Protected Attributes

• char * mBuf

allocated memory where the text is stored

• char mCanUndo

if this buffer is used for attributes, it must not do any undo calls

• void ** mCbArgs

caller arguments for modifyProcs above

• int mCursorPosHint

hint for reasonable cursor position after a buffer modification operation

• int mGapEnd

points to the first character after the gap

• int mGapStart

points to the first character of the gap

• Fl_Text_Selection mHighlight

highlighted areas

• int mLength

length of the text in the buffer (the length of the buffer itself must be calculated: gapEnd - gapStart + length)
- **Fl_Text_Modify_Cb mModifyProcs**
  procedures to call when buffer is modified to redisplay contents
- **int mNModifyProcs**
  number of modify-redisplay procs attached
- **int mNPredeleteProcs**
  number of pre-delete procs attached
- **void ** mPredeleteCbArgs**
  caller argument for pre-delete proc above
- **Fl_Text_Predelete_Cb mPredeleteProcs**
  procedure to call before text is deleted from the buffer; at most one is supported.
- **int mPreferredGapSize**
  the default allocation for the text gap is 1024 bytes and should only be increased if frequent and large changes in buffer size are expected
- **Fl_Text_Selection mPrimary**
  highlighted areas
- **Fl_Text_Undo_Action_List * mRedoList**
  List of redo event.
- **Fl_Text_Selection mSecondary**
  highlighted areas
- **int mTabDist**
  equiv.
- **Fl_Text_Undo_Action * mUndo**
  local undo event
- **Fl_Text_Undo_Action_List * mUndoList**
  List of undo event.

### 34.143.1 Detailed Description

This class manages Unicode text displayed in one or more Fl_Text_Display widgets. All text in Fl_Text_Buffer must be encoded in UTF-8. All indices used in the function calls must be aligned to the start of a UTF-8 sequence. All indices and pointers returned will be aligned. All functions that return a single character will return that in an unsigned int in UCS-4 encoding. The Fl_Text_Buffer class is used by the Fl_Text_Display and Fl_Text_Editor to manage complex text data and is based upon the excellent NEdit text editor engine - see https://sourceforge.net/projects/nedit/.

### 34.143.2 Constructor & Destructor Documentation

#### 34.143.2.1 Fl_Text_Buffer()

Fl_Text_Buffer::Fl_Text_Buffer (  
  int requestedSize = 0,  
  int preferredGapSize = 1024 )

Create an empty text buffer of a pre-determined size.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>requestedSize</td>
<td>use this to avoid unnecessary re-allocation if you know exactly how much the buffer will need to hold</td>
</tr>
<tr>
<td>preferredGapSize</td>
<td>Initial size for the buffer gap (empty space in the buffer where text might be inserted if the user is typing sequential characters)</td>
</tr>
</tbody>
</table>
34.143.3 Member Function Documentation

34.143.3.1 add_modify_callback()

```c
void Fl_Text_Buffer::add_modify_callback ( 
    Fl_Text_Modify_Cb bufModifiedCB, 
    void * cbArg )
```

Adds a callback function that is called whenever the text buffer is modified. The callback function is declared as follows:

```c
typedef void (*Fl_Text_Modify_Cb)(int pos, int nInserted, int nDeleted, 
    int nRestyled, const char* deletedText, 
    void* cbArg);
```

34.143.3.2 address() [1/2]

```c
char * Fl_Text_Buffer::address ( int pos ) [inline]
```

Convert a byte offset in buffer into a memory address.

Parameters

| pos | byte offset into buffer |

Returns

byte offset converted to a memory address

34.143.3.3 address() [2/2]

```c
const char * Fl_Text_Buffer::address ( int pos ) const [inline]
```

Convert a byte offset in buffer into a memory address.

Parameters

| pos | byte offset into buffer |

Returns

byte offset converted to a memory address

34.143.3.4 append()

```c
void Fl_Text_Buffer::append ( 
    const char * t, 
    int addedLength = -1 ) [inline]
```

Appends the text string to the end of the buffer.

Parameters

<table>
<thead>
<tr>
<th>t</th>
<th>UTF-8 encoded text</th>
</tr>
</thead>
<tbody>
<tr>
<td>addedLength</td>
<td>number of bytes to append, or -1 to indicate t is null-terminated</td>
</tr>
</tbody>
</table>
34.143.3.5  appendfile()

```cpp
int Fl_Text_Buffer::appendfile (const char * file, int buflen = 128*1024) [inline]
```

Appends the named file to the end of the buffer. See also insertfile().

34.143.3.6  byte_at()

```cpp
char Fl_Text_Buffer::byte_at (int pos) const
```

Returns the raw byte at the specified position pos in the buffer. Positions start at 0.

Parameters

`pos` byte offset into buffer

Returns

unencoded raw byte

34.143.3.7  can_redo()

```cpp
bool Fl_Text_Buffer::can_redo () const
```

Check if undo is enabled and if the last undo action can be redone. See also can_undo()

34.143.3.8  can_undo()

```cpp
bool Fl_Text_Buffer::can_undo () const
```

Check if undo is enabled and if the last action can be undone. See also can_undo()

34.143.3.9  canUndo()

```cpp
void Fl_Text_Buffer::canUndo (char flag = 1)
```

Enable or disable undo actions for this text buffer. Enable or disable undo actions for text buffer by default. If used as a style buffer in Fl_Text_Display, undo actions are disabled as they are handled by the text buffer. See also can_undo()
34.143.3.10  **char_at()**

`unsigned int Fl_Text_Buffer::char_at ( int pos ) const`

Returns the character at the specified position `pos` in the buffer. Positions start at 0.

**Parameters**

- `pos` byte offset into buffer, `pos` must be at a UTF-8 character boundary

**Returns**

Unicode UCS-4 encoded character

34.143.3.11  **copy()**

`void Fl_Text_Buffer::copy ( Fl_Text_Buffer * fromBuf, int fromStart, int fromEnd, int toPos )`

Copies text from another `Fl_Text_Buffer` to this one.

**Parameters**

- `fromBuf` source text buffer, may be the same as this
- `fromStart` byte offset into buffer
- `fromEnd` byte offset into buffer
- `toPos` destination byte offset into buffer

34.143.3.12  **count_displayed_characters()**

`int Fl_Text_Buffer::count_displayed_characters ( int lineStartPos, int targetPos ) const`

Counts the number of displayed characters between buffer position `lineStartPos` and `targetPos`. Displayed characters are the characters shown on the screen to represent characters in the buffer, where tabs and control characters are expanded.

34.143.3.13  **count_lines()**

`int Fl_Text_Buffer::count_lines ( int startPos, int endPos ) const`

Counts the number of newlines between `startPos` and `endPos` in buffer. The character at position `endPos` is not counted.

34.143.3.14  **findchar_backward()**

`int Fl_Text_Buffer::findchar_backward ( int startPos, unsigned int searchChar, int * foundPos ) const`
Search backwards in buffer `buf` for character `searchChar`, starting with the character before `startPos`, returning the result in `foundPos`.
Returns 1 if found, 0 if not. The difference between this and `search_backward()` is that it's optimized for single characters. The overall performance of the text widget is dependent on its ability to count lines quickly, hence searching for a single character: newline.

**Parameters**

<table>
<thead>
<tr>
<th>startPos</th>
<th>byte offset to start position</th>
</tr>
</thead>
<tbody>
<tr>
<td>searchChar</td>
<td>UCS-4 character that we want to find</td>
</tr>
<tr>
<td>foundPos</td>
<td>byte offset where the character was found</td>
</tr>
</tbody>
</table>

Returns

1 if found, 0 if not

### 34.143.3.15 findchar_forward()

```c
int Fl_Text_Buffer::findchar_forward (  
    int startPos,  
    unsigned searchChar,  
    int * foundPos ) const
```

Finds the next occurrence of the specified character. Search forwards in buffer for character `searchChar`, starting with the character `startPos`, and returning the result in `foundPos`. Returns 1 if found, 0 if not. The difference between this and `search_forward()` is that it's optimized for single characters. The overall performance of the text widget is dependent on its ability to count lines quickly, hence searching for a single character: newline.

**Parameters**

<table>
<thead>
<tr>
<th>startPos</th>
<th>byte offset to start position</th>
</tr>
</thead>
<tbody>
<tr>
<td>searchChar</td>
<td>UCS-4 character that we want to find</td>
</tr>
<tr>
<td>foundPos</td>
<td>byte offset where the character was found</td>
</tr>
</tbody>
</table>

Returns

1 if found, 0 if not

### 34.143.3.16 highlight_text()

```c
char * Fl_Text_Buffer::highlight_text ( )
```

Returns the highlighted text.
When you are done with the text, free it using the `free()` function.

### 34.143.3.17 insert()

```c
void Fl_Text_Buffer::insert (  
    int pos,  
    const char * text,  
    int insertedLength = -1 )
```

Inserts null-terminated string `text` at position `pos`.

**Parameters**

| pos  | insertion position as byte offset (must be UTF-8 character aligned) |
Parameters

<table>
<thead>
<tr>
<th>text</th>
<th>UTF-8 encoded text</th>
</tr>
</thead>
<tbody>
<tr>
<td>insertedLength</td>
<td>number of bytes to insert, or -1 to indicate text is null-terminated</td>
</tr>
</tbody>
</table>

34.143.3.18 insert()

```c
int Fl_Text_Buffer::insert_ (  
    int pos,  
    const char * text,  
    int insertedLength = -1 )  
```

[protected]

Internal (non-redisplaying) version of insert().

Returns the length of text inserted (this is just strlen(text) if insertedLength == -1, however this calculation can be expensive and the length will be required by any caller who will continue on to call redisplay). pos must be contiguous with the existing text in the buffer (i.e. not past the end).

Returns

the number of bytes inserted

34.143.3.19 insertfile()

```c
int Fl_Text_Buffer::insertfile (  
    const char * file,  
    int pos,  
    int buflen = 128*1024  )
```

Inserts a file at the specified position.

Returns

- 0 on success
- non-zero on error (strerror() contains reason)
- 1 indicates open for read failed (no data loaded)
- 2 indicates error occurred while reading data (data was partially loaded)

File can be UTF-8 or CP1252 encoded. If the input file is not UTF-8 encoded, the Fl_Text_Buffer widget will contain data transcoded to UTF-8. By default, the message Fl_Text_Buffer::file_encoding_warning_message will warn the user about this.

See also

```
input_file_was_transcoded and transcoding_warning_action.
```

34.143.3.20 is_word_separator()

```c
bool Fl_Text_Buffer::is_word_separator (  
    int pos ) const
```

Returns whether character at position pos is a word separator. Pos must be at a character boundary.

34.143.3.21 length()

```c
int Fl_Text_Buffer::length (  
    void ) const [inline]
```

Returns the number of bytes in the buffer.
34.143.3.22 line_end()

```cpp
int Fl_Text_Buffer::line_end (int pos) const
```

Finds and returns the position of the end of the line containing position `pos` (which is either a pointer to the newline character ending the line or a pointer to one character beyond the end of the buffer).

**Parameters**

| pos | byte index into buffer |

**Returns**

byte offset to line end

34.143.3.23 line_start()

```cpp
int Fl_Text_Buffer::line_start (int pos) const
```

Returns the position of the start of the line containing position `pos`.

**Parameters**

| pos | byte index into buffer |

**Returns**

byte offset to line start

34.143.3.24 line_text()

```cpp
char * Fl_Text_Buffer::line_text (int pos) const
```

Returns the text from the entire line containing the specified character position. When you are done with the text, free it using the `free()` function.

**Parameters**

| pos | byte index into buffer |

**Returns**

copy of UTF-8 text, must be free'd

34.143.3.25 loadfile()

```cpp
int Fl_Text_Buffer::loadfile (const char * file,
```
34.143.3.26 next_char()

```cpp
int Fl_Text_Buffer::next_char (int ix) const
```

Returns the index of the next character.

**Parameters**

- `ix` index to the current character

34.143.3.27 outputfile()

```cpp
int Fl_Text_Buffer::outputfile (const char * file, int start, int end, int buflen = 128*1024 )
```

Writes the specified portions of the text buffer to a file.

**Returns**

- 0 on success
- non-zero on error (strerror() contains reason)
- 1 indicates open for write failed (no data saved)
- 2 indicates error occurred while writing data (data was partially saved)

**See also**

`savefile(const char *file, int buflen)`

34.143.3.28 prev_char()

```cpp
int Fl_Text_Buffer::prev_char (int ix) const
```

Returns the index of the previous character.

**Parameters**

- `ix` index to the current character

34.143.3.29 printf()

```cpp
void Fl_Text_Buffer::printf (const char * fmt, ... )
```

Appends printf formatted messages to the end of the buffer.

**Example:**

```cpp
#include <FL/Fl_Text_Display.H>
int main(..) {
```

Generated by Doxygen
// Create a text display widget and assign it a text buffer
Fl_Text_Display *tdsp = new Fl_Text_Display();
Fl_Text_Buffer *tbuf = new Fl_Text_Buffer();
tdsp->buffer(tbuf);

// Append three lines of formatted text to the buffer
tbuf->printf("The current date is: %s.
The time is: %s
", date_str, time_str);
tbuf->printf("The current PID is %ld.
", (long)getpid());

Note
The expanded string is currently limited to 1024 characters.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>fmt</th>
<th>is a printf format string for the message text.</th>
</tr>
</thead>
</table>

34.143.3.30 remove()

void Fl_Text_Buffer::remove (  
  int start,  
  int end )

Deletes a range of characters in the buffer.

Parameters

<table>
<thead>
<tr>
<th>start</th>
<th>byte offset to first character to be removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>end</td>
<td>byte offset to character after last character to be removed</td>
</tr>
</tbody>
</table>

34.143.3.31 remove()

void Fl_Text_Buffer::remove_ (  
  int start,  
  int end ) [protected]

Internal (non-redisplaying) version of remove().
Removes the contents of the buffer between start and end (and moves the gap to the site of the delete).

34.143.3.32 replace()

void Fl_Text_Buffer::replace (  
  int start,  
  int end,  
  const char * text,  
  int insertedLength = -1 )

Deletes the characters between start and end, and inserts the null-terminated string text in their place in the buffer.

Parameters

<table>
<thead>
<tr>
<th>start</th>
<th>byte offset to first character to be removed and new insert position</th>
</tr>
</thead>
<tbody>
<tr>
<td>end</td>
<td>byte offset to character after last character to be removed</td>
</tr>
<tr>
<td>text</td>
<td>UTF-8 encoded text</td>
</tr>
<tr>
<td>insertedLength</td>
<td>number of bytes to insert, or -1 to indicate text is null-terminated</td>
</tr>
</tbody>
</table>
34.143.3.33 rewind_lines()

```cpp
int Fl_Text_Buffer::rewind_lines (int startPos, int nLines)
```

Finds and returns the position of the first character of the line \texttt{nLines} backwards from \texttt{startPos} (not counting the character pointed to by \texttt{startPos} if that is a newline) in the buffer. \texttt{nLines == 0} means find the beginning of the line.

34.143.3.34 savefile()

```cpp
int Fl_Text_Buffer::savefile (const char *file, int buflen = 128*1024) [inline]
```

Saves a text file from the current buffer.

Returns:
- 0 on success
- non-zero on error (\texttt{strerror()} contains reason)
- 1 indicates open for write failed (no data saved)
- 2 indicates error occurred while writing data (data was partially saved)

See also: `outputfile(const char *file, int start, int end, int buflen)`

34.143.3.35 search_backward()

```cpp
int Fl_Text_Buffer::search_backward (int startPos, const char *searchString, int *foundPos, int matchCase = 0) const
```

Search backwards in buffer for string \texttt{searchString}, starting with the character at \texttt{startPos}, returning the result in \texttt{foundPos}.

Returns: 1 if found, 0 if not.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>startPos</td>
<td>byte offset to start position</td>
</tr>
<tr>
<td>searchString</td>
<td>UTF-8 string that we want to find</td>
</tr>
<tr>
<td>foundPos</td>
<td>byte offset where the string was found</td>
</tr>
<tr>
<td>matchCase</td>
<td>if set, match character case</td>
</tr>
</tbody>
</table>

Returns:
- 1 if found, 0 if not

34.143.3.36 search_forward()

```cpp
int Fl_Text_Buffer::search_forward (int startPos,
```
```cpp
const char * searchString, int * foundPos, int matchCase = 0) const
Search forwards in buffer for string searchString, starting with the character startPos, and returning the result in foundPos. Returns 1 if found, 0 if not.

Parameters

| startPos | byte offset to start position |
| searchString | UTF-8 string that we want to find |
| foundPos | byte offset where the string was found |
| matchCase | if set, match character case |

Returns

1 if found, 0 if not

34.143.3.37 secondary_selection_text()
char * Fl_Text_Buffer::secondary_selection_text ( )
Returns the text in the secondary selection. When you are done with the text, free it using the free() function.

34.143.3.38 selection_text()
char * Fl_Text_Buffer::selection_text ( )
Returns the currently selected text. When you are done with the text, free it using the free() function.

34.143.3.39 skip_displayed_characters()
int Fl_Text_Buffer::skip_displayed_characters ( int lineStartPos, int nChars )
Count forward from buffer position startPos in displayed characters. Displayed characters are the characters shown on the screen to represent characters in the buffer, where tabs and control characters are expanded.

Parameters

| lineStartPos | byte offset into buffer |
| nChars | number of bytes that are sent to the display |

Returns

byte offset in input after all output bytes are sent

34.143.3.40 tab_distance()
int Fl_Text_Buffer::tab_distance ( ) const [inline]
Gets the tab width. The tab width is measured in characters. The pixel position is calculated using an average character width.
```
34.143.3.41  text() [1/2]

char * Fl_Text_Buffer::text() const
Get a copy of the entire contents of the text buffer.
Memory is allocated to contain the returned string, which the caller must free.

Returns
    newly allocated text buffer - must be free'd, text is UTF-8

34.143.3.42  text() [2/2]

void Fl_Text_Buffer::text(
    const char * text)
Replaces the entire contents of the text buffer.

Parameters
| text | Text must be valid UTF-8. If null, an empty string is substituted. |

34.143.3.43  text_range()

char * Fl_Text_Buffer::text_range(
    int start,
    int end) const
Get a copy of a part of the text buffer.
Return a copy of the text between start and end character positions from text buffer buf. Positions start at 0, and the range does not include the character pointed to by end. When you are done with the text, free it using the free() function.

Parameters
| start | byte offset to first character |
| end   | byte offset after last character in range |

Returns
    newly allocated text buffer - must be free'd, text is UTF-8

34.143.3.44  undo()

int Fl_Text_Buffer::undo(
    int * cursorPos = 0)
Undo text modification according to the undo variables or insert text from the undo buffer.
Take the previous changes and undo them.
Return the previous cursor position in cursorPos. Returns 1 if the undo was applied. CursorPos will be at a character boundary.

34.143.3.45  vprintf()

void Fl_Text_Buffer::vprintf(
    const char * fmt,
    va_list ap)
Can be used by subclasses that need their own printf() style functionality.
Note

The expanded string is currently limited to 1024 characters.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>fmt</th>
<th>is a printf format string for the message text.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>ap</td>
<td>is a va_list created by va_start() and closed with va_end(), which the caller is responsible for handling.</td>
</tr>
</tbody>
</table>

34.143.46 word_end()

int Fl_Text_Buffer::word_end (  
    int pos ) const

Returns the position corresponding to the end of the word.

Parameters

| pos | byte index into buffer |

Returns

byte offset to word end

34.143.47 word_start()

int Fl_Text_Buffer::word_start (  
    int pos ) const

Returns the position corresponding to the start of the word.

Parameters

| pos | byte index into buffer |

Returns

byte offset to word start

34.143.4 Member Data Documentation

34.143.4.1 file_encoding_warning_message

const char * Fl_Text_Buffer::file_encoding_warning_message [static]

Initial value:

"Displayed text contains the UTF-8 transcoding\n"  
"of the input file which was not UTF-8 encoded.\n"  
"Some changes may have occurred."

This message may be displayed using the fl_alert() function when a file which was not UTF-8 encoded is input.

34.143.4.2 mTabDist

int Fl_Text_Buffer::mTabDist [protected]
equiv.
number of characters in a tab

34.143.4 transcoding_warning_action

void(* Fl_Text_Buffer::transcoding_warning_action) (Fl_Text_Buffer *)

Pointer to a function called after reading a non UTF-8 encoded file.
This function is called after reading a file if the file content was transcoded to UTF-8. Its default implementation calls
fl_alert() with the text of file_encoding_warning_message. No warning message is displayed if this pointer is set to
NULL. Use input_file_was_transcoded to be informed if file input required transcoding to UTF-8.
The documentation for this class was generated from the following files:

- Fl_Text_Buffer.H
- Fl_Text_Buffer.cxx

34.144 Fl_Text_Display Class Reference

Rich text display widget.
#include <Fl_Text_Display.H>

Inheritance diagram for Fl_Text_Display:

```
Fl_Widget
  |               |
  v               v
Fl_Group
  |               |
  v               v
Fl_Text_Display

Fl_Simple_Terminal Fl_Text_Editor
```

Classes

- struct Style_Table_Entry
  
  This structure associates the color, font, and font size of a string to draw with an attribute mask matching attr.

Public Types

- enum {
  NORMAL_CURSOR, CARET_CURSOR, DIM_CURSOR, BLOCK_CURSOR,  
  HEAVY_CURSOR, SIMPLE_CURSOR
  }

  text display cursor shapes enumeration

- enum {
  CURSOR_POS, CHARACTER_POS
  }

  the character position is the left edge of a character, whereas the cursor is thought to be between the centers of two
  consecutive characters.

- enum {
  DRAG_NONE = -2, DRAG_START_DND = -1, DRAG_CHAR = 0, DRAG_WORD = 1,  
  DRAG_LINE = 2
  }

  drag types - they match Fl::event_clicks() so that single clicking to start a collection selects by character, double
  clicking selects by word and triple clicking selects by line.

- enum {
  WRAP_NONE, WRAP_AT_COLUMN, WRAP_AT_PIXEL, WRAP_AT_BOUNDS
  }

  wrap types - used in wrap_mode()

- enum {
  ATTR_BGCOLOR = 0x0001, ATTR_BGCOLOR_EXT = 0x0002, ATTR_BGCOLOR_EXT = 0x0003,  
  ATTR_UNDERLINE = 0x0004
  }

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994 Class Documentation

**ATTR_GRAMMAR** = 0x0008, **ATTR_SPELLING** = 0x000C, **ATTR_STRIKE_THROUGH** = 0x0010, **ATTR_LINES_MASK** = 0x001C

attribute flags in `Style_Table_Entry.attr`

- typedef void(* _Unfinished_Style_Cb) (int, void *)

### Public Member Functions

- **Fl_Text_Buffer** ∗ buffer () const
  
  Gets the current text buffer associated with the text widget.

- void buffer (Fl_Text_Buffer &buf)
  
  Sets the current text buffer associated with the text widget.

- void buffer (Fl_Text_Buffer ∗buf)
  
  Attach a text buffer to display, replacing the current buffer (if any).

- double col_to_x (double col) const
  
  Convert a column number into an x pixel position.

- int count_lines (int start, int end, bool start_pos_is_line_start) const
  
  Count the number of lines between two positions.

- **Fl_Color** cursor_color () const
  
  Gets the text cursor color.

- void cursor_color (Fl_Color n)
  
  Sets the text cursor color.

- int cursor_style () const
  
  Sets the text cursor style.

- void cursor_style (int style)
  
  Sets the text cursor style.

- **Fl_Text_Display** (int X, int Y, int W, int H, const char ∗l=0)
  
  Creates a new text display widget.

- **Fl_Color** grammar_underline_color () const
  
  Gets the underline color for style attribute **ATTR_GRAMMAR**.

- void grammar_underline_color (Fl_Color color)
  
  Sets the underline color for style attribute **ATTR_GRAMMAR**.

- int handle (int e) FL_OVERRIDE
  
  Event handling.

- void hide_cursor ()
  
  Hides the text cursor.

- void highlight_data (Fl_Text_Buffer ∗styleBuffer, const Style_Table_Entry ∗styleTable, int nStyles, char unfinishedStyle, _Unfinished_Style_Cb unfinishedHighlightCB, void ∗cbArg)
  
  Attach (or remove) highlight information in text display and redisplay.

- int in_selection (int x, int y) const
  
  Check if a pixel position is within the primary selection.

- void insert (const char ∗text)
  
  Inserts "text" at the current cursor location.

- int insert_position () const
  
  Gets the position of the text insertion cursor for text display.

- void insert_position (int newPos)
  
  Sets the position of the text insertion cursor for text display.

- int line_end (int startPos, bool start_pos_is_line_start) const
  
  Returns the end of a line.

- int line_start (int pos) const
  
  Return the beginning of a line.

- **Fl_Align** linenumber_align () const
  
  Returns the alignment used for line numbers (if enabled).
• void linenumber_align (Fl_Align val)
  
  Set alignment for line numbers (if enabled).

• Fl_Color linenumberbgcolor () const
  
  Returns the background color used for line numbers (if enabled).

• void linenumberbgcolor (Fl_Color val)
  
  Set the background color used for line numbers (if enabled).

• Fl_Color linenumberfgcolor () const
  
  Return the foreground color used for line numbers (if enabled).

• void linenumberfgcolor (Fl_Color val)
  
  Set the foreground color used for line numbers (if enabled).

• Fl_Font linenumber_font () const
  
  Return the font used for line numbers (if enabled).

• void linenumber_font (Fl_Font val)
  
  Set the font used for line numbers (if enabled).

• const char ∗linenumber_format () const
  
  Returns the line number printf() format string.

• void linenumber_format (const char ∗val)
  
  Sets the printf() style format string used for line numbers.

• Fl_Fontsize linenumber_size () const
  
  Return the font size used for line numbers (if enabled).

• void linenumber_size (Fl_Fontsize val)
  
  Set the font size used for line numbers (if enabled).

• int linenumber_width () const
  
  Return the screen area width provided for line numbers.

• void linenumber_width (int width)
  
  Set width of screen area for line numbers.

• int move_down ()
  
  Moves the current insert position down one line.

• int move_left ()
  
  Moves the current insert position left one character.

• int move_right ()
  
  Moves the current insert position right one character.

• int move_up ()
  
  Moves the current insert position up one line.

• void next_word (void)
  
  Moves the current insert position right one word.

• void overstrike (const char ∗text)
  
  Replaces text at the current insert position.

• int position_style (int lineStartPos, int lineLen, int lineIndex) const
  
  Find the correct style for a character.

• int position_to_xy (int pos, int ∗x, int ∗y) const
  
  Convert a character index into a pixel position.

• void previous_word (void)
  
  Moves the current insert position left one word.

• virtual void recalc_display ()
  
  Recalculate the display’s visible lines and scrollbar sizes.

• void redisplay_range (int start, int end)
  
  Marks text from start to end as needing a redraw.

• void resize (int X, int Y, int W, int H) FL_OVERRIDE
  
  Change the size of the displayed text area.

• int rewind_lines (int startPos, int nLines)
void scroll (int topLineNum, int horizOffset)

Scrolls the current buffer to start at the specified line and column.

Fl_Align scrollbar_align () const

Gets the scrollbar alignment type.

void scrollbar_align (Fl_Align a)

Sets the scrollbar alignment type.

int scrollbar_size () const

Gets the current size of the scrollbars' troughs, in pixels.

void scrollbar_size (int newSize)

Sets the pixel size of the scrollbars' troughs to newSize, in pixels.

int scrollbar_width () const

Returns the global value Fl::scrollbar_size() unless a specific scrollbar_width_ has been set.

void scrollbar_width (int width)

Sets the global Fl::scrollbar_size(), and forces this instance of the widget to use it.

Fl_Color secondary_selection_color () const

Gets the background color for the secondary selection block.

void secondary_selection_color (Fl_Color color)

Sets the background color for the secondary selection block.

int shortcut () const

void shortcut (int s)

void show_cursor (int b=1)

Shows the text cursor.

void show_insert_position ()

Scrolls the text buffer to show the current insert position.

int skip_lines (int startPos, int nLines, bool startPosIsLineStart)

Skip a number of lines forward.

Fl_Color spelling_underline_color () const

Gets the underline color for style attribute ATTR_SPELLING.

void spelling_underline_color (Fl_Color color)

Sets the underline color for style attribute ATTR_SPELLING.

Fl_Text_Buffer * style_buffer () const

Gets the current style buffer associated with the text widget.

Fl_Color textcolor () const

Sets the default color of text in the widget.

void textcolor (Fl_Color n)

Sets the default color of text in the widget.

Fl_Font textfont () const

Gets the default font used when drawing text in the widget.

void textfont (Fl_Font s)

Sets the default font used when drawing text in the widget.

Fl_Fontsize textsize () const

Sets the default size of text in the widget.

void textsize (Fl_Fontsize s)

Sets the default size of text in the widget.

int word_end (int pos) const

Moves the insert position to the end of the current word.

int word_start (int pos) const

Moves the insert position to the beginning of the current word.

void wrap_mode (int wrap, int wrap_margin)

Set the new text wrap mode.
• **int wrapped_column** (int row, int column) const
  Nobody knows what this function does.

• **int wrapped_row** (int row) const
  Nobody knows what this function does.

• **double x_to_col** (double x) const
  Convert an x pixel position into a column number.

• **\~Fl_Text_Display** ()
  Free a text display and release its associated memory.

### Protected Types

```
enum {
  DRAW_LINE, FIND_INDEX, FIND_INDEX_FROM_ZERO, GET_WIDTH, FIND_CURSOR_INDEX
}
```

### Protected Member Functions

• **void absolute_top_line_number** (int oldFirstChar)
  Re-calculate absolute top line number for a change in scroll position.

• **void calc_last_char** ()
  Update last display character index.

• **void calc_line_starts** (int startLine, int endLine)
  Update the line starts array.

• **void clear_rect** (int style, int x, int y, int width, int height) const
  Clear a rectangle with the appropriate background color for style.

• **void display_insert** ()
  Scroll the display to bring insertion cursor into view.

• **void draw()** FL_OVERRIDE
  Draw the widget.

• **void draw_cursor** (int, int)
  Draw a cursor with top center at X, Y.

• **void draw_line_numbers** (bool clearAll)
  Refresh the line number area.

• **void draw_range** (int start, int end)
  Draw a range of text.

• **void draw_string** (int style, int x, int y, int toX, const char∗ string, int nChars) const
  Draw a text segment in a single style.

• **void draw_text** (int x, int y, int W, int H)
  Refresh a rectangle of the text display.

• **void draw_vline** (int visLineNum, int leftClip, int rightClip, int leftCharIndex, int rightCharIndex)
  Draw a single line of text.

• **int empty_vlines** () const
  Return true if there are lines visible with no corresponding buffer text.

• **void extend_range_for_styles** (int *start, int *end)
  I don’t know what this does!

• **void find_line_end** (int pos, bool start_pos_is_line_start, int *lineEnd, int *nextLineStart) const
  Finds both the end of the current line and the start of the next line.

• **void find_wrap_range** (const char∗ deletedText, int pos, int nInserted, int nDeleted, int *modRangeStart, int *modRangeEnd, int *linesInserted, int *linesDeleted)
  Wrapping calculations.

• **int find_x** (const char∗ s, int len, int style, int x) const
  Find the index of the character that lies at the given x position / closest cursor position.
• int get_absolute_top_line_number () const
  Returns the absolute (non-wrapped) line number of the first line displayed.

• int handle_rmb (int readonly)
  Handle right mouse button down events.

• int handle_vline (int mode, int lineStart, int lineLen, int leftChar, int rightChar, int topClip, int bottomClip, int leftClip, int rightClip) const
  Universal pixel machine.

• int longest_vline () const
  Find the longest line of all visible lines.

• void maintain_absolute_top_line_number (int state)
  Line numbering stuff, currently unused.

• int maintaining_absolute_top_line_number () const
  Returns true if a separate absolute top line number is being maintained.

• void measure_deleted_lines (int pos, int nDeleted)
  Wrapping calculations.

• double measure_proportional_character (const char ∗s, int colNum, int pos) const
  Wrapping calculations.

• int measure_vline (int visLineNum) const
  Returns the width in pixels of the displayed line pointed to by "visLineNum".

• void offset_line_starts (int newTopLineNum)
  Offset line start counters for a new vertical scroll position.

• int position_to_line (int pos, int ∗lineNum) const
  Convert a position index into a line number offset.

• int position_to_linecol (int pos, int ∗lineNum, int ∗column) const
  Find the line and column number of position pos.

• void reset_absolute_top_line_number ()
  Reestablish the absolute (non-wrapped) top line number.

• int scroll_ (int topLineNum, int horizOffset)
  Scrolls the current buffer to start at the specified line and column.

• double string_width (const char ∗string, int length, int style) const
  Find the width of a string in the font of a particular style.

• void update_h_scrollbar ()
  Update horizontal scrollbar.

• void update_line_starts (int pos, int charsInserted, int charsDeleted, int linesInserted, int linesDeleted, int ∗scrolled)
  Update line start arrays and variables.

• void update_v_scrollbar ()
  Update vertical scrollbar.

• int vline_length (int visLineNum) const
  Count number of bytes in a visible line.

• int wrap_uses_character (int lineEndPos) const
  Check if the line break is caused by a newline or by line wrapping.

• void wrapped_line_counter (Fl_Text_Buffer ∗buf, int startPos, int maxPos, int maxLines, bool startPosIs←LineStart, int styleBufOffset, int ∗retPos, int ∗retLines, int ∗retLineStart, int ∗retLineEnd, int countLast←LineMissingNewLine=true) const
  Wrapping calculations.

• int xy_to_position (int x, int y, int PosType=CHARACTER_POS) const
  Translate a pixel position into a character index.

• void xy_to_rowcol (int x, int y, int ∗row, int ∗column, int PosType=CHARACTER_POS) const
  Translate pixel coordinates into row and column.
Static Protected Member Functions

- static void buffer_modified_cb (int pos, int nInserted, int nDeleted, int nRestyled, const char *deletedText, void *cbArg)
  
  *This is called whenever the buffer is modified.*

- static void buffer_predelete_cb (int pos, int nDeleted, void *cbArg)
  
  *This is called before any characters are deleted.*

- static void h_scrollbar_cb (Fl_Scrollbar *w, Fl_Text_Display *d)
  
  *Callback for drag or valueChanged on horizontal scrollbar.*

- static void scroll_timer_cb (void *cbArg)
  
  *Timer callback for scroll events.*

- static void v_scrollbar_cb (Fl_Scrollbar *w, Fl_Text_Display *d)
  
  *Callback for drag or valueChanged on vertical scrollbar.*

Protected Attributes

- int damage_range1_end
- int damage_range1_start
- int damage_range2_end
- int damage_range2_start
- int display_insert_position_hint
- int dragging
- int dragPos
- int dragType
- FL_Color grammar_underline_color_
- FL_Align linenumber_align_
- FL_Color linenumberbgcolor_
- FL_Color linenumberbgcolor_
- FL_Font linenumberfont_
- const char *linenumberformat_
- FL_Fontsize linenumbersize_
- int mAbsTopLineNum
- FL_Text_Buffer *mBuffer
- double mColumnScale
- int mContinuousWrap
- FL_Color mCursor_color
- int mCursorOldY
- int mCursorOn
- int mCursorPos
- int mCursorPreferredXPos
- int mCursorStyle
- int mCursorToHint
- int mFirstChar
- void *mHighlightCBArg
- int mHorizOffset
- int mHorizOffsetHint
- FL_Scrollbar *mHScrollBar
- int mLastChar
- int mLineNumLeft
- int mLineNumWidth
- int *mLineStarts
- int mMaxsize
- int mModifyingTabDistance
- int mNBufferLines
- int mNeedAbsTopLineNum
• int mNLinesDeleted
• int mNStyles
• int mNVisibleLines
• Fl_Text_Buffer * mStyleBuffer
• const Style_Table_Entry * mStyleTable
• int mSuppressResync
• int mTopLineNum
• int mTopLineNumHint
• Unfinished_Style_Cb mUnfinishedHighlightCB
• char mUnfinishedStyle
• Fl_Scrollbar * mVScrollBar
• int mWrapMarginPix
• Fl_Align scrollbar_align_
• int scrollbar_width_
• Fl_Color secondary_selection_color_
• int shortcut_
• Fl_Color spelling_underline_color_

•

    struct {
        int h
        int w
        int x
        int y
    } text_area

• Fl_Color textcolor_
• Fl_Font textfont_
• Fl_Fontsize textsize_

Friends

    • void fl_text_drag_me (int pos, Fl_Text_Display *d)
    • int fl_text_drag_prepare (int pos, int key, Fl_Text_Display *d)

Additional Inherited Members

34.144.1 Detailed Description

Rich text display widget.
This is the FLTK text display widget. It allows the user to view multiple lines of text and supports highlighting, word wrap, mixes of font faces and colors, line numbers and scrolling. The buffer that is displayed in the widget is managed by the Fl_Text_Buffer class. A single Text Buffer can be displayed by multiple Text Displays.
Example Use

```cpp
#include <FL/Fl_Text_Display.H>

int main() {
    Fl_Text_Buffer *buff = new Fl_Text_Buffer();
    Fl_Text_Display *disp = new Fl_Text_Display(10, 10, 640, 480);
    disp->buffer(buff); // attach text buffer to display widget
    buff->text("line one
line two"); // add some text to buffer
    ..
}
```

Features

- Word wrap: `wrap_mode()`, `wrapped_column()`, `wrapped_row()`
- Font control: `textfont()`, `textsize()`, `textcolor()`
• Font styling: `highlight_data()`

• Cursor: `cursor_style()`, `show_cursor()`, `hide_cursor()`, `cursor_color()`

• Line numbers: `linenumber_width()`, `linenumber_font()`, `linenumber_size()`, `linenumber_fgcolor()`, `linenumberbgcolor()`, `linenumber_align()`, `linenumber_format()`

Note that other features may be available via `Fl_Text_Editor` and `Fl_Text_Buffer` classes.

Note

Line numbers were added in FLTK 1.3.3.

See also

`Fl_Widget::shortcut_label(int)`

### 34.144.2 Member Enumeration Documentation

#### 34.144.2.1 anonymous enum

```text
anonymous enum
text display cursor shapes enumeration
```

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL_CURSOR</td>
<td>I-beam.</td>
</tr>
<tr>
<td>CARET_CURSOR</td>
<td>caret under the text</td>
</tr>
<tr>
<td>DIM_CURSOR</td>
<td>dim I-beam</td>
</tr>
<tr>
<td>BLOCK_CURSOR</td>
<td>unfilled box under the current character</td>
</tr>
<tr>
<td>HEAVY_CURSOR</td>
<td>thick I-beam</td>
</tr>
<tr>
<td>SIMPLE_CURSOR</td>
<td>as cursor as <code>Fl_Input</code> cursor</td>
</tr>
</tbody>
</table>

#### 34.144.2.2 anonymous enum

```text
anonymous enum
wrap types - used in `wrap_mode()`
```

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRAP_NONE</td>
<td>don't wrap text at all</td>
</tr>
<tr>
<td>WRAP_AT_COLUMN</td>
<td>wrap text at the given text column</td>
</tr>
<tr>
<td>WRAP_AT_PIXEL</td>
<td>wrap text at a pixel position</td>
</tr>
<tr>
<td>WRAP_AT_BOUNDS</td>
<td>wrap text so that it fits into the widget width</td>
</tr>
</tbody>
</table>

#### 34.144.2.3 anonymous enum

```text
anonymous enum
attribute flags in `Style_Table_Entry.attr`
```

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTR_BGCOLOR</td>
<td>use the background color in the bgcolor field</td>
</tr>
</tbody>
</table>
### 34.144.3 Constructor & Destructor Documentation

#### 34.144.3.1 Fl_Text_Display()

```cpp
Fl_Text_Display::Fl_Text_Display ( 
    int X,
    int Y,
    int W,
    int H,
    const char ∗ l = 0 )
```

Creates a new text display widget.

**Parameters**

- `X,Y,W,H`: position and size of widget
- `l`: label text, defaults to none

#### 34.144.3.2 ~Fl_Text_Display()

```cpp
Fl_Text_Display::~Fl_Text_Display ( )
```

Free a text display and release its associated memory.

**Note**

The text buffer that the text display displays is a separate entity and is not freed, nor are the style buffer or style table.

**See also**

`Fl_Text_Display::buffer(Fl_Text_Buffer ∗ buf)`

### 34.144.4 Member Function Documentation

#### 34.144.4.1 absolute_top_line_number()

```cpp
void Fl_Text_Display::absolute_top_line_number ( 
    int oldFirstChar ) [protected]
```

Re-calculate absolute top line number for a change in scroll position. Does nothing if the absolute top line number is not being maintained.
34.144.4.2 buffer() [1/3]

```cpp
Fl_Text_Buffer * Fl_Text_Display::buffer ( ) const [inline]
```
Gets the current text buffer associated with the text widget.
Multiple text widgets can be associated with the same text buffer.

Returns

current text buffer

See also

- `Fl_Text_Display::buffer(Fl_Text_Buffer* buf)`
- `Fl_Text_Display::buffer(Fl_Text_Buffer& buf)`

34.144.4.3 buffer() [2/3]

```cpp
void Fl_Text_Display::buffer ( Fl_Text_Buffer & buf ) [inline]
```
Sets the current text buffer associated with the text widget.
Multiple text widgets can be associated with the same text buffer.

Parameters

- **buf** new text buffer

See also

- `Fl_Text_Display::buffer(Fl_Text_Buffer* buf)`

34.144.4.4 buffer() [3/3]

```cpp
void Fl_Text_Display::buffer ( Fl_Text_Buffer * buf )
```
Attach a text buffer to display, replacing the current buffer (if any).
Multiple text widgets can be associated with the same text buffer.

Note

The caller is responsible for the old (replaced) buffer (if any). This method does not delete the old buffer.

Parameters

- **buf** attach this text buffer

34.144.4.5 buffer_modified_cb()

```cpp
void Fl_Text_Display::buffer_modified_cb ( int pcs, int nInserted, int nDeleted, int nRestyled, const char * deletedText, void * cbArg ) [static], [protected]
```
This is called whenever the buffer is modified. Callback attached to the text buffer to receive modification information. This callback can be used to adjust the display or update other setting. It is not advisable to change any buffers or text in this callback, or line counting may get out of sync.

**Parameters**

<table>
<thead>
<tr>
<th>pos</th>
<th>starting index of modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>nInserted</td>
<td>number of bytes we inserted (must be UTF-8 aligned!)</td>
</tr>
<tr>
<td>nDeleted</td>
<td>number of bytes deleted (must be UTF-8 aligned!)</td>
</tr>
<tr>
<td>nRestyled</td>
<td>??</td>
</tr>
<tr>
<td>deletedText</td>
<td>this is what was removed, must not be NULL if nDeleted is set</td>
</tr>
<tr>
<td>cbArg</td>
<td>&quot;this&quot; pointer for static callback function</td>
</tr>
</tbody>
</table>

### 34.144.4.6 buffer_predelete_cb()

```c
void Fl_Text_Display::buffer_predelete_cb (int pos, int nDeleted, void * cbArg ) [static], [protected]
```

This is called before any characters are deleted. Callback attached to the text buffer to receive delete information before the modifications are actually made. This callback can be used to adjust the display or update other setting. It is not advisable to change any buffers or text in this callback, or line counting may get out of sync.

**Parameters**

<table>
<thead>
<tr>
<th>pos</th>
<th>starting index of deletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>nDeleted</td>
<td>number of bytes we will delete (must be UTF-8 aligned!)</td>
</tr>
<tr>
<td>cbArg</td>
<td>&quot;this&quot; pointer for static callback function</td>
</tr>
</tbody>
</table>

### 34.144.4.7 calc_last_char()

```c
void Fl_Text_Display::calc_last_char ( ) [protected]
```

Update last display character index.

Given a Fl_Text_Display with a complete, up-to-date lineStarts array, update the lastChar entry to point to the last buffer position displayed.

### 34.144.4.8 calc_line_starts()

```c
void Fl_Text_Display::calc_line_starts ( int startLine, int endLine ) [protected]
```

Update the line starts array. Scan through the text in the Text Display's buffer and recalculate the line starts array values beginning at index "startLine" and continuing through (including) "endLine". It assumes that the line starts entry preceding "startLine" (or mFirstChar if startLine is 0) is good, and re-counts newlines to fill in the requested entries. Out of range values for "startLine" and "endLine" are acceptable.

**Parameters**

| startLine, endLine | range of lines to scan as line numbers |
34.144.4.9 clear_rect()

```cpp
void Fl_Text_Display::clear_rect (  
    int style,  
    int X,  
    int Y,  
    int width,  
    int height ) const [protected]
```
Clear a rectangle with the appropriate background color for style.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>style</code></td>
<td>index into style table</td>
</tr>
<tr>
<td><code>X,Y,width,height</code></td>
<td>size and position of background area</td>
</tr>
</tbody>
</table>

34.144.4.10 col_to_x()

```cpp
double Fl_Text_Display::col_to_x (  
    double col ) const
```
Convert a column number into an x pixel position.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>col</code></td>
<td>an approximate column number based on the main font</td>
</tr>
</tbody>
</table>

Returns
- number of pixels from the left margin to the left of an average sized character

See also
- `x_to_col()`

34.144.4.11 count_lines()

```cpp
int Fl_Text_Display::count_lines (  
    int startPos,  
    int endPos,  
    bool startPosIsLineStart ) const
```
Count the number of lines between two positions.
Same as `Fl_Text_Buffer::count_lines()`, but takes into account wrapping if wrapping is turned on. If the caller knows that `startPos` is at a line start, it can pass `startPosIsLineStart` as True to make the call more efficient by avoiding the additional step of scanning back to the last newline.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>startPos</code></td>
<td>index to first character</td>
</tr>
<tr>
<td><code>endPos</code></td>
<td>index after last character</td>
</tr>
<tr>
<td><code>startPosIsLineStart</code></td>
<td>avoid scanning back to the line start</td>
</tr>
</tbody>
</table>
Returns

number of lines

34.144.4.12  cursor_color() [1/2]

Fl_Color Fl_Text_Display::cursor_color () const [inline]

Gets the text cursor color.

Returns

cursor color

34.144.4.13  cursor_color() [2/2]

void Fl_Text_Display::cursor_color ( Fl_Color n ) [inline]

Sets the text cursor color.

Parameters

| n     | new cursor color |

34.144.4.14  cursor_style()

void Fl_Text_Display::cursor_style ( int style )

Sets the text cursor style.

Sets the text cursor style to one of the following:

- `Fl_Text_Display::NORMAL_CURSOR` - Shows an I beam.
- `Fl_Text_Display::CARET_CURSOR` - Shows a caret under the text.
- `Fl_Text_Display::DIM_CURSOR` - Shows a dimmed I beam.
- `Fl_Text_Display::BLOCK_CURSOR` - Shows an unfilled box around the current character.
- `Fl_Text_Display::HEAVY_CURSOR` - Shows a thick I beam.

This call also switches the cursor on and may trigger a redraw.

Parameters

| style | new cursor style |

34.144.4.15  display_insert()

void Fl_Text_Display::display_insert ( ) [protected]

Scroll the display to bring insertion cursor into view.

Note: it would be nice to be able to do this without counting lines twice (scroll() counts them too) and/or to count from the most efficient starting point, but the efficiency of this routine is not as important to the overall performance of the text display.
34.144.4.16 draw()

void Fl_Text_Display::draw (  
    void ) [protected], [virtual]

Draw the widget.
This function tries to limit drawing to smaller areas if possible.
Reimplemented from Fl_Group.

34.144.4.17 draw_cursor()

void Fl_Text_Display::draw_cursor (  
    int X,  
    int Y ) [protected]

Draw a cursor with top center at X, Y.

Parameters

| X, Y | cursor position in pixels |

34.144.4.18 draw_line_numbers()

void Fl_Text_Display::draw_line_numbers (  
    bool clearAll ) [protected]

Refresh the line number area.

Parameters

| clearAll | (currently unused) If False, only draws the line number text, does not clear the area behind it. If True, clears the area and redraws the text. Use False to avoid a 'flash' for single buffered windows. |

34.144.4.19 draw_range()

void Fl_Text_Display::draw_range (  
    int startpos,  
    int endpos ) [protected]

Draw a range of text.
Refresh all of the text between buffer positions startpos and endpos not including the character at the position endpos.
If endpos points beyond the end of the buffer, refresh the whole display after startpos, including blank lines which are not technically part of any range of characters.

Parameters

| startpos | index of first character to draw |
| endpos   | index after last character to draw |

34.144.4.20 draw_string()

void Fl_Text_Display::draw_string (  
    int style,  
    int X,  
    int Y)
int Y,
int toX,
const char ** string,
int nChars ) const [protected]

Draw a text segment in a single style.
Draw a string or blank area according to parameter style, using the appropriate colors and drawing method for
that style, with top left corner at X, Y. If style says to draw text, use string as source of characters, and draw
nChars, # style is FILL, erase rectangle where text would have drawn from X to toX and from Y to the maximum
y extent of the current font(s).

Parameters

<table>
<thead>
<tr>
<th>style</th>
<th>index into style lookup table</th>
</tr>
</thead>
<tbody>
<tr>
<td>X,Y</td>
<td>drawing origin</td>
</tr>
<tr>
<td>toX</td>
<td>rightmost position if this is a fill operation</td>
</tr>
<tr>
<td>string</td>
<td>text if this is a drawing operation</td>
</tr>
<tr>
<td>nChars</td>
<td>number of characters to draw</td>
</tr>
</tbody>
</table>

34.144.4.21 draw_text()

void Fl_Text_Display::draw_text (  
    int left,  
    int top,  
    int width,  
    int height ) [protected]

Refresh a rectangle of the text display.

Parameters

| left,top | are in coordinates of the text drawing window. |
| width,height | size in pixels |

34.144.4.22 draw_vline()

void Fl_Text_Display::draw_vline (  
    int visLineNum,  
    int leftClip,  
    int rightClip,  
    int leftCharIndex,  
    int rightCharIndex ) [protected]

Draw a single line of text.
Draw the text on a single line represented by visLineNum (the number of lines down from the top of the display),
limited by leftClip and rightClip window coordinates and leftCharIndex and rightCharIndex
character positions (not including the character at position rightCharIndex).

Parameters

| visLineNum | index of line in the visible line number lookup |
| leftClip,rightClip | pixel position of clipped area |
| leftCharIndex,rightCharIndex | index into line of segment that we want to draw |
34.144.4.23  empty_vlines()

int Fl_Text_Display::empty_vlines ( ) const [protected]
Return true if there are lines visible with no corresponding buffer text.
Returns
1 if there are empty lines

34.144.4.24  extend_range_for_styles()

void Fl_Text_Display::extend_range_for_styles ( int ∗ startPos, int ∗ endpos ) [protected]
I don't know what this does!
Extend the range of a redraw request (from ∗start to ∗end) with additional redraw requests resulting from changes
to the attached style buffer (which contains auxiliary information for coloring or styling text).

Parameters

<table>
<thead>
<tr>
<th>startPos</th>
<th>??</th>
</tr>
</thead>
<tbody>
<tr>
<td>endpos</td>
<td>??</td>
</tr>
</tbody>
</table>

Todo  Unicode?

34.144.4.25  find_line_end()

void Fl_Text_Display::find_line_end ( int startPos, bool startPosIsLineStart, int ∗ lineEnd, int ∗ nextLineStart ) const [protected]
Finds both the end of the current line and the start of the next line.
Why? In continuous wrap mode, if you need to know both, figuring out one from the other can be expensive or error
prone. The problem comes when there’s a trailing space or tab just before the end of the buffer. To translate an end
of line value to or from the next lines start value, you need to know whether the trailing space or tab is being used
as a line break or just a normal character, and to find that out would otherwise require counting all the way back to
the beginning of the line.

Parameters

<table>
<thead>
<tr>
<th>startPos</th>
</tr>
</thead>
<tbody>
<tr>
<td>startPosIsLineStart</td>
</tr>
<tr>
<td>out lineEnd</td>
</tr>
<tr>
<td>out nextLineStart</td>
</tr>
</tbody>
</table>

34.144.4.26  find_wrap_range()

void Fl_Text_Display::find_wrap_range ( const char ∗ deletedText, int pos, int nInserted, int nDeleted,
Wrapping calculations.
When continuous wrap is on, and the user inserts or deletes characters, wrapping can happen before and beyond the changed position. This routine finds the extent of the changes, and counts the deleted and inserted lines over that range. It also attempts to minimize the size of the range to what has to be counted and re-displayed, so the results can be useful both for delimiting where the line starts need to be recalculated, and for deciding what part of the text to redisplay.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>deletedText</td>
<td>UTF-8 text string</td>
</tr>
<tr>
<td>pos</td>
<td>length of string</td>
</tr>
<tr>
<td>nInserted</td>
<td>index into style lookup table</td>
</tr>
<tr>
<td>nDeleted</td>
<td>position in pixels - negative returns closest cursor position</td>
</tr>
<tr>
<td>modRangeStart</td>
<td></td>
</tr>
<tr>
<td>modRangeEnd</td>
<td></td>
</tr>
<tr>
<td>linesInserted</td>
<td></td>
</tr>
<tr>
<td>linesDeleted</td>
<td></td>
</tr>
</tbody>
</table>

34.144.4.27  find_x()

```cpp
int Fl_Text_Display::find_x ( const char * s,
   int len,
   int style,
   int x ) const [protected]
```

Find the index of the character that lies at the given x position / closest cursor position.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>UTF-8 text string</td>
</tr>
<tr>
<td>len</td>
<td>length of string</td>
</tr>
<tr>
<td>style</td>
<td>index into style lookup table</td>
</tr>
<tr>
<td>x</td>
<td>position in pixels - negative returns closest cursor position</td>
</tr>
</tbody>
</table>

Returns

index into buffer

34.144.4.28  get_absolute_top_line_number()

```cpp
int Fl_Text_Display::get_absolute_top_line_number ( ) const [protected]
```

Returns the absolute (non-wrapped) line number of the first line displayed. Returns 0 if the absolute top line number is not being maintained.

34.144.4.29  grammar_underline_color() [1/2]

```cpp
Fl_Color Fl_Text_Display::grammar_underline_color ( ) const [inline]
```

Gets the underline color for style attribute ATTR_GRAMMAR.
Returns

underline color

### 34.144.4.30 grammar_underline_color() [2/2]

```cpp
def grammar_underline_color(color)
    # inline
```

Sets the underline color for style attribute `ATTR_GRAMMAR`.

**Parameters**

- `color` underline color

### 34.144.4.31 handle()

```cpp
def handle(e)
    # virtual
```

Event handling.
Reimplemented from `Fl_Group`.
Reimplemented in `Fl_Text_Editor`.

### 34.144.4.32 handle_rmb()

```cpp
def handle_rmb(readonly)
    # protected
```

Handle right mouse button down events.

**Returns**

- 0 for no op, 1 to cut, 2 to copy, 3 to paste

### 34.144.4.33 handle_vline()

```cpp
def handle_vline(mode, lineStartPos, lineLen, leftChar, rightChar, Y, bottomClip, leftClip, rightClip)
    # protected
```

Universal pixel machine.
We use a single function that handles all line layout, measuring, and drawing

- draw a text range
- return the width of a text range in pixels
- return the index of a character that is at a pixel position
### Parameters

| in | mode          | DRAW_LINE, GET_WIDTH, FIND_INDEX, FIND_INDEX_FROM_ZERO, or FIND_CURSOR_INDEX |
| in | lineStartPos  | index of first character                                      |
| in | lineLen       | size of string in bytes                                      |
| in | leftChar, rightChar | drawing position                                      |
| in | Y            | drawing position                                             |
| in | bottomClip, leftClip, rightClip | stop work when we reach the clipped area. rightClip is the X position that we search in FIND_INDEX. |

### Return values

| DRAW_LINE | index of last drawn character |
| GET_WIDTH | width in pixels of text segment if we would draw it |
| FIND_INDEX | index of character at given x position in window coordinates |
| FIND_INDEX_FROM_ZERO | index of character at given x position without scrolling and widget offsets |

**Todo**
- we need to handle hidden hyphens and tabs here!
- we handle all styles and selections
- we must provide code to get pixel positions of the middle of a character as well

---

### 34.144.4.34 highlight_data()

```c
void Fl_Text_Display::highlight_data (  
    Fl_Text_Buffer ∗ styleBuffer,  
    const Style_Table_Entry ∗ styleTable,  
    int nStyles,  
    char unfinishedStyle,  
    Unfinished_Style_Cb unfinishedHighlightCB,  
    void ∗ cbArg )
```

Attach (or remove) highlight information in text display and redisplay.

Highlighting information consists of a style buffer which parallels the normal text buffer, but codes font and color information for the display; a style table which translates style buffer codes (indexed by buffer character - 'A') into fonts and colors; and a callback mechanism for as-needed highlighting, triggered by a style buffer entry of "unfinished←Style". Style buffer can trigger additional redisplay during a normal buffer modification if the buffer contains a primary `Fl_Text_Selection` (see `extend_range_for_styles()` for more information on this protocol).

Style buffers, tables and their associated memory are managed by the caller.

Styles are ranged from 65 ('A') to 126.

**Note**

Style information in the style buffer must have the same byte offset as the corresponding character in the text buffer. UTF-8 characters can have a maximum length of four bytes. Style information must take this into account and fill the unused bytes with 0. See `fl_utf8len()`.

**Text:** "*g r ü n*", where normal style is 'A', and bold is 'B'

**Text Buffer(hex):** 67 72 c3 bc 6e : gr..n

**Style Buffer(hex):** 42 41 41 00 42 : BAA.B

### Parameters

| styleBuffer | this buffer works in parallel to the text buffer. For every character in the text buffer, the style buffer has a byte at the same offset that contains an index into an array of possible styles. |
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>styleTable</td>
<td>a list of styles indexed by the style buffer</td>
</tr>
<tr>
<td>nStyles</td>
<td>number of styles in the style table</td>
</tr>
<tr>
<td>unfinishedStyle</td>
<td>if this style is found, the callback below is called</td>
</tr>
<tr>
<td>unfinishedHighlightCB</td>
<td>if a character with an unfinished style is found, this callback will be called</td>
</tr>
<tr>
<td>cbArg</td>
<td>an optional argument for the callback above, usually a pointer to the Text Display.</td>
</tr>
</tbody>
</table>

See also

Fl_Text_Display::style_buffer()

34.144.4.35 in_selection()

```
int Fl_Text_Display::in_selection (int X, int Y) const
```

Check if a pixel position is within the primary selection.

Parameters

| X, Y                  | pixel position to test |

Returns

1 if position (X, Y) is inside of the primary Fl_Text_Selection

34.144.4.36 insert()

```
void Fl_Text_Display::insert (const char * text )
```

Inserts "text" at the current cursor location.

This has the same effect as inserting the text into the buffer using insert(insert_position().text) and then moving the insert position after the newly inserted text, except that it's optimized to do less redrawing.

Parameters

| text                  | new text in UTF-8 encoding. |

34.144.4.37 insert_position() [1/2]

```
int Fl_Text_Display::insert_position() const [inline]
```

Gets the position of the text insertion cursor for text display.

The insert position is the byte count (offset) from the beginning of the text buffer (starting with 0). Returns 0 (zero) if no buffer is associated to the text display. Returns buffer()->length() if the insert position is at the end of the buffer.

Returns

insert position index into text buffer
See also

`insert_position(int)`

---

**34.144.4.38  insert_position() [2/2]**

```cpp
text Fl_Text_Display::insert_position (  
    int newPos)  
```

Sets the position of the text insertion cursor for text display.
Moves the insertion cursor in front of the character at `newPos`. This function may trigger a redraw.

**Parameters**

| newPos | new caret position |

---

**34.144.4.39  line_end()**

```cpp
int Fl_Text_Display::line_end (  
    int startPos,  
    bool startPosIsLineStart) const
```

Returns the end of a line.
Same as `buffer()>line_end(startPos)`, but takes into account line breaks when wrapping is turned on. If the caller knows that `startPos` is at a line start, it can pass `startPosIsLineStart` as True to make the call more efficient by avoiding the additional step of scanning back to the last newline.
Note that the definition of the end of a line is less clear when continuous wrap is on. With continuous wrap off, it's just a pointer to the newline that ends the line. When it's on, it's the character beyond the last displayable character on the line, where a whitespace character which has been "converted" to a newline for wrapping is not considered displayable. Also note that a line can be wrapped at a non-whitespace character if the line had no whitespace. In this case, this routine returns a pointer to the start of the next line. This is also consistent with the model used by `visLineLength`.

**Parameters**

| startPos | index to starting character |

| startPosIsLineStart | avoid scanning back to the line start |

**Returns**

new position as index

---

**34.144.4.40  line_start()**

```cpp
int Fl_Text_Display::line_start (  
    int pos) const
```

Return the beginning of a line.
Same as `buffer()>line_start(pos)`, but returns the character after last wrap point rather than the last newline.

**Parameters**

| pos | index to starting character |
Returns

new position as index

### linenumber_align()

```c
void Fl_Text_Display::linenumber_align (Fl_Align val)
```

Set alignment for line numbers (if enabled). Valid values are FL_ALIGN_LEFT, FL_ALIGN_CENTER or FL_ALIGN_RIGHT.

**Version**

1.3.3

### linenumber_bgcolor()

```c
void Fl_Text_Display::linenumber_bgcolor (Fl_Color val)
```

Set the background color used for line numbers (if enabled).

**Version**

1.3.3

### linenumber_fgcolor()

```c
void Fl_Text_Display::linenumber_fgcolor (Fl_Color val)
```

Set the foreground color used for line numbers (if enabled).

**Version**

1.3.3

### linenumber_font()

```c
void Fl_Text_Display::linenumber_font (Fl_Font val)
```

Set the font used for line numbers (if enabled).

**Version**

1.3.3

### linenumber_format()

```c
void Fl_Text_Display::linenumber_format (const char * val)
```

Sets the printf() style format string used for line numbers. Default is "\%d" for normal unpadded decimal integers. An internal copy of \texttt{val} is allocated and managed; it is automatically freed whenever a new value is assigned, or when the widget is destroyed. The value of \texttt{val} must not be NULL. Example values:
- "%d" -- For normal line numbers without padding (Default)
- "%03d" -- For 000 padding
- "%x" -- For hexadecimal line numbers
- "%o" -- For octal line numbers

Version
1.3.3

34.144.46 linenumber_size()

void Fl_Text_Display::linenumber_size (  
   Fl_Fontsize val )
Set the font size used for line numbers (if enabled).

Version
1.3.3

34.144.47 linenumber_width()

void Fl_Text_Display::linenumber_width (  
   int width )
Set width of screen area for line numbers.
Use to also enable/disable line numbers. A value of 0 disables line numbering, values >0 enable the line number display.

Parameters

| width | The new width of the area for line numbers to appear, in pixels. 0 disables line numbers (default) |

34.144.48 longest_vline()

int Fl_Text_Display::longest_vline ( ) const [protected]
Find the longest line of all visible lines.

Returns

the width of the longest visible line in pixels

34.144.49 maintain_absolute_top_line_number()

void Fl_Text_Display::maintain_absolute_top_line_number (  
   int state ) [protected]
Line numbering stuff, currently unused.
In continuous wrap mode, internal line numbers are calculated after wrapping. A separate non-wrapped line count is maintained when line numbering is turned on. There is some performance cost to maintaining this line count, so normally absolute line numbers are not tracked if line numbering is off. This routine allows callers to specify that they still want this line count maintained (for use via Fl_Text_Display::position_to_linecol()). More specifically, this allows the line number reported in the statistics line to be calibrated in absolute lines, rather than post-wrapped lines.

34.144.50 maintaining_absolute_top_line_number()

int Fl_Text_Display::maintaining_absolute_top_line_number ( ) const [protected]
Returns true if a separate absolute top line number is being maintained. The absolute top line number is used for displaying line numbers in continuous wrap mode or showing in the statistics line (the latter is currently not available in FLTK).

### 34.144.4.51 measure_deleted_lines()

```cpp
void Fl_Text_Display::measure_deleted_lines ( int pos, int nDeleted ) [protected]
```

Wrapping calculations.
This is a stripped-down version of the findWrapRange() function above, intended to be used to calculate the number of “deleted” lines during a buffer modification. It is called before the modification takes place. This function should only be called in continuous wrap mode with a non-fixed font width. In that case, it is impossible to calculate the number of deleted lines, because the necessary style information is no longer available after the modification. In other cases, we can still perform the calculation afterwards (possibly even more efficiently).

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pos</td>
<td></td>
</tr>
<tr>
<td>nDeleted</td>
<td></td>
</tr>
</tbody>
</table>

### 34.144.4.52 measure_proportional_character()

```cpp
double Fl_Text_Display::measure_proportional_character ( const char * s, int xPix, int pos ) const [protected]
```

Wrapping calculations.
Measure the width in pixels of the first character of string "s" at a particular column "colNum" and buffer position "pos". This is for measuring characters in proportional or mixed-width highlighting fonts. A note about proportional and mixed-width fonts: the mixed width and proportional font code in nedit does not get much use in general editing, because nedit doesn't allow per-language-mode fonts, and editing programs in a proportional font is usually a bad idea, so very few users would choose a proportional font as a default. There are still probably mixed- width syntax highlighting cases where things don't redraw properly for insertion/deletion, though static display and wrapping and resizing should now be solid because they are now used for online help display.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>text string</td>
</tr>
<tr>
<td>xPix</td>
<td>x pixel position needed for calculating tab widths</td>
</tr>
<tr>
<td>pos</td>
<td>offset within string</td>
</tr>
</tbody>
</table>

Returns

width of character in pixels

### 34.144.4.53 measure_vline()

```cpp
int Fl_Text_Display::measure_vline ( int visLineNum ) const [protected]
```

Returns the width in pixels of the displayed line pointed to by "visLineNum".

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---

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Parameters

| visLineNum | index into visible lines array |

Returns

- width of line in pixels

### 34.144.4.54 move_down()

```c
int Fl_Text_Display::move_down ( )
```

Moves the current insert position down one line.

Returns

- 1 if the cursor moved, 0 if the beginning of the text was reached

### 34.144.4.55 move_left()

```c
int Fl_Text_Display::move_left ( )
```

Moves the current insert position left one character.

Returns

- 1 if the cursor moved, 0 if the beginning of the text was reached

### 34.144.4.56 move_right()

```c
int Fl_Text_Display::move_right ( )
```

Moves the current insert position right one character.

Returns

- 1 if the cursor moved, 0 if the end of the text was reached

### 34.144.4.57 move_up()

```c
int Fl_Text_Display::move_up ( )
```

Moves the current insert position up one line.

Returns

- 1 if the cursor moved, 0 if the beginning of the text was reached

### 34.144.4.58 offset_line_starts()

```c
void Fl_Text_Display::offset_line_starts ( 
    int newTopLineNum ) [protected]
```

Offset line start counters for a new vertical scroll position.

Offset the line starts array, mTopLineNum, mFirstChar and lastChar, for a new vertical scroll position given by newTopLineNum. If any currently displayed lines will still be visible, salvage the line starts values, otherwise, count lines from the nearest known line start (start or end of buffer, or the closest value in the mLineStarts array)
Parameters

- `newTopLineNum` index into buffer

### 34.144.4.59 overstrike()

```cpp
void Fl_Text_Display::overstrike (const char * text )
```

Replaces text at the current insert position.

Parameters

- `text` new text in UTF-8 encoding

Todo Unicode? Find out exactly what we do here and simplify.

### 34.144.4.60 position_style()

```cpp
int Fl_Text_Display::position_style (int lineStartPos, int lineLen, int lineIndex ) const
```

Find the correct style for a character.

Determine the drawing method to use to draw a specific character from "buf".

* lineStartPos gives the character index where the line begins, lineIndex, the number of characters past the beginning of the line, and lineLen the number of displayed characters past the beginning of the line. Passing lineStartPos of -1 returns the drawing style for "no text".

Why not just: position_style(pos)? Because style applies to blank areas of the window beyond the text boundaries, and because this routine must also decide whether a position is inside of a rectangular Fl_Text_Selection, and do so efficiently, without re-counting character positions from the start of the line.

Note that style is a somewhat incorrect name, drawing method would be more appropriate. If lineIndex is pointing to the last character in a line, and the second to last character has the ATTR_BGCOLOR_EXT set, the background color will extend into the remaining line.

Parameters

- `lineStartPos` beginning of this line
- `lineLen` number of bytes in line
- `lineIndex` position of character within line

Returns

- style for the given character

### 34.144.4.61 position_to_line()

```cpp
int Fl_Text_Display::position_to_line (int pos, int * lineNum ) const [protected]
```

Convert a position index into a line number offset.

Find the line number of position `pos` relative to the first line of displayed text, counting from 0 to visible lines - 1. The line number is returned in `lineNum`. 
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Returns 0 if the line is not displayed. In this case lineNum is 0 as well. Returns 1 if the line is displayed. In this case lineNum is the relative line number.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>pos</th>
<th>byte position in buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>lineNum</td>
<td>relative line number of byte pos in buffer</td>
</tr>
</tbody>
</table>

Returns

whether the character at byte position pos is currently displayed

Return values

| 0 | pos is not displayed; lineNum is invalid (zero) |
| 1 | pos is displayed; lineNum is valid |

34.144.4.62 position_to_linecol()

int Fl_Text_Display::position_to_linecol ( int pos, int * lineNum, int * column ) const [protected]

Find the line and column number of position pos.
This only works for displayed lines. If the line is not displayed, the function returns 0 (without the mLineStarts array it could turn in to very long calculation involving scanning large amounts of text in the buffer). If continuous wrap mode is on, returns the absolute line number (as opposed to the wrapped line number which is used for scrolling).

Parameters

<table>
<thead>
<tr>
<th>pos</th>
<th>character index</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>lineNum</td>
</tr>
<tr>
<td>out</td>
<td>column</td>
</tr>
</tbody>
</table>

Returns

0 if pos is off screen, line number otherwise

Todo a column number makes little sense in the UTF-8/variable font width environment. We will have to further define what exactly we want to return. Please check the functions that call this particular function.

34.144.4.63 position_to_xy()

int Fl_Text_Display::position_to_xy ( int pos, int * X, int * Y ) const

Convert a character index into a pixel position.
Translate a buffer text position to the XY location where the top left of the cursor would be positioned to point to that character. Returns 0 if the position is not displayed because it is vertically out of view. If the position is horizontally out of view, returns the X coordinate where the position would be if it were visible.
Parameters

<table>
<thead>
<tr>
<th>pos</th>
<th>character index</th>
</tr>
</thead>
<tbody>
<tr>
<td>out</td>
<td>X,Y pixel position of character on screen</td>
</tr>
</tbody>
</table>

Returns

0 if character vertically out of view, X & Y positions otherwise

### 34.144.4.64 redisplay_range()

```cpp
def void Fl_Text_Display::redisplay_range (int startpos, int endpos)
```

Marks text from start to end as needing a redraw.
This function will trigger a damage event and later a redraw of parts of the widget.

Parameters

<table>
<thead>
<tr>
<th>startpos</th>
<th>index of first character needing redraw</th>
</tr>
</thead>
<tbody>
<tr>
<td>endpos</td>
<td>index after last character needing redraw</td>
</tr>
</tbody>
</table>

### 34.144.4.65 reset_absolute_top_line_number()

```cpp
def void Fl_Text_Display::reset_absolute_top_line_number () [protected]
```

Reestablish the absolute (non-wrapped) top line number.
Count lines from the beginning of the buffer to reestablish the absolute (non-wrapped) top line number. If mode is not continuous wrap, or the number is not being maintained, does nothing.

### 34.144.4.66 resize()

```cpp
def void Fl_Text_Display::resize (int X, int Y, int W, int H ) [virtual]
```

Change the size of the displayed text area.
Calling this function will trigger a recalculation of all visible lines and of all scrollbar sizes.

Parameters

| X,Y,W,H | new position and size of this widget |

Reimplemented from Fl_Group.

### 34.144.4.67 rewind_lines()

```cpp
def int Fl_Text_Display::rewind_lines (int startPos, int nLines)
```

Skip a number of lines back.
Same as buffer()->rewind_lines(startPos, nLines), but takes into account line breaks when wrapping is turned on.
Parameters

<table>
<thead>
<tr>
<th>startPos</th>
<th>index to starting character</th>
</tr>
</thead>
<tbody>
<tr>
<td>nLines</td>
<td>number of lines to skip back</td>
</tr>
</tbody>
</table>

Returns

new position as index

34.144.4.68 scroll()

```cpp
void Fl_Text_Display::scroll ( int topLineNum, int horizOffset )
```

Scrolls the current buffer to start at the specified line and column.

Parameters

<table>
<thead>
<tr>
<th>topLineNum</th>
<th>top line number</th>
</tr>
</thead>
<tbody>
<tr>
<td>horizOffset</td>
<td>column number</td>
</tr>
</tbody>
</table>

Todo  Column numbers make little sense here.

34.144.4.69 scroll_()

```cpp
int Fl_Text_Display::scroll_ ( int topLineNum, int horizOffset ) [protected]
```

Scrolls the current buffer to start at the specified line and column.

Parameters

<table>
<thead>
<tr>
<th>topLineNum</th>
<th>top line number</th>
</tr>
</thead>
<tbody>
<tr>
<td>horizOffset</td>
<td>in pixels</td>
</tr>
</tbody>
</table>

Returns

0 if nothing changed, 1 if we scrolled

34.144.4.70 scroll_timer_cb()

```cpp
void Fl_Text_Display::scroll_timer_cb ( void * user_data ) [static], [protected]
```

Timer callback for scroll events.

This timer event scrolls the text view proportionally to how far the mouse pointer has left the text area. This allows for smooth scrolling without “wiggeling” the mouse.

34.144.4.71 scrollbar_align() [1/2]

```cpp
Fl_Align Fl_Text_Display::scrollbar_align ( ) const [inline]
```

Gets the scrollbar alignment type.
>Returns

scrollbar alignment

---

### scrollbar_align() [2/2]

```cpp
void Fl_Text_Display::scrollbar_align ( Fl_Align a ) [inline]
```

Sets the scrollbar alignment type.

**Parameters**

- `a` new scrollbar alignment

---

### scrollbar_size() [1/2]

```cpp
int Fl_Text_Display::scrollbar_size ( void ) const [inline]
```

Gets the current size of the scrollbars' troughs, in pixels.
If this value is zero (default), this widget will use the `Fl::scrollbar_size()` value as the scrollbar's width.

**Returns**

Scrollbar size in pixels, or 0 if the global `Fl::scrollbar_size()` is being used.

**See also**

- `Fl::scrollbar_size(int)`

---

### scrollbar_size() [2/2]

```cpp
void Fl_Text_Display::scrollbar_size ( int newSize ) [inline]
```

Sets the pixel size of the scrollbars' troughs to `newSize`, in pixels.
Normally you should not need this method, and should use `Fl::scrollbar_size(int)` instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.

Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.

Setting `newSize` to the special value of 0 causes the widget to track the global `Fl::scrollbar_size()`, which is the default.

**Parameters**

- `in` `newSize` Sets the scrollbar size in pixels.
  If 0 (default), scrollbar size tracks the global `Fl::scrollbar_size()`

**See also**

- `Fl::scrollbar_size()`

---

### scrollbar_width() [1/2]

```cpp
int Fl_Text_Display::scrollbar_width ( void ) const [inline]
```

Generated by Doxygen
Returns the global value Fl::scrollbar_size() unless a specific scrollbar_width_ has been set.

**Deprecated**: Use scrollbar_size() instead.

**Todo**: This method should eventually be removed.

### 34.144.4.76 scrollbar_width() [2/2]

```cpp
void Fl_Text_Display::scrollbar_width (int width) [inline]
```

Sets the global Fl::scrollbar_size(), and forces this instance of the widget to use it.

**Deprecated**: Use scrollbar_size() instead.

**Todo**: This method should eventually be removed.

### 34.144.4.77 secondary_selection_color() [1/2]

```cpp
Fl_Color Fl_Text_Display::secondary_selection_color ( ) const [inline]
```

Gets the background color for the secondary selection block.

Returns

background color color

### 34.144.4.78 secondary_selection_color() [2/2]

```cpp
void Fl_Text_Display::secondary_selection_color (Fl_Color color) [inline]
```

Sets the background color for the secondary selection block.

**Parameters**

- **color**: background color

### 34.144.4.79 shortcut() [1/2]

```cpp
int Fl_Text_Display::shortcut ( ) const [inline]
```

**Todo**: FIXME: get set methods pointing on shortcut_ have no effects as shortcut_ is unused in this class and derived!

Returns

the current shortcut key

### 34.144.4.80 shortcut() [2/2]

```cpp
void Fl_Text_Display::shortcut (int s) [inline]
```

**Todo**: FIXME: get set methods pointing on shortcut_ have no effects as shortcut_ is unused in this class and derived!
34.144.4.81  show_cursor()

void Fl_Text_Display::show_cursor (  
    int b = 1  
)  
Shows the text cursor.  
This function may trigger a redraw.

Parameters

| b | show(1) or hide(0) the text cursor (caret). |

34.144.4.82  show_insert_position()

void Fl_Text_Display::show_insert_position ( )  
Scrolls the text buffer to show the current insert position.  
This function triggers a complete recalculation, ending in a call to Fl_Text_Display::display_insert()

34.144.4.83  skip_lines()

int Fl_Text_Display::skip_lines (  
    int startPos,  
    int nLines,  
    bool startPosIsLineStart  
)  
Skip a number of lines forward.  
Same as Fl_Text_Buffer::skip_lines(startPos, nLines), but takes into account line breaks when wrapping is turned on. If the caller knows that startPos is at a line start, it can pass startPosIsLineStart as True to make the call more efficient by avoiding the additional step of scanning back to the last newline.

Parameters

| startPos | index to starting character |
| nLines   | number of lines to skip ahead |
| startPosIsLineStart | avoid scanning back to the line start |

Returns

new position as index

34.144.4.84  spelling_underline_color() [1/2]

Fl_Color Fl_Text_Display::spelling_underline_color ( ) const [inline]  
Gets the underline color for style attribute ATTR_SPELLING.

Returns

underline color
34.144.4.85 spelling_underline_color() [2/2]

void Fl_Text_Display::spelling_underline_color ( Fl_Color color ) [inline]
Sets the underline color for style attribute ATTR_SPELLING.

Parameters

| color | underline color |

34.144.4.86 string_width()

double Fl_Text_Display::string_width ( const char * string, int length, int style ) const [protected]
Find the width of a string in the font of a particular style.

Parameters

| string | the text |
| length | number of bytes in string |
| style  | index into style table |

Returns

width of text segment in pixels

34.144.4.87 style_buffer()

Fl_Text_Buffer * Fl_Text_Display::style_buffer ( ) const [inline]
Gets the current style buffer associated with the text widget. Multiple text widgets can be associated with the same style buffer.

Returns

current style buffer

See also

Fl_Text_Display::highlight_data()

34.144.4.88 textcolor() [1/2]

Fl_Color Fl_Text_Display::textcolor ( void ) const [inline]
Gets the default color of text in the widget.

Returns

text color unless overridden by a style
34.144.4.89  textcolor() [2/2]

void Fl_Text_Display::textcolor (  
    Fl_Color n ) [inline]

Sets the default color of text in the widget.

Parameters

n  new text color

34.144.4.90  textfont() [1/2]

Fl_Font Fl_Text_Display::textfont (  
    void ) const [inline]

Gets the default font used when drawing text in the widget.

Returns

current text font face unless overridden by a style

34.144.4.91  textfont() [2/2]

void Fl_Text_Display::textfont (  
    Fl_Font s ) [inline]

Sets the default font used when drawing text in the widget.

Parameters

s  default text font face

34.144.4.92  textsize() [1/2]

Fl_Fontsize Fl_Text_Display::textsize (  
    void ) const [inline]

Gets the default size of text in the widget.

Returns

current text height unless overridden by a style

34.144.4.93  textsize() [2/2]

void Fl_Text_Display::textsize (  
    Fl_Fontsize s ) [inline]

Sets the default size of text in the widget.

Parameters

s  new text size
34.144.4.94 update_h_scrollbar()

`void Fl_Text_Display::update_h_scrollbar ()` [protected]

Update horizontal scrollbar.
Update the minimum, maximum, slider size, page increment, and value for the horizontal scrollbar.

34.144.4.95 update_line_starts()

`void Fl_Text_Display::update_line_starts ( )` [protected]

Update line start arrays and variables.
Update the line starts array, mTopLineNum, mFirstChar and lastChar for this text display after a modification to the

text buffer, given by the position `pos` where the change began, and the numbers of characters and lines inserted
and deleted.

**Parameters**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>pos</code></td>
<td>index into buffer of recent changes</td>
</tr>
<tr>
<td><code>charsInserted</code></td>
<td>number of bytes(!) inserted</td>
</tr>
<tr>
<td><code>charsDeleted</code></td>
<td>number of bytes(!) deleted</td>
</tr>
<tr>
<td><code>linesInserted</code></td>
<td>number of lines</td>
</tr>
<tr>
<td><code>linesDeleted</code></td>
<td>number of lines</td>
</tr>
<tr>
<td><code>scrolled</code></td>
<td>set to 1 if the text display needs to be scrolled</td>
</tr>
</tbody>
</table>

34.144.4.96 update_v_scrollbar()

`void Fl_Text_Display::update_v_scrollbar ( )` [protected]

Update vertical scrollbar.
Update the minimum, maximum, slider size, page increment, and value for the vertical scrollbar.

34.144.4.97 vline_length()

`int Fl_Text_Display::vline_length ( )` [protected]

Count number of bytes in a visible line.
Return the length of a line (number of bytes) by examining entries in the line starts array rather than by scanning for

```
newlines.
```

**Parameters**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>visLineNum</code></td>
<td>index of line in visible line array</td>
</tr>
</tbody>
</table>

**Returns**

number of bytes in this line

34.144.4.98 word_end()

`int Fl_Text_Display::word_end ( )` [inline]

Generated by Doxygen
Moves the insert position to the end of the current word.

**Parameters**

| pos  | start calculation at this index |

**Returns**

index of first character after the end of the word

### 34.144.4.99 word_start()

```cpp
int Fl_Text_Display::word_start (int pos) const [inline]
```

Moves the insert position to the beginning of the current word.

**Parameters**

| pos  | start calculation at this index |

**Returns**

beginning of the words

### 34.144.4.100 wrap_mode()

```cpp
void Fl_Text_Display::wrap_mode (int wrap, int wrapMargin)
```

Set the new text wrap mode.

If `wrap` mode is not zero, this call enables automatic word wrapping at column `wrapMargin`. Word-wrapping does not change the text buffer itself, only the way the text is displayed. Different Text Displays can have different wrap modes, even if they share the same Text Buffer.

Valid wrap modes are:

- WRAP_NONE : don't wrap text at all
- WRAP_AT_COLUMN : wrap text at the given text column
- WRAP_ATPIXEL : wrap text at a pixel position
- WRAP_AT_BOUNDS : wrap text so that it fits into the widget width

**Parameters**

<table>
<thead>
<tr>
<th>wrap</th>
<th>new wrap mode (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>wrapMargin</td>
<td>in WRAP_AT_COLUMN mode, text will wrap at the n'th character. For variable width fonts, an average character width is calculated. The column width is calculated using the current textfont or the first style when this function is called. If the font size changes, this function must be called again. In WRAP_AT_PIXEL mode, this is the pixel position.</td>
</tr>
</tbody>
</table>
34.144.4.101 wrap_uses_character()

```cpp
int Fl_Text_Display::wrap_uses_character (  
    int lineEndPos ) const [protected]  
Check if the line break is caused by a newline or by line wrapping.
Line breaks in continuous wrap mode usually happen at newlines (\n) or whitespace. This line-terminating character is not included in line width measurements and has a special status as a non-visible character. However, lines with no whitespace are wrapped without the benefit of a line terminating character, and this distinction causes endless trouble with all of the text display code which was originally written without continuous wrap mode and always expects to wrap at a newline character.
Given the position of the end of the line, as returned by Fl_Text_Display::line_end() or Fl_Text_Buffer::line_end(), this returns true if there is a line terminating character, and false if there's not. On the last character in the buffer, this function can't tell for certain whether a trailing space was used as a wrap point, and just guesses that it wasn't. So if an exact accounting is necessary, don't use this function.

Parameters

| lineEndPos | index of character where the line wraps |

Returns

1 if a \n character causes the line wrap
```

34.144.4.102 wrapped_column()

```cpp
int Fl_Text_Display::wrapped_column (  
    int row,  
    int column ) const
Nobody knows what this function does.
Correct a column number based on an unconstrained position (as returned by TextDXYToUnconstrainedPosition) to be relative to the last actual newline in the buffer before the row and column position given, rather than the last line start created by line wrapping. This is an adapter for rectangular selections and code written before continuous wrap mode, which thinks that the unconstrained column is the number of characters from the last newline. Obviously this is time consuming, because it involves character re-counting.

Parameters

| row   |  
| column |

Returns

something unknown

**Todo** What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function TextDXYToUnconstrainedPosition does not exist (nedit port?)

**Todo** Unicode?

34.144.4.103 wrapped_line_counter()

```cpp
void Fl_Text_Display::wrapped_line_counter (  
    Fl_Text_Buffer * buf,  
    int startPos,  
    int maxPos,  
    int maxLines,
```

Generated by Doxygen
bool startPosIsLineStart,
int styleBufOffset,
int * retPos,
int * retLines,
int * retLineStart,
int * retLineEnd,
bool countLastLineMissingNewLine = true ) const [protected]

Wrapping calculations.
Count forward from startPos to either maxPos or maxLines (whichever is reached first), and return all relevant
positions and line count. The provided textBuffer may differ from the actual text buffer of the widget. In that case it
must be a (partial) copy of the actual text buffer and the styleBufOffset argument must indicate the starting position
of the copy, to take into account the correct style information.

Parameters

| in  | buf   | The text buffer to operate on |
| in  | startPos | Starting index position into the buffer |
| in  | maxPos  | Maximum index position into the buffer we'll reach |
| in  | maxLines | Maximum number of lines we'll reach |
| in  | startPosIsLineStart | Flag indicating if startPos is start of line. (If set, prevents our having to find the line start) |
| in  | styleBufOffset | Offset index position into style buffer. |
| out | retPos  | Position where counting ended. When counting lines, the position returned is the start of the line "maxLines" lines beyond "startPos". |
| out | retLines | Number of line breaks counted |
| out | retLineStart | Start of the line where counting ended |
| out | retLineEnd | End position of the last line traversed |
| out | countLastLineMissingNewLine | |

34.144.4.104 wrapped_row()

int Fl_Text_Display::wrapped_row ( int row ) const

Nobody knows what this function does.
Correct a row number from an unconstrained position (as returned by TextDXYToUnconstrainedPosition) to a
straight number of newlines from the top line of the display. Because rectangular selections are based on newlines,
rather than display wrapping, and anywhere a rectangular selection needs a row, it needs it in terms of un-wrapped
lines.

Parameters

| row | |

Returns

something unknown

Todo What does this do and how is it useful? Column numbers mean little in this context. Which functions depend
on this one? Function TextDXYToUnconstrainedPosition does not exist (nedit port?)

34.144.4.105 x_to_col()

double Fl_Text_Display::x_to_col ( double x ) const
Convert an x pixel position into a column number.

**Parameters**

| x  | number of pixels from the left margin |

**Returns**

an approximate column number based on the main font

### 34.144.4.106 xy_to_position()

```cpp
def xy_to_position(x: int, y: int) -> int:
    posType = CHARACTER_POS
    return translate a pixel position into a character index.
```

Translate window coordinates to the nearest (insert cursor or character cell) text position. The parameter `posType` specifies how to interpret the position: CURSOR_POS means translate the coordinates to the nearest cursor position, and CHARACTER_POS means return the position of the character closest to $(x, y)$.

**Parameters**

<table>
<thead>
<tr>
<th>X, Y</th>
<th>pixel position</th>
</tr>
</thead>
<tbody>
<tr>
<td>posType</td>
<td>CURSOR_POS or CHARACTER_POS</td>
</tr>
</tbody>
</table>

**Returns**

index into text buffer

### 34.144.4.107 xy_to_rowcol()

```cpp
def xy_to_rowcol(x: int, y: int, row: int, column: int, posType: int = CHARACTER_POS) -> int:
    return translate pixel coordinates into row and column.
```

Translate window coordinates to the nearest row and column number for positioning the cursor. This, of course, makes no sense when the font is proportional, since there are no absolute columns. The parameter `posType` specifies how to interpret the position: CURSOR_POS means translate the coordinates to the nearest position between characters, and CHARACTER_POS means translate the position to the nearest character cell.

**Parameters**

| X, Y | pixel coordinates |
| out  | row,column nearest row and column |
| posType | CURSOR_POS or CHARACTER_POS |

The documentation for this class was generated from the following files:

- Fl_Text_Display.H
- Fl_Text_Display.cxx
34.145 FL_Text_Editor Class Reference

This is the FLTK text editor widget.

#include <Fl_Text_Editor.H>

Inheritance diagram for Fl_Text_Editor:

```
Fl_Widget
  Fl_Group
    Fl_Text_Display
      Fl_Text_Editor
```

Classes
- struct Key_Binding
  Simple linked list item associating a key/state to a function.

Public Types
- typedef int (∗ Key_Func) (int key, Fl_Text_Editor ∗editor)
  Key function binding callback type.

Public Member Functions
- void add_default_key_bindings (Key_Binding ∗∗list)
  Adds all of the default editor key bindings to the specified key binding list.
- void add_key_binding (int key, int state, Key_Func f)
  Adds a key of state state with the function f.
- void add_key_binding (int key, int state, Key_Func f, Key_Binding ∗∗list)
  Adds a key of state state with the function function to an arbitrary key binding list list.
- Key_Func bound_key_function (int key, int state) const
  Returns the function associated with a key binding.
- Key_Func bound_key_function (int key, int state, Key_Binding ∗list) const
  Returns the function associated with a key binding.
- void default_key_function (Key_Func f)
  Sets the default key function for unassigned keys.
- Fl_Text_Editor (int X, int Y, int W, int H, const char ∗l=0)
  The constructor creates a new text editor widget.
- int handle (int e) FL_OVERRIDE
  Event handling.
- int insert_mode ()
  Gets the current insert mode; if non-zero, new text is inserted before the current cursor position.
- void insert_mode (int b)
  Sets the current insert mode; if non-zero, new text is inserted before the current cursor position.
- void remove_all_key_bindings ()
  Removes all of the key bindings associated with the text editor or list.
- void remove_all_key_bindings (Key_Binding ∗∗list)
  Removes all of the key bindings associated with the text editor or list.
- void remove_key_binding (int key, int state)
Removes the key binding associated with the key "key" of state "state".

- void remove_key_binding (int key, int state, Key_Binding *list)
  
  Removes the key binding associated with the key key of state state from the Key_Binding list list.

- int tab_nav () const
  
  Check if Tab focus navigation is enabled.

- void tab_nav (int val)
  
  Enables or disables Tab key focus navigation.

**Static Public Member Functions**

- static int kf_backspace (int c, Fl_Text_Editor *e)
  
  Does a backspace for key 'c' in the current buffer of editor 'e'.

- static int kf_c_s_move (int c, Fl_Text_Editor *e)
  
  Extends the current selection in the direction indicated by control key 'c' in editor 'e'.

- static int kf_copy (int c, Fl_Text_Editor *e)
  
  Does a copy of selected text or the current character in the current buffer of editor 'e'.

- static int kf_ctrl_move (int c, Fl_Text_Editor *e)
  
  Moves the current text cursor in the direction indicated by control key 'c' in editor 'e'.

- static int kf_cut (int c, Fl_Text_Editor *e)
  
  Does a cut of selected text in the current buffer of editor 'e'.

- static int kf_default (int c, Fl_Text_Editor *e)
  
  Inserts the text associated with key 'c' in editor 'e'.

- static int kf_delete (int c, Fl_Text_Editor *e)
  
  Does a delete of selected text or the current character in the current buffer of editor 'e'.

- static int kf_down (int c, Fl_Text_Editor *e)
  
  Moves the text cursor one line down for editor 'e'.

- static int kf_end (int c, Fl_Text_Editor *e)
  
  Moves the text cursor to the end of the current line in editor 'e'.

- static int kf_enter (int c, Fl_Text_Editor *e)
  
  Inserts a newline for key 'c' at the current cursor position in editor 'e'.

- static int kf_home (int, Fl_Text_Editor *e)
  
  Moves the text cursor to the beginning of the current line in editor 'e'.

- static int kf_ignore (int c, Fl_Text_Editor *e)
  
  Ignores the key 'c' in editor 'e'.

- static int kf_insert (int c, Fl_Text_Editor *e)
  
  Toggles the insert mode for editor 'e'.

- static int kf_left (int c, Fl_Text_Editor *e)
  
  Moves the text cursor one character to the left in editor 'e'.

- static int kf_m_s_move (int c, Fl_Text_Editor *e)
  
  Extends the current selection in the direction indicated by meta key 'c' in editor 'e'.

- static int kf_meta_move (int c, Fl_Text_Editor *e)
  
  Moves the current text cursor in the direction indicated by meta key 'c' in editor 'e'.

- static int kf_move (int c, Fl_Text_Editor *e)
  
  Moves the text cursor in the direction indicated by key 'c' in editor 'e'.

- static int kf_page_down (int c, Fl_Text_Editor *e)
  
  Moves the text cursor down one page for editor 'e'.

- static int kf_page_up (int c, Fl_Text_Editor *e)
  
  Moves the text cursor up one page for editor 'e'.

- static int kf_paste (int c, Fl_Text_Editor *e)
  
  Does a paste of selected text in the current buffer of editor 'e'.

- static int kf_redo (int c, Fl_Text_Editor *e)
Redo last undo action.

- static int kf_right (int c, Fl_Text_Editor *e)
  
  Moves the text cursor one character to the right for editor 'e'.

- static int kf_select_all (int c, Fl_Text_Editor *e)

  Selects all text in the current buffer in editor 'e'.

- static int kf_shift_move (int c, Fl_Text_Editor *e)

  Extends the current selection in the direction of key 'c' in editor 'e'.

- static int kf_undo (int c, Fl_Text_Editor *e)

  Undoes the last edit in the current buffer of editor 'e'.

- static int kf_up (int c, Fl_Text_Editor *e)

  Moves the text cursor one line up for editor 'e'.

Protected Member Functions

- int handle_key ()

  Handles a key press in the editor.

- void maybe_do_callback (Fl_Callback_Reason reason=FL_REASON_CHANGED)

  Does or does not a callback according to changed() and when() settings.

Static Protected Attributes

- static Key_Binding * global_key_bindings

  Global key binding list.

Additional Inherited Members

34.145.1 Detailed Description

This is the FLTK text editor widget. It allows the user to edit multiple lines of text and supports highlighting and scrolling. The buffer that is displayed in the widget is managed by the Fl_Text_Buffer class.

34.145.2 Member Function Documentation

34.145.2.1 add_key_binding()

void Fl_Text_Editor::add_key_binding (  
  int key,  
  int state,  
  Key_Func function,  
  Key_Binding ** list )

Add a key of state state with the function function to an arbitrary key binding list list.
This can be used in derived classes to add global key bindings by using the global (static) Key_Binding list Fl_Text_Editor::global_key_bindings.

34.145.2.2 handle()

int Fl_Text_Editor::handle (  
  int e ) [virtual]

Event handling. Reimplemented from Fl_Text_Display.
34.145.2.3  

insert_mode() [1/2]

int Fl_Text_Editor::insert_mode ( ) [inline]

Gets the current insert mode; if non-zero, new text is inserted before the current cursor position. Otherwise, new text replaces text at the current cursor position.

34.145.2.4  

insert_mode() [2/2]

void Fl_Text_Editor::insert_mode ( int b ) [inline]

Sets the current insert mode; if non-zero, new text is inserted before the current cursor position. Otherwise, new text replaces text at the current cursor position.

34.145.2.5  

kf_backspace()

int Fl_Text_Editor::kf_backspace ( int c, Fl_Text_Editor * e ) [static]

Does a backspace for key 'c' in the current buffer of editor 'e'. Any current selection is deleted. Otherwise, the character left is deleted and the cursor moved. The key value 'c' is currently unused.

34.145.2.6  

kf_c_s_move()

int Fl_Text_Editor::kf_c_s_move ( int c, Fl_Text_Editor * e ) [static]

Extends the current selection in the direction indicated by control key 'c' in editor 'e'.

See also

kf_ctrl_move().

34.145.2.7  

kf_copy()

int Fl_Text_Editor::kf_copy ( int c, Fl_Text_Editor * e ) [static]

Does a copy of selected text or the current character in the current buffer of editor 'e'. The key value 'c' is currently unused.

34.145.2.8  

kf_ctrl_move()

int Fl_Text_Editor::kf_ctrl_move ( int c, Fl_Text_Editor * e ) [static]

Moves the current text cursor in the direction indicated by control key 'c' in editor 'e'. Supported values for 'c' are currently:

- FL_Home -- moves the cursor to the beginning of the document
- FL_End -- moves the cursor to the end of the document
- FL_Left -- moves the cursor left one word
- FL_Right -- moves the cursor right one word
- FL_Up -- scrolls up one line, without moving cursor
- FL_Down -- scrolls down one line, without moving cursor
- FL_Page_Up -- moves the cursor to the beginning of the top line on the current page
- FL_Page_Down -- moves the cursor to the beginning of the last line on the current page

Generated by Doxygen
34.145.2.9 kf_cut()

```cpp
int Fl_Text_Editor::kf_cut (int c,
                        Fl_Text_Editor * e ) [static]
```

Does a cut of selected text in the current buffer of editor 'e'.
The key value 'c' is currently unused.

34.145.2.10 kf_default()

```cpp
int Fl_Text_Editor::kf_default (int c,
                        Fl_Text_Editor * e ) [static]
```

Inserts the text associated with key 'c' in editor 'e'.
Honors the current selection and insert/overstrike mode.

34.145.2.11 kf_delete()

```cpp
int Fl_Text_Editor::kf_delete (int c,
                        Fl_Text_Editor * e ) [static]
```

Does a delete of selected text or the current character in the current buffer of editor 'e'.
The key value 'c' is currently unused.

34.145.2.12 kf_down()

```cpp
int Fl_Text_Editor::kf_down (int c,
                        Fl_Text_Editor * e ) [static]
```

Moves the text cursor one line down for editor 'e'.
Same as kf_move(FL_Down, e). The key value 'c' is currently unused.

34.145.2.13 kf_end()

```cpp
int Fl_Text_Editor::kf_end (int c,
                        Fl_Text_Editor * e ) [static]
```

Moves the text cursor to the end of the current line in editor 'e'.
Same as kf_move(FL_End, e). The key value 'c' is currently unused.

34.145.2.14 kf_enter()

```cpp
int Fl_Text_Editor::kf_enter (int c,
                        Fl_Text_Editor * e ) [static]
```

Inserts a newline for key 'c' at the current cursor position in editor 'e'.
The key value 'c' is currently unused.

34.145.2.15 kf_home()

```cpp
int Fl_Text_Editor::kf_home (int c,
                        Fl_Text_Editor * e ) [static]
```

Moves the text cursor to the beginning of the current line in editor 'e'.
Same as kf_move(FL_Home, e). The key value 'c' is currently unused.

34.145.2.16 kf_ignore()

```cpp
int Fl_Text_Editor::kf_ignore (int c,
                        Fl_Text_Editor * e ) [static]
```

Generated by Doxygen
Ignores the key ‘c’ in editor ‘e’.
This method can be used as a keyboard binding to disable a key that might otherwise be handled or entered as text.
An example would be disabling FL_Escape, so that it isn’t added to the buffer when invoked by the user.

34.145.2.17 kf_insert()

int Fl_Text_Editor::kf_insert (  
    int c,  
    Fl_Text_Editor * e ) [static]
Toggles the insert mode for editor ‘e’.
The key value ‘c’ is currently unused.

34.145.2.18 kf_left()

int Fl_Text_Editor::kf_left (  
    int c,  
    Fl_Text_Editor * e ) [static]
Moves the text cursor one character to the left in editor ‘e’.
Same as kf_move(FL_Left, e). The key value ‘c’ is currently unused.

34.145.2.19 kf_m_s_move()

int Fl_Text_Editor::kf_m_s_move (  
    int c,  
    Fl_Text_Editor * e ) [static]
Extends the current selection in the direction indicated by meta key ‘c’ in editor ‘e’.
See also
    kf_meta_move().

34.145.2.20 kf_meta_move()

int Fl_Text_Editor::kf_meta_move (  
    int c,  
    Fl_Text_Editor * e ) [static]
Moves the current text cursor in the direction indicated by meta key ‘c’ in editor ‘e’.
Supported values for ‘c’ are currently:
FLUp   -- moves cursor to the beginning of the current document
FLDown  -- moves cursor to the end of the current document
FLLeft  -- moves the cursor to the beginning of the current line
FRLight -- moves the cursor to the end of the current line

34.145.2.21 kf_move()

int Fl_Text_Editor::kf_move (  
    int c,  
    Fl_Text_Editor * e ) [static]
Moves the text cursor in the direction indicated by key ‘c’ in editor ‘e’.
Supported values for ‘c’ are currently:
FLHome  -- moves the cursor to the beginning of the current line
FLEnd   -- moves the cursor to the end of the current line
FLLeft  -- moves the cursor left one character
FRLight -- moves the cursor right one character
FLUp    -- moves the cursor up one line
FLOn        -- moves the cursor down one line
FLPage_Up  -- moves the cursor up one page
FLPage_Down -- moves the cursor down one page
34.145.2.22 \texttt{kf\_page\_down()}

```cpp
int Fl_Text_Editor::kf_page_down (int c, Fl_Text_Editor * e) [static]
```

Moves the text cursor down one page for editor 'e'.
Same as \texttt{kf\_move(FL\_Page\_Down, e)}. The key value 'c' is currently unused.

34.145.2.23 \texttt{kf\_page\_up()}

```cpp
int Fl_Text_Editor::kf_page_up (int c, Fl_Text_Editor * e) [static]
```

Moves the text cursor up one page for editor 'e'.
Same as \texttt{kf\_move(FL\_Page\_Up, e)}. The key value 'c' is currently unused.

34.145.2.24 \texttt{kf\_paste()}

```cpp
int Fl_Text_Editor::kf_paste (int c, Fl_Text_Editor * e) [static]
```

Does a paste of selected text in the current buffer of editor 'e'.
Any current selection is replaced with the pasted content. The key value 'c' is currently unused.

34.145.2.25 \texttt{kf\_redo()}

```cpp
int Fl_Text_Editor::kf_redo (int c, Fl_Text_Editor * e) [static]
```

Redo last undo action.
Also deselects previous selection. The key value 'c' is currently unused.

34.145.2.26 \texttt{kf\_right()}

```cpp
int Fl_Text_Editor::kf_right (int c, Fl_Text_Editor * e) [static]
```

Moves the text cursor one character to the right for editor 'e'.
Same as \texttt{kf\_move(FL\_Right, e)}. The key value 'c' is currently unused.

34.145.2.27 \texttt{kf\_select\_all()}

```cpp
int Fl_Text_Editor::kf_select_all (int c, Fl_Text_Editor * e) [static]
```

Selects all text in the current buffer in editor 'e'.
The key value 'c' is currently unused.

34.145.2.28 \texttt{kf\_shift\_move()}

```cpp
int Fl_Text_Editor::kf_shift_move (int c, Fl_Text_Editor * e) [static]
```

Extends the current selection in the direction of key 'c' in editor 'e'.
See also

```cpp
kf\_move()
```
34.145.2.29 kf_undo()

```cpp
int Fl_Text_Editor::kf_undo (  
   int c,  
   Fl_Text_Editor * e ) [static]
```

Undo last edit in the current buffer of editor 'e'. Also deselected previous selection. The key value 'c' is currently unused.

34.145.2.30 kf_up()

```cpp
int Fl_Text_Editor::kf_up (  
   int c,  
   Fl_Text_Editor * e ) [static]
```

Moves the text cursor one line up for editor 'e'. Same as kf_move(FL_Up, e). The key value 'c' is currently unused.

34.145.2.31 remove_key_binding()

```cpp
void Fl_Text_Editor::remove_key_binding (  
   int key,  
   int state,  
   Key_Binding ** list )
```

Removes the key binding associated with the key of state of state from the Key_Binding list list. This can be used in derived classes to remove global key bindings by using the global (static) Key_Binding list Fl_Text_Editor::global_key_bindings.

34.145.2.32 tab_nav() [1/2]

```cpp
int Fl_Text_Editor::tab_nav ( ) const
```

Check if Tab focus navigation is enabled. If disabled (default), hitting Tab inserts a tab character into the editor buffer. If enabled, hitting Tab navigates focus to the next widget, and Shift-Tab navigates focus to the previous widget.

Returns

- if Tab inserts tab characters or moves the focus

Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Tab inserts tab characters (default)</td>
</tr>
<tr>
<td>1</td>
<td>Tab navigation is enabled.</td>
</tr>
</tbody>
</table>

See also

- tab_nav(int), Fl::OPTION_ARROW_FOCUS.

Version

- 1.3.4 ABI feature

34.145.2.33 tab_nav() [2/2]

```cpp
void Fl_Text_Editor::tab_nav (  
   int val )
```

Enables or disables Tab key focus navigation. When disabled (default), tab characters are inserted into Fl_Text_Editor. Only the mouse can change focus. This behavior is desirable when Fl_Text_Editor is used, e.g. in a source code editor.
When enabled, Tab navigates focus to the next widget, and Shift-Tab navigates focus to the previous widget. This behavior is desirable when Fl_Text_Editor is used e.g. in a database input form. Currently, this method is implemented as a convenience method that adjusts the key bindings for the Tab key. This implementation detail may change in the future. Know that changing the editor's key bindings for Tab and Shift-Tab may affect tab navigation.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>val</td>
<td>If val is 0, Tab inserts a tab character (default). If val is 1, Tab navigates widget focus.</td>
</tr>
</tbody>
</table>

See also

tab_nav(), Fl::OPTION_ARROW_FOCUS.

Version

1.3.4 ABI feature

34.145.3 Member Data Documentation

34.145.3.1 global_key_bindings

Key_Binding* Fl_Text_Editor::global_key_bindings [static], [protected]

Global key binding list. Derived classes can add key bindings for all Fl_Text_Editor widgets by adding a Key_Binding to this list.

See also

add_key_binding(int key, int state, Key_Func f, Key_Binding** list);

The documentation for this class was generated from the following files:

- Fl_Text_Editor.H
- Fl_Text_Editor.cxx

34.146 Fl_Text_Selection Class Reference

This is an internal class for Fl_Text_Buffer to manage text selections.

#include <Fl_Text_Buffer.H>

Public Member Functions

- int end () const
  
  Returns the byte offset to the character after the last selected character.

- int includes (int pos) const
  
  Returns true if position pos is in the Fl_Text_Selection.

- int length () const
  
  Returns the size in bytes of the selection.

- int position (int *startpos, int *endpos) const

- bool selected () const
  
  Returns true if any text is selected.

- void selected (bool b)
  
  Modifies the 'selected' flag.

- int selected (int *startpos, int *endpos) const
Returns the status and the positions of this selection.

- void set (int startpos, int endpos)
  
  Sets the selection range.

- int start () const
  
  Returns the byte offset to the first selected character.

- void update (int pos, int nDeleted, int nInserted)
  
  Updates a selection after text was modified.

Protected Attributes

- int mEnd
  
  byte offset to the character after the last selected character

- bool mSelected
  
  this flag is set if any text is selected

- int mStart
  
  byte offset to the first selected character

Friends

- class Fl_Text_Buffer

34.146.1 Detailed Description

This is an internal class for Fl_Text_Buffer to manage text selections. All methods use byte (not UTF-8 character) offsets and start at 0. This class works correctly with UTF-8 strings assuming that the parameters for all calls are on character boundaries. If the selection is inactive (not currently used), then selected() returns false and start() and end() return 0 (zero). The stored offsets are in ascending order, hence the following conditions are true (pseudo code):

```cpp
if ( !selected() ) : (start() == 0) && (end() == 0) && (start() == end())
if ( selected() ) : start() < end()
always : 0 <= start() <= end()
always : length() == end() - start()
```

The selection size in bytes can always (unconditionally) be computed by

```cpp
int size = sel->end() - sel->start();
```

See also

length()

Note

The protected member variables mStart and mEnd are not necessarily 0 (zero) if mSelected == false because they are not cleared when selected(false) is called (as of Jul 2017). This may be changed in the future.

34.146.2 Member Function Documentation

34.146.2.1 end()

```cpp
int Fl_Text_Selection::end ( 
    void ) const [inline]
```

Returns the byte offset to the character after the last selected character. The returned offset is only valid if selected() returns true (non-zero). The offset is 0 if no text is selected (since FLTK 1.4.0).

Note

In FLTK 1.3.x the returned offset could be non-zero even if selected() would have returned 0.
Returns

byte offset or 0 if not selected.

34.146.2.2 includes()

```cpp
int Fl_Text_Selection::includes (  
    int pos ) const
```

Returns true if position `pos` is in the `Fl_Text_Selection`. `pos` must be at a character boundary.

34.146.2.3 length()

```cpp
int Fl_Text_Selection::length (  
    void ) const [inline]
```

Returns the size in bytes of the selection. This is a convenience method. It always returns the same as `end() - start()` and it returns 0 if `selected() == false`.

Returns

size in bytes or 0 if not selected.

Since

FLTK 1.4.0

34.146.2.4 position()

```cpp
int Fl_Text_Selection::position (  
    int * startpos,  
    int * endpos ) const [inline]
```

Deprecated "in 1.4.0 - use selected(startpos, endpos) instead"

34.146.2.5 selected() [1/3]

```cpp
bool Fl_Text_Selection::selected ( ) const [inline]
```

Returns true if any text is selected.

Returns

ture if any text has been selected, or false if no text is selected.

34.146.2.6 selected() [2/3]

```cpp
void Fl_Text_Selection::selected (  
    bool b ) [inline]
```

Modifies the 'selected' flag.

Parameters

- `b` new flag
34.146.2.7  selected() [3/3]

int Fl_Text_Selection::selected (  
    int * startpos,  
    int * endpos ) const  

Returns the status and the positions of this selection.  
This method returns the same as selected() as an int (0 or 1) in its return value and the offsets to the start  
of the selection in startpos and to the byte after the last selected character in endpos, if selected() is true.  
If selected() is false, both offsets are set to 0.  

Note  
In FLTK 1.3.x startpos and endpos were not modified if selected() was false.  

Parameters  

<table>
<thead>
<tr>
<th>startpos</th>
<th>return byte offset to first selected character</th>
</tr>
</thead>
<tbody>
<tr>
<td>endpos</td>
<td>return byte offset pointing after last selected character</td>
</tr>
</tbody>
</table>

Returns  
whether the selection is active (selected()) or not  

Return values  

<table>
<thead>
<tr>
<th>0</th>
<th>if not selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>if selected</td>
</tr>
</tbody>
</table>

See also  
selected(), start(), end()

34.146.2.8  set()  

void Fl_Text_Selection::set (  
    int startpos,  
    int endpos )  

Sets the selection range.  
startpos and endpos must be at a character boundary.  
If startpos != endpos selected() is set to true, else to false.  
If startpos is greater than endpos they are swapped so that startpos <= endpos.  

Parameters  

<table>
<thead>
<tr>
<th>in</th>
<th>startpos</th>
<th>byte offset to first selected character</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>endpos</td>
<td>byte offset pointing after last selected character</td>
</tr>
</tbody>
</table>

34.146.2.9  start()  

int Fl_Text_Selection::start ( ) const [inline]  

Returns the byte offset to the first selected character.
The returned offset is only valid if `selected()` returns true. If the selection is not valid the returned offset is 0 since FLTK 1.4.0.

Note

In FLTK 1.3.x the returned offset could be non-zero even if `selected()` would have returned 0.

Returns

byte offset or 0 if not selected.

### 34.146.2.10 update()

```cpp
void Fl_Text_Selection::update (  
    int pos,  
    int nDeleted,  
    int nInserted )
```

Updates a selection after text was modified.

Updates an individual selection for changes in the corresponding text.

Parameters

<table>
<thead>
<tr>
<th>pos</th>
<th>byte offset into text buffer at which the change occurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>nDeleted</td>
<td>number of bytes deleted from the buffer</td>
</tr>
<tr>
<td>nInserted</td>
<td>number of bytes inserted into the buffer</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Text_Buffer.H
- Fl_Text_Buffer.cxx

### 34.147 Fl_Tile Class Reference

The `Fl_Tile` class lets you resize its children by dragging the border between them.

Inheritance diagram for `Fl_Tile`:

```
Fl_Tile
    |   |
    v   v
Fl_Group
    |   |
    v   v
Fl_Widget
```

#### Classes

- struct `Size_Range`

#### Public Member Functions

- virtual void `drag_intersection` (int oldx, int oldy, int newx, int newy)
  
  *Drags the intersection at \((oldx,oldy)\) to \((newx,newy)\).*

- `Fl_Tile` (int X, int Y, int W, int H, const char *L=0)
  
  *Creates a new `Fl_Tile` widget using the given position, size, and label string.*

- int `handle` (int event) FL_OVERRIDE
Handles the specified event.

- void **init_size_range** (int default_min_w=-1, int default_min_h=-1)
  
  Initialize the size range mode of **Fl_Tile** and set the default minimum width and height.

- virtual void **move_intersection** (int oldx, int oldy, int newx, int newy)
  
  Drags the intersection at \((oldx, oldy)\) to \((newx, newy)\).

- void **position** (int oldx, int oldy, int newx, int newy)

- void **position** (int x, int y)

- void **resize** (int X, int Y, int W, int H) **FL_OVERRIDE**
  
  Resizes the **Fl_Tile** widget and its children.

- void **size_range** (Fl_Widget ∗w, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF)
  
  Set the allowed size range for the given child widget.

- void **size_range** (int index, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF)
  
  Set the allowed size range for the child at the given index.

- ∼**Fl_Tile** () **FL_OVERRIDE**
  
  Destructor.

**Protected Member Functions**

- Fl_Cursor cursor (int n)
  
  Returns the cursor for cursor index n.

- int **on_insert** (Fl_Widget ∗w, int) **FL_OVERRIDE**
  
  Insert a new entry in the size range list.

- int **on_move** (int, int) **FL_OVERRIDE**
  
  Move the entry in the size range list.

- void **on_remove** (int) **FL_OVERRIDE**
  
  Remove the entry from the size range list.

- void **request_grow_b** (int old_b, int &new_b, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_grow_l** (int old_l, int &new_l, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_grow_r** (int old_r, int &new_r, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_grow_t** (int old_t, int &new_t, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_shrink_b** (int old_b, int &new_b, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_shrink_l** (int old_l, int &new_l, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_shrink_r** (int old_r, int &new_r, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **request_shrink_t** (int old_t, int &new_t, Fl_Rect ∗final_size)
  
  Request for children to change their layout.

- void **set_cursor** (int n)
  
  Set one of four cursors used for dragging etc...
Protected Attributes

- int cursor_
  current cursor index (0..3)
- Fl_Cursor * cursors_
  points at the array of 4 cursors (may be overridden)
- int default_min_h_
- int default_min_w_
- Size_Range * size_range_
- int size_range_capacity_
- int size_range_size_

Additional Inherited Members

34.147.1 Detailed Description

The Fl_Tile class lets you resize its children by dragging the border between them.

![Figure 34.61 Fl_Tile](image)

For the tiling to work correctly, the children of an Fl_Tile must cover the entire area of the widget, but must not overlap. This means that all children must touch each other at their edges, and no gaps can be left inside the Fl_Tile.

Fl_Tile does not normally draw any graphics of its own. The "borders" which can be seen in the snapshot above are actually part of the children. Their boxtypes have been set to FL_DOWN_BOX creating the impression of "ridges" where the boxes touch. What you see are actually two adjacent FL_DOWN_BOX's drawn next to each other. All neighboring widgets share the same edge - the widget's thick borders make it appear as though the widgets aren't actually touching, but they are. If the edges of adjacent widgets do not touch, then it will be impossible to drag the corresponding edges.

Note

Fl_Tile works in two distinctive modes. In classic mode, the range of motion for edges and intersections is controlled using an invisible child that is marked as the resizable() widget of the tile group. Classic mode is described in detail a few paragraphs down.

Fl_Tile size_range mode

By assigning a default minimum size to all children with Fl_Tile::init_size_range(int default_minimum_width, int default_minimum_height) or by assigning minimal sizes to individual children with size_range(Fl_Widget *child, int minimum_width, int minimum_height, int) the tile group is put into size_range operation mode.

In this mode, the child that is marked resizable() will behave as it would in a regular Fl_Group widget. When dragging edges or intersections with the mouse, Fl_Tile will ensure that none of the children shrinks to a size that is smaller than requested. When resizing the Fl_Tile group, size ranges are not enforced by the tile. Instead, the size range of the enclosing window should be limited to a valid range.
Tile does not differentiate between visible and invisible children. If children are created smaller than their assigned minimum size, dragging intersections may cause unexpected jumps in size. Zero width or height widget are not harmful, but should be avoided.

Example for a center document tile and two tool boxes on the left and right

```c
Fl_Window win(400, 300, "My App");
Fl_Tile tile(0, 0, 400, 300);
Fl_Box left_tool_box(0, 0, 100, 300, "Tools");
left_tool_box.box(FL_DOWN_BOX);
tile.size_range(&left_tool_box, 50, 50);
Fl_Box document(100, 0, 200, 300, "Document");
document.box(FL_DOWN_BOX);
tile.size_range(&document, 100, 50);
Fl_Box right_tool_box(300, 0, 100, 300, "More\nTools");
right_tool_box.box(FL_DOWN_BOX);
tile.size_range(&right_tool_box, 50, 50);
tile.end();
tile.resizable(document);
win.end();
win.resizable(tile);
win.show(argc,argv);
win.size_range(200, 50);
```

**Fl_Tile classic mode**

**Fl_Tile** allows objects to be resized to zero dimensions. To prevent this you can use the `resizable()` to limit where corners can be dragged to. For more information see note below. Even though objects can be resized to zero sizes, they must initially have non-zero sizes so the **Fl_Tile** can figure out their layout. If desired, call `position()` after creating the children but before displaying the window to set the borders where you want.

**Note on resizable(Fl_Widget &w):** The "resizable" child widget (which should be invisible) limits where the borders can be dragged to. All dragging will be limited inside the resizable widget's borders. If you don't set it, it will be possible to drag the borders right to the edges of the **Fl_Tile** widget, and thus resize objects on the edges to zero width or height. When the entire **Fl_Tile** widget is resized, the `resizable()` widget will keep its border distance to all borders the same (this is normal resize behavior), so that you can effectively set a border width that will never change. To ensure correct event delivery to all child widgets the `resizable()` widget must be the first child of the **Fl_Tile** widget group. Otherwise some events (e.g. **FL_MOVE** and **FL_ENTER**) might be consumed by the `resizable()` widget so that they are lost for widgets covered (overlapped) by the `resizable()` widget.

**Note**

You can still resize widgets inside the `resizable()` to zero width and/or height, i.e. box 2b above to zero width and box 3a to zero height.

**See also**

```c
void Fl_Group::resizable(Fl_Widget &w)
```

Example for resizable with 20 pixel border distance:

```c
int dx = 20, dy = dx;
Fl_Tile tile(50,50,300,300);
// create resizable() box first
Fl_Box r(tile.x()+dx,tile.y()+dy,tile.w()-2*dx,tile.h()-2*dy);
tile.resizable(r);
// ... create widgets inside tile (see test/tile.cxx) ...
tile.end();
```

See also the complete example program in test/tile.cxx.

34.147.2 Constructor & Destructor Documentation

34.147.2.1 Fl_Tile()

**Fl_Tile::Fl_Tile**

```c
int X,
int Y,
int W,
```
int H,
const char * L = 0)

Creates a new Fl_Tile widget using the given position, size, and label string.
The default boxtype is FL_NO_BOX.
The destructor also deletes all the children. This allows a whole tree to be deleted at once, without having to keep
a pointer to all the children in the user code. A kludge has been done so the Fl_Tile and all of its children can be
automatic (local) variables, but you must declare the Fl_Tile first, so that it is destroyed last.

See also
class Fl_Group

34.147.3 Member Function Documentation

34.147.3.1 cursor()

Fl_Cursor Fl_Tile::cursor (int n) [inline], [protected]

Returns the cursor for cursor index n.

See also
Fl_Tile::set_cursor(int)

34.147.3.2 drag_intersection()

void Fl_Tile::drag_intersection (int oldx, int oldy, int newx, int newy) [virtual]

Drags the intersection at (oldx,oldy) to (newx,newy).

See also
Fl_Tile::move_intersection(int oldx, int oldy, int newx, int newy), but this method does not call init_sizes() and
is used for interactive children layout using the mouse.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>oldx, oldy</th>
<th>move the intersection at this coordinate, pass zero to disable drag in that direction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>newx, newy</td>
<td>move the intersection as close to this new coordinate as possible</td>
</tr>
</tbody>
</table>

34.147.3.3 handle()

int Fl_Tile::handle (int event) [virtual]

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-
circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.
This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>event</th>
<th>the kind of event received</th>
</tr>
</thead>
</table>

Return values

| 0    | if the event was not used or understood |
| 1    | if the event was used and can be deleted |

See also

Fl_Event

Reimplemented from Fl_Group.

34.147.3.4 init_size_range()

void Fl_Tile::init_size_range (  
    int default_min_w = -1,  
    int default_min_h = -1 )

Initialize the size range mode of Fl_Tile and set the default minimum width and height. The default minimum width and height is the size of the mouse pointer grab area at about 4 pixel units.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>default_min_w, default_min_h</th>
<th>default size range for widgets that don't have an individual range assigned</th>
</tr>
</thead>
</table>

34.147.3.5 move_intersection()

void Fl_Tile::move_intersection (  
    int oldx,  
    int oldy,  
    int newx,  
    int newy )  [virtual]

Drags the intersection at (oldx, oldy) to (newx, newy). This redraws all the necessary children.

If no size ranges are set, the new intersection position is limited to the size of the tile group. The resizable() option is not taken into account here.

If size ranges are set, the actual new position of the intersection will depend on the size range of every individual child. No child will be smaller than their minw and minh. After the new position is found, move_intersection() will call init_sizes(). The resizable() range is ignored.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>oldx, oldy</th>
<th>move the intersection at this coordinate, pass zero to disable drag in that direction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>newx, newy</td>
<td>move the intersection as close to this new coordinate as possible</td>
</tr>
</tbody>
</table>
34.147.3.6  on_insert()

int Fl_Tile::on_insert (  
  Fl_Widget * candidate, 
  int index ) [protected], [virtual]

Insert a new entry in the size range list.  
Reimplemented from Fl_Group.

34.147.3.7  on_move()

int Fl_Tile::on_move (  
  int oldIndex, 
  int newIndex ) [protected], [virtual]

Move the entry in the size range list.  
Reimplemented from Fl_Group.

34.147.3.8  on_remove()

void Fl_Tile::on_remove (  
  int index ) [protected], [virtual]

Remove the entry from the size range list.  
Reimplemented from Fl_Group.

34.147.3.9  position()

void Fl_Tile::position (  
  int oldx, 
  int oldy, 
  int newx, 
  int newy ) [inline]

Deprecated "in 1.4.0 - use move_intersection(p) instead"

34.147.3.10  request_grow_b()

void Fl_Tile::request_grow_b (  
  int old_b, 
  int & new_b, 
  Fl_Rect * final_size ) [protected]

Request for children to change their layout.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>old_b</td>
<td>grow all children with this current bottom edge toward the bottom edge of this tile</td>
</tr>
<tr>
<td>in, out</td>
<td>new_b</td>
<td>try to grow to this coordinate, return the maximum possible growth (currently maxh is ignored, so we always grow to new_b)</td>
</tr>
<tr>
<td>in, out</td>
<td>final_size</td>
<td>write the new position and size of all affected children into this list of Fl_Rect</td>
</tr>
</tbody>
</table>
34.147.3.11  request_grow_l()

```cpp
void Fl_Tile::request_grow_l (
    int old_l,
    int & new_l,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>old_l</th>
<th>described as in</th>
</tr>
</thead>
<tbody>
<tr>
<td>in,out</td>
<td>new_l</td>
<td>try to grow to this coordinate, return the maximum possible growth (currently maxw is ignored, so we always grow to new_l)</td>
</tr>
<tr>
<td>in,out</td>
<td>final_size</td>
<td>write the new position and size of all affected children into this list of Fl_Rect</td>
</tr>
</tbody>
</table>

34.147.3.12  request_grow_r()

```cpp
void Fl_Tile::request_grow_r (
    int old_r,
    int & new_r,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>old_r</th>
<th>described as in</th>
</tr>
</thead>
<tbody>
<tr>
<td>in,out</td>
<td>new_r</td>
<td>try to grow to this coordinate, return the maximum possible growth (currently maxw is ignored, so we always grow to new_r)</td>
</tr>
<tr>
<td>in,out</td>
<td>final_size</td>
<td>write the new position and size of all affected children into this list of Fl_Rect</td>
</tr>
</tbody>
</table>

34.147.3.13  request_grow_t()

```cpp
void Fl_Tile::request_grow_t (
    int old_t,
    int & new_t,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>old_t</th>
<th>described as in</th>
</tr>
</thead>
<tbody>
<tr>
<td>in,out</td>
<td>new_t</td>
<td>try to grow to this coordinate, return the maximum possible growth (currently maxh is ignored, so we always grow to new_t)</td>
</tr>
<tr>
<td>in,out</td>
<td>final_size</td>
<td>write the new position and size of all affected children into this list of Fl_Rect</td>
</tr>
</tbody>
</table>

34.147.3.14  request_shrink_b()

```cpp
void Fl_Tile::request_shrink_b (
    int old_b,
    int & new_b,
    Fl_Rect * final_size ) [protected]
```

Generated by Doxygen
Request for children to change their layout.

See also

\texttt{Fl\_Tile::request\_shrink\_l(int old\_l, int &new\_l, Fl\_Rect *final\_size)}

### Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{old_b} shrink all children with this current bottom edge toward the top edge of this tile</td>
</tr>
<tr>
<td>in,out</td>
<td>\texttt{new_b} try to shrink to this coordinate, return the maximum possible shrinkage</td>
</tr>
<tr>
<td>in,out</td>
<td>\texttt{final_size} if not NULL, write the new position and size of all affected children into this list of \texttt{Fl_Rect}</td>
</tr>
</tbody>
</table>

#### 34.147.3.15 \texttt{request\_shrink\_l()}

\texttt{void Fl\_Tile::request\_shrink\_l (}\texttt{\int old\_l,} \texttt{int & new\_l,} \texttt{Fl\_Rect * final\_size) [protected]}

Request for children to change their layout.

drag\_intersection requests that all children with the left edge at old\_l to shrink to new\_l towards the right side of the tile. If the child can not shrink by that amount, it will ask all other children that touch its right side to shrink by the remainder (recursion). new\_l will return the the maximum possible value while maintaining minimum width for all children involved.

request\_shrink\_r asks children to shrink toward the left, so that their right edge is as close as possible to new\_r.
request\_shrink\_t and request\_shrink\_b provide the same functionality for vertical resizing.

### Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{old_l} shrink all children with this current left edge</td>
</tr>
<tr>
<td>in,out</td>
<td>\texttt{new_l} try to shrink to this coordinate, return the maximum possible shrinkage</td>
</tr>
<tr>
<td>in,out</td>
<td>\texttt{final_size} if not NULL, write the new position and size of all affected children into this list of \texttt{Fl_Rect}</td>
</tr>
</tbody>
</table>

#### 34.147.3.16 \texttt{request\_shrink\_r()}

\texttt{void Fl\_Tile::request\_shrink\_r (}\texttt{\int old\_r,} \texttt{int & new\_r,} \texttt{Fl\_Rect * final\_size) [protected]}

Request for children to change their layout.

See also

\texttt{Fl\_Tile::request\_shrink\_l(int old\_l, int &new\_l, Fl\_Rect *final\_size)}

### Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>\texttt{old_r} shrink all children with this current right edge toward the left edge of this tile</td>
</tr>
<tr>
<td>in,out</td>
<td>\texttt{new_r} try to shrink to this coordinate, return the maximum possible shrinkage</td>
</tr>
<tr>
<td>in,out</td>
<td>\texttt{final_size} if not NULL, write the new position and size of all affected children into this list of \texttt{Fl_Rect}</td>
</tr>
</tbody>
</table>
### 34.147.3.17 request_shrink_t()

```c
void Fl_Tile::request_shrink_t (  
  int old_t,  
  int & new_t,  
  Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

**See also**

```
Fl_Tile::request_shrink_l(int old_l, int &new_l, Fl_Rect *final_size)
```

**Parameters**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>old_t</code></td>
<td>shrink all children with this current top edge toward the bottom edge of this tile</td>
</tr>
<tr>
<td>in,out</td>
<td><code>new_t</code></td>
<td>try to shrink to this coordinate, return the maximum possible shrinkage</td>
</tr>
<tr>
<td>in,out</td>
<td><code>final_size</code></td>
<td>if not NULL, write the new position and size of all affected children into this list of Fl_Rect</td>
</tr>
</tbody>
</table>

### 34.147.3.18 resize()

```c
void Fl_Tile::resize (  
  int X,  
  int Y,  
  int W,  
  int H ) [virtual]
```

Resizes the Fl_Tile widget and its children.

**Fl_Tile** implements its own resize() method. It does not use Fl_Group::resize() to resize itself and its children. In size_range mode, the child marked resizable() is resized first. Only if its minimum size is reached, other widgets in the tile will resize too.

In classic mode or when no resizable child is set, enlarging works by moving the lower-right corner and resizing the bottom and right border widgets accordingly.

Shrinking the Fl_Tile works in the opposite way by shrinking the bottom and right border widgets, unless they are reduced to zero width or height, resp. or to their minimal sizes defined by the resizable() widget. In this case other widgets will be shrunk as well.

**See** the Fl_Tile class documentation about how the resizable() works.

Reimplemented from Fl_Group.

### 34.147.3.19 set_cursor()

```c
void Fl_Tile::set_cursor (  
  int n ) [protected]
```

Set one of four cursors used for dragging etc..

**Fl_Tile** uses an array of four cursors that are set depending on user actions:

- 0: normal cursor
- 1: horizontal dragging
- 2: vertical dragging
- 3: dragging an intersection

This method sets the window cursor for the given index n.

### 34.147.3.20 size_range() [1/2]

```c
void Fl_Tile::size_range (  
  Fl_Widget * w,
```

Generated by Doxygen
int minw,
int minh,
int maxw = 0x7FFFFFFF,
int maxh = 0x7FFFFFFF)

Set the allowed size range for the give child widget.
Fl_Tile currently supports only the minimal width and height setting.

Parameters

<table>
<thead>
<tr>
<th>in w</th>
<th>set the range for this child widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in minw, minh</td>
<td>minimum width and height for that child</td>
</tr>
<tr>
<td>in maxw, maxh</td>
<td>maximum size, defaults to infinite, currently ignored</td>
</tr>
</tbody>
</table>

34.147.3.21 size_range() [2/2]

void Fl_Tile::size_range (  
    int index,
    int minw,
    int minh,
    int maxw = 0x7FFFFFFF,
    int maxh = 0x7FFFFFFF)

Set the allowed size range for the child at the given index.
Fl_Tile currently supports only the minimal width and height setting.

Parameters

<table>
<thead>
<tr>
<th>in index</th>
<th>set the range for the child at this index</th>
</tr>
</thead>
<tbody>
<tr>
<td>in minw, minh</td>
<td>minimum width and height for that child</td>
</tr>
<tr>
<td>in maxw, maxh</td>
<td>maximum size, defaults to infinite, currently ignored</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Tile.H
- Fl_Tile.cxx

34.148 Fl_Tiled_Image Class Reference

This class supports tiling of images over a specified area.
#include <Fl_Tiled_Image.H>
Inheritance diagram for Fl_Tiled_Image:

```
Fl_Tiled_Image

| Fl_Tiled_Image
```

Public Member Functions

- void color_average (FL_Color c, float i) FL_OVERRIDE

  The color_average() method averages the colors in the image with the provided FLTK color value.
- Fl_Image * copy () const
- Fl_Image * copy (int W, int H) const FL_OVERRIDE
Creates a resized copy of the image.

- void desaturate () FL_OVERRIDE
  The desaturate() method converts an image to grayscale.

- void draw (int X, int Y)

- void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE
  Draws a tiled image.

- FL_Tiled_Image (Fl_Image *i, int W=0, int H=0)
  The constructors create a new tiled image containing the specified image.

- Fl_Image * image ()
  Gets The image that is tiled.

- virtual ~Fl_Tiled_Image ()
  The destructor frees all memory and server resources that are used by the tiled image.

Protected Attributes

- int alloc_image_
- Fl_Image * image_

Additional Inherited Members

34.148.1 Detailed Description

This class supports tiling of images over a specified area. The source (tile) image is not copied unless you call the color_average(), desaturate(), or inactive() methods.

34.148.2 Constructor & Destructor Documentation

34.148.2.1 Fl_Tiled_Image()

Fl_Tiled_Image::Fl_Tiled_Image (  
  Fl_Image * i,  
  int W = 0,  
  int H = 0 )

The constructors create a new tiled image containing the specified image. Use a width and height of 0 to tile the whole window/widget.

Note

Due to implementation constraints in FLTK 1.3.3 and later width and height of 0 may not work as expected when used as background image in widgets other than windows. You may need to center and clip the image (label) and set the label type to FL_NORMAL_LABEL. Doing so will let the tiled image fill the whole widget as its background image. Other combinations of label flags may or may not work.

#include "bg.xpm"
Fl_Pixmap *bg_xpm = new Fl_Pixmap(bg_xpm);
Fl_Tiled_Image *bg_tiled = new Fl_Tiled_Image(bg_xpm,0,0);
Fl_Box *box = new Fl_Box(40,40,300,100,"");
box->box(FL_UP_BOX);
box->labeltype(FL_NORMAL_LABEL);
box->align(FL_ALIGN_INSIDE | FL_ALIGN_CENTER | FL_ALIGN_CLIP);
box->image(bg_tiled);

Note

Setting an image (label) for a window may not work as expected due to implementation constraints in FLTK 1.3.x and maybe later. The reason is the way Fl::scheme() initializes the window's label type and image. A possible workaround is to use another Fl_Group as the only child widget and to set the background image for this group as described above.

Todo Fix Fl_Tiled_Image as background image for widgets and windows and fix the implementation of Fl::scheme(const char *).
34.148.3 Member Function Documentation

34.148.3.1 color_average()

```cpp
void Fl_Tiled_Image::color_average ( Fl_Color c, float i ) [virtual]
```

The `color_average()` method averages the colors in the image with the provided FLTK color value.
The first argument specifies the FLTK color to be used. The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color. An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
Reimplemented from `Fl_Image`.

34.148.3.2 copy()

```cpp
Fl_Image * Fl_Tiled_Image::copy ( int W, int H ) const [virtual]
```

Creates a resized copy of the image. The new image should be released when you are done with it.
Note: since FLTK 1.4.0 you can use `Fl_Image::release()` for all types of images (i.e. all subclasses of `Fl_Image`) instead of operator `delete` for `Fl_Image`'s and `Fl_Image::release()` for `Fl_Shared_Image`'s. The new image data will be converted to the requested size. RGB images are resized using the algorithm set by `Fl_Image::RGB_scaling()`.

For the new image the following equations are true:

- \( w() == \text{data\_w()} == W \)
- \( h() == \text{data\_h()} == H \)

Parameters

| in | \( W,H \) | Requested width and height of the new image |

Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of `Fl_RGB_Image`, `Fl_SVG_Image`, `Fl_Pixmap`, `Fl_Bitmap`, `Fl_Tiled_Image`, `Fl_Anim_GIF_Image` and `Fl_Shared_Image`. Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an `Fl_GIF_Image` is an object of class `Fl_Pixmap`.
Since FLTK 1.4.0 this method is 'const'. If you derive your own class from `Fl_Image` or any subclass your overridden methods of `Fl_Image::copy() const` and `Fl_Image::copy(int, int) const` must also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.
Reimplemented from `Fl_Image`.

34.148.3.3 desaturate()

```cpp
void Fl_Tiled_Image::desaturate ( ) [virtual]
```

The `desaturate()` method converts an image to grayscale. If the image contains an alpha channel (depth = 4), the alpha channel is preserved. An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.
34.148.3.4 draw()

```c
void Fl_Tiled_Image::draw (  
    int X,  
    int Y,  
    int W,  
    int H,  
    int cx = 0,  
    int cy = 0 ) [virtual]
```

Draws a tiled image.

Tiled images can be used as background images for widgets and windows. However, due to implementation constraints, you must take care when setting label types and alignment flags. Only certain combinations work as expected, others may yield unexpected results and undefined behavior.

This draw method can draw multiple copies of one image in an area given by X, Y, W, H.

The optional arguments cx and cy can be used to crop the image starting at offsets (cx, cy). cx and cy must be >= 0 (negative values are ignored). If one of the values is greater than the image width or height resp. (cx >= image()->w() or cy >= image()->h()) nothing is drawn, because the resulting image would be empty.

After calculating the resulting image size the image is drawn as often as necessary to fill the given area, starting at the top left corner.

If both W and H are 0 the image is repeated as often as necessary to fill the entire window, unless there is a valid clip region. If you want to fill only one particular widget's background, then you should either set a clip region in your draw() method or use the label alignment flags FL_ALIGN_INSIDE | FL_ALIGN_CLIP to make sure the image is clipped.

This may be improved in a later version of the library.

Reimplemented from Fl_Image.

The documentation for this class was generated from the following files:

- FL_Tiled_Image.H
- FL_Tiled_Image.cxx

34.149 Fl_Timeout Class Reference

The internal class Fl_Timeout handles all timeout related functions.

```c
#include <Fl_Timeout.h>
```

**Static Public Member Functions**

- static void `add_timeout` (double time, Fl_Timeout_Handler cb, void *data)
  
  Adds a one-shot timeout callback.

- static void `do_timeouts` ()
  
  Elapse timers and call their callbacks if any timers are expired.

- static void `elapse_timeouts` ()
  
  Elapse all timers w/o calling their callbacks.

- static int `has_timeout` (Fl_Timeout_Handler cb, void *data)
  
  Returns true if the timeout exists and has not been called yet.

- static void `remove_timeout` (Fl_Timeout_Handler cb, void *data)
  
  Remove a timeout callback.

- static void `repeat_timeout` (double time, Fl_Timeout_Handler cb, void *data)
  
  Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.

- static double `time_to_wait` (double ttw)
  
  Returns the delay in seconds until the next timer expires, limited by ttw.
Protected Member Functions

- double delay ()
  
  Get the timer's delay in seconds.

- void delay (double t)
  
  Set the timer's delay in seconds.

- void insert ()
  
  Insert this timer entry into the active timer queue.

- void make_current ()
  
  Remove the timeout from the active timer queue and push it onto the stack of currently running callbacks.

- void release ()
  
  Remove the top-most timeout from the stack of currently running timeout callbacks and insert it into the list of free timers.

Static Protected Member Functions

- static Fl_Timeout * current ()
  
  Returns the first (top-most) timeout from the current timeout stack.

- static Fl_Timeout * get (double time, Fl_Timeout_Handler cb, void *data)
  
  Get an Fl_Timeout instance for further handling.

Protected Attributes

- Fl_Timeout_Handler callback
- void * data
- Fl_Timeout * next
- int skip
- double time

Static Protected Attributes

- static Fl_Timeout * current_timeout = 0
  
  The list of current timeouts is used to store the timeout whose callback is called while the callback is executed.

- static Fl_Timeout * first_timeout = 0
  
  List of active timeouts.

- static Fl_Timeout * free_timeout = 0
  
  List of free timeouts after use.

34.149.1 Detailed Description

The internal class Fl_Timeout handles all timeout related functions. All code is platform independent except retrieving a timestamp which requires calling a system driver function and potentially results in different timer resolutions (from milliseconds to microseconds). Related user documentation:

- Fl_Timeout_Handler
- Fl::add_timeout(double time, Fl_Timeout_Handler cb, void *data)
- Fl::repeat_timeout(double time, Fl_Timeout_Handler cb, void *data)
- Fl::has_timeout(Fl_Timeout_Handler cb, void *data)
- Fl::remove_timeout(Fl_Timeout_Handler cb, void *data)

34.149.2 Member Function Documentation
34.149.2.1  add_timeout()

void Fl_Timeout::add_timeout (  
    double time,  
    Fl_Timeout_Handler cb,  
    void * data ) [static]

Adds a one-shot timeout callback.  
The callback function cb will be called by Fl::wait() at time seconds after this function is called.

Parameters

<table>
<thead>
<tr>
<th>in time</th>
<th>delta time in seconds until the timer expires</th>
</tr>
</thead>
<tbody>
<tr>
<td>in cb</td>
<td>callback function</td>
</tr>
<tr>
<td>in data</td>
<td>optional user data (default: NULL)</td>
</tr>
</tbody>
</table>

Implements Fl::add_timeout(double time, Fl_Timeout_Handler cb, void *data)

See also

Fl::add_timeout(double time, Fl_Timeout_Handler cb, void *data)

34.149.2.2  current()

Fl_Timeout * Fl_Timeout::current ( ) [static], [protected]

Returns the first (top-most) timeout from the current timeout stack.  
This returns a pointer to the timeout but does not remove it from the list of current timeouts.  
This should be the timeout that is currently executing its callback.

Returns

Fl_Timeout* The current timeout whose callback is running.

Return values

| NULL | if no callback is currently running. |

34.149.2.3  elapse_timeouts()

void Fl_Timeout::ellipse_timeouts ( ) [static]

Ellipse all timers w/o calling their callbacks.  
All timer values are adjusted by the delta time since the last call.  
This method does NOT call timer callbacks if timers are expired.  
This must be called before new timers are added to the timer queue to make sure that the next timer decrement does not count down too much time.

See also

Fl_Timeout::do_timeouts()

34.149.2.4  get()

Fl_Timeout * Fl_Timeout::get (  
    double time,  
    Fl_Timeout_Handler cb,  
    void * data ) [static], [protected]
Get an `Fl_Timeout` instance for further handling.
The timer object will be initialized with the input parameters as given by `Fl::add_timeout()` or `Fl::repeat_timeout()`.
`Fl_Timeout` objects are maintained in three queues:

- active timer queue
- list (stack, i.e. LIFO) of currently executing timer callbacks
- free timer entries.

When the FLTK program is launched all queues are empty. Whenever a new timer object is required the `get()` method is called and a timer object is either found in the queue of free timer entries or a new timer object is created (operator new).
Active timer entries are inserted into the "active timer queue" until they expire and their callback is called.
Before the callback is called the timer entry is inserted into the list of current timers, i.e. it becomes the `Fl_Timeout::current()` timeout. This can be used in `Fl::repeat_timeout()` to find out if and how long the current timeout has been delayed.
When a timer is no longer used it is popped from the `current` list and inserted into the "free timer" list so it can be reused later.
Timer queue entries are never returned to the system, there’s no garbage collection. The total number of timer objects is determined by the largest number of concurrently active timers.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>time</th>
<th>requested delta time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cb</td>
<td>timer callback</td>
</tr>
<tr>
<td></td>
<td>data</td>
<td>userdata for timer callback</td>
</tr>
</tbody>
</table>

Returns

`Fl_Timeout` Timer entry

See also

`Fl::add_timeout()`, `Fl::repeat_timeout()`

34.149.2.5 has_timeout()

```cpp
template<typename Fl_Timeout_Handler = Fl_Timeout_Handler_v>
int Fl_Timeout::has_timeout ( Fl_Timeout_Handler cb, void * data ) [static]
```

Returns true if the timeout exists and has not been called yet.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cb</th>
<th>Timer callback (must match)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>data</td>
<td>Callback user data (must match)</td>
</tr>
</tbody>
</table>

Returns

whether the timer was found in the queue

Return values

| 0   | not found |
| 1   | found     |
Implements `Fl::has_timeout(Fl_Timeout_Handler cb, void *data)`

See also

`Fl::has_timeout(Fl_Timeout_Handler cb, void *data)`

### 34.149.2.6 insert()

```cpp
void Fl_Timeout::insert ( ) [protected]
```

Insert this timer entry into the active timer queue. The timer is inserted at the required position so the timer queue is always ordered by due time.

### 34.149.2.7 make_current()

```cpp
void Fl_Timeout::make_current ( ) [protected]
```

Remove the timeout from the active timer queue and push it onto the stack of currently running callbacks. This becomes the `current()` timeout which can be used in `Fl::repeat_timeout()`.

See also

`Fl_Timeout::current()`

### 34.149.2.8 release()

```cpp
void Fl_Timeout::release ( ) [protected]
```

Remove the top-most timeout from the stack of currently running timeout callbacks and insert it into the list of free timers.

Typical code in the library would look like:

```cpp
// The timeout p Fl_Timeout *t has expired, run its callback
t->make_current();
(t->callback)(t->data);
(t->release());
```

### 34.149.2.9 remove_timeout()

```cpp
void Fl_Timeout::remove_timeout ( Fl_Timeout_Handler cb,
                               void * data ) [static]
```

Remove a timeout callback.

This method removes all matching timeouts, not just the first one. This may change in the future.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>cb</code></td>
<td>Timer callback to be removed (must match)</td>
<td></td>
</tr>
<tr>
<td><code>data</code></td>
<td>Wildcard if NULL, must match otherwise</td>
<td></td>
</tr>
</tbody>
</table>

Implements `Fl::remove_timeout(Fl_Timeout_Handler cb, void *data)`

See also

`Fl::remove_timeout(Fl_Timeout_Handler cb, void *data)`

### 34.149.2.10 repeat_timeout()

```cpp
void Fl_Timeout::repeat_timeout ( double time,
                                int flags )
```

Generated by Doxygen
Fl_Timeout_Handler cb,
void * data ) [static]

Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>time</th>
<th>delta time in seconds until the timer expires</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>cb</td>
<td>callback function</td>
</tr>
<tr>
<td>in</td>
<td>data</td>
<td>optional user data (default: NULL)</td>
</tr>
</tbody>
</table>

Implements Fl::repeat_timeout(double time, Fl_Timeout_Handler cb, void *data)

See also
Fl::repeat_timeout(double time, Fl_Timeout_Handler cb, void *data)

34.149.2.11 time_to_wait()

double Fl_Timeout::time_to_wait (  
    double ttw ) [static]

Returns the delay in seconds until the next timer expires, limited by ttw. This function calculates the time to wait for the FLTK event queue processing, depending on the given value ttw. If at least one timer is active and its timeout value is smaller than ttw then this value is returned. Fl::wait() will wait no longer than until the next timer expires. If no timer is active this returns the input value ttw unchanged. If at least one timer is expired this returns 0.0 so the event processing does not wait.

Parameters

| in  | ttw   | time to wait from Fl::wait() etc. (upper limit) |

Returns
delay until next timeout or 0.0 (see description)

34.149.3 Member Data Documentation

34.149.3.1 current_timeout

Fl_Timeout * Fl_Timeout::current_timeout = 0 [static], [protected]
The list of current timeouts is used to store the timeout whose callback is called while the callback is executed. This is used like a stack, the current timeout is pushed to the front of the list and once the callback is finished, that timeout is removed and entered into the free list. Background: Fl::repeat_timeout() needs to know which timeout triggered it and the exact schedule time and/or the delay of that timeout, i.e. how long the scheduled time was missed before the callback was called. A static, global variable is not sufficient since the user code can call other functions, e.g. dialogs, that run a nested event loop which can run another timeout callback. Hence this list of "current" timeouts is used like a stack (last in, first out).

See also
Fl_Timeout::push() Member function (method)

34.149.3.2 first_timeout

Fl_Timeout * Fl_Timeout::first_timeout = 0 [static], [protected]
List of active timeouts.
These timeouts can be triggered when due, which calls their callbacks. The lifetime of a timeout:

- active, in this queue
- callback running, in queue current_timeout
- done, in list of free timeouts, ready to be reused.

34.149.3.3 free_timeout

Fl_Timeout ∗ Fl_Timeout::free_timeout = 0 [static], [protected]
List of free timeouts after use.
Timeouts can be reused many times.
The documentation for this class was generated from the following files:

- Fl_Timeout.h
- Fl_Timeout.cxx

34.150 Fl_Timer Class Reference

This is provided only to emulate the Forms Timer widget.

#include <Fl_Timer.H>

Inheritance diagram for Fl_Timer:

```
Fl_Widget
   Fl_Timer
```

Public Member Functions

- char direction () const
  Gets or sets the direction of the timer.
- void direction (char d)
  Gets or sets the direction of the timer.
- Fl_Timer (uchar t, int x, int y, int w, int h, const char ∗l)
  Creates a new Fl_Timer widget using the given type, position, size, and label string.
- int handle (int) FL_OVERRIDE
  Handles the specified event.
- char suspended () const
  Gets or sets whether the timer is suspended.
- void suspended (char d)
  Gets or sets whether the timer is suspended.
- double value () const
  See void Fl_Timer::value(double)
- void value (double)
  Sets the current timer value.
- ~Fl_Timer ()
  Destroys the timer and removes the timeout.
Protected Member Functions

• void draw () FL_OVERRIDE

  Draws the widget.

Additional Inherited Members

34.150.1 Detailed Description

This is provided only to emulate the Forms Timer widget. It works by making a timeout callback every 1/5 second. This is wasteful and inaccurate if you just want something to happen a fixed time in the future. You should directly call Fl::add_timeout() instead.

34.150.2 Constructor & Destructor Documentation

34.150.2.1 Fl_Timer()

Fl_Timer::Fl_Timer ( uchar t, int X, int Y, int W, int H, const char ∗ l )

Creates a new Fl_Timer widget using the given type, position, size, and label string. The type parameter can be any of the following symbolic constants:

• FL_NORMAL_TIMER - The timer just does the callback and displays the string "Timer" in the widget.
• FL_VALUE_TIMER - The timer does the callback and displays the current timer value in the widget.
• FL_HIDDEN_TIMER - The timer just does the callback and does not display anything.

34.150.3 Member Function Documentation

34.150.3.1 direction() [1/2]

char Fl_Timer::direction ( ) const [inline]

Gets or sets the direction of the timer. If the direction is zero then the timer will count up, otherwise it will count down from the initial value().

34.150.3.2 direction() [2/2]

void Fl_Timer::direction ( char d ) [inline]

Gets or sets the direction of the timer. If the direction is zero then the timer will count up, otherwise it will count down from the initial value().

34.150.3.3 draw()

void Fl_Timer::draw ( ) [protected], [virtual]

Draws the widget. Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead. Override this function to draw your own widgets.
If you ever need to call another widget's draw method from within your own draw() method, e.g., for an embedded scrollbar, you can do it (because draw() is virtual) like this:

```c++
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.

### 34.150.3.4 handle()

```c++
int Fl_Timer::handle (int event) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

#### Parameters

- **event** the kind of event received

#### Return values

- 0 if the event was not used or understood
- 1 if the event was used and can be deleted

#### See also

Fl_Event

Reimplemented from Fl_Widget.

### 34.150.3.5 suspended()

```c++
char Fl_Timer::suspended ( ) const [inline]
```

• Gets or sets whether the timer is suspended.

The documentation for this class was generated from the following files:

- Fl_Timer.H
- forms_timer.hxx

### 34.151 Fl_Toggle_Button Class Reference

The toggle button is a push button that needs to be clicked once to toggle on, and one more time to toggle off.

```c++
#include <Fl_Toggle_Button.H>
```

Inheritance diagram for Fl_Toggle_Button:
Public Member Functions

- **Fl_Toggle_Button** (int X, int Y, int W, int H, const char *l=0)
  
  Creates a new Fl_Toggle_Button widget using the given position, size, and label string.

Additional Inherited Members

34.151.1 Detailed Description

The toggle button is a push button that needs to be clicked once to toggle on, and one more time to toggle off. The Fl_Toggle_Button subclass displays the "on" state by drawing a pushed-in button. Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for type() and when().

34.151.2 Constructor & Destructor Documentation

34.151.2.1 Fl_Toggle_Button()

Fl_Toggle_Button::Fl_Toggle_Button {
  int X,
  int Y,
  int W,
  int H,
  const char * L = 0
}

Creates a new Fl_Toggle_Button widget using the given position, size, and label string. The constructor creates the button using the given position, size, and label. The inherited destructor deletes the toggle button. The Button type() is set to FL_TOGGLE_BUTTON.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>X,Y,W,H</th>
<th>position and size of the widget</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>L</td>
<td>widget label, default is no label</td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following files:

- Fl_Toggle_Button.H
- Fl_Button.cxx

34.152 Fl_Tooltip Class Reference

The Fl_Tooltip class provides tooltip support for all FLTK widgets.

#include <Fl_Tooltip.H>

Static Public Member Functions

- static FL_Color color ()
Gets the background color for tooltips.

- static void color (Fl_Color c)
  
  Sets the background color for tooltips.

- static Fl_Widget * current ()
  
  Gets the current widget target.

- static void current (Fl_Widget *)
  
  Sets the current widget target.

- static Fl_Window * current_window (void)
  
  Returns the window that is used for tooltips.

- static float delay ()
  
  Gets the tooltip delay.

- static void delay (float f)
  
  Sets the tooltip delay.

- static void disable ()
  
  Same as enable(0), disables tooltips on all widgets.

- static void enable (int b=1)
  
  Enables tooltips on all widgets (or disables if b is false).

- static int enabled ()
  
  Returns non-zero if tooltips are enabled.

- static void enter_area (Fl_Widget *w, int X, int Y, int W, int H, const char *tip)
  
  You may be able to use this to provide tooltips for internal pieces of your widget.

- static Fl_Font font ()
  
  Gets the typeface for the tooltip text.

- static void font (Fl_Font i)
  
  Sets the typeface for the tooltip text.

- static float hidedelay ()
  
  Gets the time until an open tooltip hides again.

- static void hidedelay (float f)
  
  Sets the time until an open tooltip hides again.

- static float hoverdelay ()
  
  Gets the tooltip hover delay, the delay between tooltips.

- static void hoverdelay (float f)
  
  Sets the tooltip hover delay, the delay between tooltips.

- static int margin_height ()
  
  Gets the amount of extra space above and below the tooltip's text.

- static void margin_height (int v)
  
  Sets the amount of extra space above and below the tooltip's text.

- static int margin_width ()
  
  Gets the amount of extra space left/right of the tooltip's text.

- static void margin_width (int v)
  
  Sets the amount of extra space left/right of the tooltip's text.

- static Fl_Fontsize size ()
  
  Gets the size of the tooltip text.

- static void size (Fl_Fontsize s)
  
  Sets the size of the tooltip text.

- static Fl_Color textcolor ()
  
  Gets the color of the text in the tooltip.

- static void textcolor (Fl_Color c)
  
  Sets the color of the text in the tooltip.

- static int wrap_width ()
  
  Gets the maximum width for tooltip's text before it word wraps.

- static void wrap_width (int v)
  
  Sets the maximum width for tooltip's text before it word wraps.
Static Public Attributes

- static void enter(Fl_Widget *w) = nothing
- static void exit(Fl_Widget *w) = nothing

Friends

- class Fl_TooltipBox
- void Fl_Widget::copy_tooltip(const char *)
- void Fl_Widget::tooltip(const char *)

34.152.1 Detailed Description

The Fl_Tooltip class provides tooltip support for all FLTK widgets. It contains only static methods.

![Figure 34.62 Fl_Tooltip Options]

34.152.2 Member Function Documentation

34.152.2.1 color() [1/2]

static Fl_Color Fl_Tooltip::color (
    void ) [inline], [static]

Gets the background color for tooltips. The default background color is a pale yellow.

34.152.2.2 color() [2/2]

static void Fl_Tooltip::color (
    Fl_Color c ) [inline], [static]

Sets the background color for tooltips. The default background color is a pale yellow.

34.152.2.3 current()

void Fl_Tooltip::current (
    Fl_Widget *w ) [static]

Sets the current widget target. Acts as though enter(widget) was done but does not pop up a tooltip. This is useful to prevent a tooltip from reappearing when a modal overlapping window is deleted. FLTK does this automatically when you click the mouse button.
34.152.2.4 delay() [1/2]

static float Fl_Tooltip::delay ( ) [inline], [static]
Gets the tooltip delay.
The default delay is 1.0 seconds.

34.152.2.5 delay() [2/2]

static void Fl_Tooltip::delay ( float f ) [inline], [static]
Sets the tooltip delay.
The default delay is 1.0 seconds.

34.152.2.6 disable()

static void Fl_Tooltip::disable ( ) [inline], [static]
Same as enable(0), disables tooltips on all widgets.

34.152.2.7 enable()

static void Fl_Tooltip::enable ( int b = 1 ) [inline], [static]
Enables tooltips on all widgets (or disables if b is false).

34.152.2.8 enabled()

static int Fl_Tooltip::enabled ( ) [inline], [static]
Returns non-zero if tooltips are enabled.

34.152.2.9 enter_area()

void Fl_Tooltip::enter_area ( Fl_Widget * wid, int x, int y, int w, int h, const char * t ) [static]
You may be able to use this to provide tooltips for internal pieces of your widget.
Call this after setting Fl::belowmouse() to your widget (because that calls the above enter() method). Then figure
out what thing the mouse is pointing at, and call this with the widget (this pointer is used to remove the tooltip if
the widget is deleted or hidden, and to locate the tooltip), the rectangle surrounding the area, relative to the top-left
corner of the widget (used to calculate where to put the tooltip), and the text of the tooltip (which must be a pointer
to static data as it is not copied).

34.152.2.10 font() [1/2]

static Fl_Font Fl_Tooltip::font ( ) [inline], [static]
Gets the typeface for the tooltip text.
### font() [2/2]

```
static void Fl_Tooltip::font (
    Fl_Font i ) [inline], [static]
```

Sets the typeface for the tooltip text.

### hidedelay() [1/2]

```
static float Fl_Tooltip::hidedelay ( ) [inline], [static]
```

Gets the time until an open tooltip hides again. The default delay is 12.0 seconds.

### hidedelay() [2/2]

```
static void Fl_Tooltip::hidedelay (
    float f ) [inline], [static]
```

Sets the time until an open tooltip hides again. The default delay is 12.0 seconds.

### hoverdelay() [1/2]

```
static float Fl_Tooltip::hoverdelay ( ) [inline], [static]
```

Gets the tooltip hover delay, the delay between tooltips. The default delay is 0.2 seconds.

### hoverdelay() [2/2]

```
static void Fl_Tooltip::hoverdelay (
    float f ) [inline], [static]
```

Sets the tooltip hover delay, the delay between tooltips. The default delay is 0.2 seconds.

### margin_height() [1/2]

```
static int Fl_Tooltip::margin_height ( ) [inline], [static]
```

Gets the amount of extra space above and below the tooltip's text. Default is 3.

### margin_height() [2/2]

```
static void Fl_Tooltip::margin_height (
    int v ) [inline], [static]
```

Sets the amount of extra space above and below the tooltip's text. Default is 3.

### margin_width() [1/2]

```
static int Fl_Tooltip::margin_width ( ) [inline], [static]
```

Gets the amount of extra space left/right of the tooltip's text. Default is 3.

### margin_width() [2/2]

```
static void Fl_Tooltip::margin_width (
    int v ) [inline], [static]
```

Sets the amount of extra space left/right of the tooltip's text.
Default is 3.

### 34.152.20 size() [1/2]

```cpp
class Fl_Tooltip {
public:
    static Fl_Fontsize size () [inline], [static]
    Gets the size of the tooltip text.
}
```

### 34.152.21 size() [2/2]

```cpp
class Fl_Tooltip {
public:
    static void size ( Fl_Fontsize s ) [inline], [static]
    Sets the size of the tooltip text.
}
```

### 34.152.22 textcolor() [1/2]

```cpp
class Fl_Tooltip {
public:
    static Fl_Color textcolor ( void ) [inline], [static]
    Gets the color of the text in the tooltip.
    The default is black.
}
```

### 34.152.23 textcolor() [2/2]

```cpp
class Fl_Tooltip {
public:
    static void textcolor ( Fl_Color c ) [inline], [static]
    Sets the color of the text in the tooltip.
    The default is black.
}
```

### 34.152.24 wrap_width() [1/2]

```cpp
class Fl_Tooltip {
public:
    static int wrap_width ( ) [inline], [static]
    Gets the maximum width for tooltip's text before it word wraps.
    Default is 400.
}
```

### 34.152.25 wrap_width() [2/2]

```cpp
class Fl_Tooltip {
public:
    static void wrap_width ( int v ) [inline], [static]
    Sets the maximum width for tooltip's text before it word wraps.
    Default is 400.
}
```

The documentation for this class was generated from the following files:

- Fl_Tooltip.H
- Fl.cxx
- Fl_Tooltip.cxx

### 34.153 Fl_Tree Class Reference

Tree widget.
#include <Fl_Tree.H>
Inheritance diagram for Fl_Tree:
Public Member Functions

- **Fl_Tree_Item * add (const char *path, Fl_Tree_Item *newitem=0)**
  Adds a new item, given a menu style 'path'.
- **Fl_Tree_Item * add (Fl_Tree_Item *parent_item, const char *name)**
  Add a new child item labeled 'name' to the specified 'parent_item'.
- **void calc_dimensions ()**
  Recalculate widget dimensions and scrollbar visibility, normally managed automatically.
- **void calc_tree ()**
  Recalculates the tree's sizes and scrollbar visibility, normally managed automatically.
- **Fl_Tree_Item * callback_item ()**
  Gets the item that caused the callback.
- **void callback_item (Fl_Tree_Item *item)**
  Sets the item that was changed for this callback.
- **Fl_Tree_Reason callback_reason () const**
  Gets the reason for this callback.
- **void callback_reason (Fl_Tree_Reason reason)**
  Sets the reason for this callback.
- **void clear ()**
  Clear the entire tree's children, including the root.
- **void clear_children (Fl_Tree_Item *item)**
  Clear all the children for 'item'.
- **int close (const char *path, int docallback=1)**
  Closes the item specified by 'path'.
- **int close (Fl_Tree_Item *item, int docallback=1)**
  Closes the specified 'item'.
- **Fl_Image * closeicon () const**
  Returns the icon to be used as the 'close' icon.
- **void closeicon (Fl_Image *val)**
  Sets the icon to be used as the 'close' icon.
- **Fl_Color connectorcolor () const**
  Get the connector color used for tree connection lines.
- **void connectorcolor (Fl_Color val)**
  Set the connector color used for tree connection lines.
- **Fl_Tree_Connector connectorstyle () const**
  Returns the line drawing style for inter-connecting items.
- **void connectorstyle (Fl_Tree_Connector val)**
  Sets the line drawing style for inter-connecting items.
- **int connectorwidth () const**
  Gets the width of the horizontal connection lines (in pixels) that appear to the left of each tree item's label.
- **void connectorwidth (int val)**
  Sets the width of the horizontal connection lines (in pixels) that appear to the left of each tree item's label.
- **int deselect (const char *path, int docallback=1)**
Deselect an item specified by 'path'.

- **int deselect (Fl_Tree_Item *item, int docallback=1)**
  Deselect the specified item.

- **int deselect_all (Fl_Tree_Item *item=0, int docallback=1)**
  Deselect 'item' and all its children.

- **void display (Fl_Tree_Item *item)**
  Displays 'item', scrolling the tree as necessary.

- **int displayed (Fl_Tree_Item *item)**
  See if 'item' is currently displayed on-screen (visible within the widget).

- **int extend_selection (Fl_Tree_Item *from, Fl_Tree_Item *to, int val=1, bool visible=false)**
  Extend a selection between 'from' and 'to' depending on 'visible'.

- **int extend_selection_dir (Fl_Tree_Item *from, Fl_Tree_Item *to, int dir, int val, bool visible)**
  Extend the selection between and including 'from' and 'to' depending on direction, 'dir', 'val', and 'visible'.

- **Fl_Tree_Item *find_clicked (int yonly=0)**
  Non-const version of Fl_Tree::find_clicked(int yonly) const.

- **const Fl_Tree_Item *find_clicked (int yonly=0) const**
  Find the item that was last clicked on.

- **Fl_Tree_Item *find_item (const char *path)**
  Non-const version of Fl_Tree::find_item(const char *path) const.

- **const Fl_Tree_Item *find_item (const char *path) const**
  Find the item, given a menu style path, e.g.

- **Fl_Tree_Item *first ()**
  Returns the first item in the tree, or 0 if none.

- **Fl_Tree_Item *first_selected_item ()**
  Returns the first selected item in the tree.

- **Fl_Tree_Item *first_visible ()**
  Returns the first open(), visible item in the tree, or 0 if none.

- **Fl_Tree_Item *first_visible_item ()**
  Returns the first open(), visible item in the tree, or 0 if none.

- **Fl_Tree (int X, int Y, int W, int H, const char *L=0)**
  Constructor.

- **Fl_Tree_Item *get_item_focus () const**
  Get the item that currently has keyboard focus.

- **int get_selected_items (Fl_Tree_Item_Array &items)**
  Returns the currently selected items as an array of 'ret_items'.

- **int handle (int e) FL_OVERRIDE**
  Standard FLTK event handler for this widget.

- **int hposition () const**
  Returns the horizontal scroll position as a pixel offset.

- **void hposition (int pos)**
  Sets the horizontal scroll offset to position 'pos'.

- **Fl_Tree_Item *insert (Fl_Tree_Item *item, const char *name, int pos)**
  Insert a new item 'name' into 'item's children at position 'pos'.

- **Fl_Tree_Item *insert_above (Fl_Tree_Item *above, const char *name)**
  Inserts a new item 'name' above the specified Fl_Tree_Item 'above'.

- **int is_close (const char *path) const**
  See if item specified by 'path' is closed.

- **int is_close (Fl_Tree_Item *item) const**
  See if the specified 'item' is closed.

- **int is_hscroll_visible () const**
See if the horizontal scrollbar is currently visible.

- **int is_open (const char ∗path) const**
  See if item specified by 'path' is open.

- **int is_open (Fl_Tree_Item ∗item) const**
  See if 'item' is open.

- **int is_scrollbar (Fl_Widget ∗w)**
  See if widget 'w' is one of the Fl_Tree widget's scrollbars.

- **int is_selected (const char ∗path)**
  See if item specified by 'path' is selected.

- **int is_selected (Fl_Tree_Item ∗item) const**
  See if the specified 'item' is selected.

- **int is_vscroll_visible () const**
  See if the vertical scrollbar is currently visible.

- **Fl_Tree_Item ∗item_clicked ()**
  Return the item that was last clicked.

- **Fl_Tree_Item_Draw_Mode item_draw_mode () const**
  Get the 'item draw mode' used for the tree.

- **void item_draw_mode (Fl_Tree_Item_Draw_Mode mode)**
  Set the 'item draw mode' used for the tree to 'mode'.

- **void item_draw_mode (int mode)**
  Set the 'item draw mode' used for the tree to integer 'mode'.

- **void item_labelbgcolor (Fl_Color val)**
  Set the default label background color used for creating new items.

- **Fl_Color item_labelbgcolor (void) const**
  Get the default label background color used for creating new items.

- **void item_labelfgcolor (Fl_Color val)**
  Set the default label foreground color used for creating new items.

- **Fl_Color item_labelfgcolor (void) const**
  Get the default label foreground color used for creating new items.

- **Fl_Font item_labelfont () const**
  Get the default font face used for creating new items.

- **void item_labelfont (Fl_Font val)**
  Set the default font face used for creating new items.

- **Fl_Fontsize item_labelsize () const**
  Get the default label fontsize used for creating new items.

- **void item_labelsize (Fl_Fontsize val)**
  Set the default label font size used for creating new items.

- **int item_pathname (char ∗pathname, int pathnamelen, const Fl_Tree_Item ∗item) const**
  Return 'pathname' of size 'pathnamelen' for the specified 'item'.

- **Fl_Tree_Item_Reselect_Mode item_reselect_mode () const**
  Returns the current item re/selection mode.

- **void item_reselect_mode (Fl_Tree_Item_Reselect_Mode mode)**
  Sets the item re/selection mode.

- **int labelmarginleft () const**
  Get the amount of white space (in pixels) that should appear to the left of the label text.

- **void labelmarginleft (int val)**
  Set the amount of white space (in pixels) that should appear to the left of the label text.

- **Fl_Tree_Item ∗last ()**
  Returns the last item in the tree.

- **Fl_Tree_Item ∗last_selected_item ()**
  Returns the last selected item in the tree.
• **Fl_Tree_Item * last_visible ()**
  Returns the last open(), visible item in the tree.

• **Fl_Tree_Item * last_visible_item ()**
  Returns the last open(), visible item in the tree.

• **int linespacing () const**
  Get the amount of white space (in pixels) that should appear between items in the tree.

• **void linespacing (int val)**
  Sets the amount of white space (in pixels) that should appear between items in the tree.

• **void load (class Fl_Preferences &)**
  Load FLTK preferences.

• **int marginbottom () const**
  Get the amount of white space (in pixels) that should appear below the last visible item when the vertical scroller is scrolled to the bottom.

• **void marginbottom (int val)**
  Sets the amount of white space (in pixels) that should appear below the last visible item when the vertical scroller is scrolled to the bottom.

• **int marginleft () const**
  Get the amount of white space (in pixels) that should appear between the widget's left border and the tree's contents.

• **void marginleft (int val)**
  Set the amount of white space (in pixels) that should appear between the widget's left border and the left side of the tree's contents.

• **int margintop () const**
  Get the amount of white space (in pixels) that should appear between the widget's top border and the top of the tree's contents.

• **void margintop (int val)**
  Sets the amount of white space (in pixels) that should appear between the widget's top border and the top of the tree's contents.

• **Fl_Tree_Item * next (Fl_Tree_Item *item=0)**
  Return the next item after 'item', or 0 if no more items.

• **Fl_Tree_Item * next_item (Fl_Tree_Item *item, int dir=FL_Down, bool visible=false)**
  Returns next item after 'item' in direction 'dir' depending on 'visible'.

• **Fl_Tree_Item * next_selected_item (Fl_Tree_Item *item=0, int dir=FL_Down)**
  Returns the next selected item above or below 'item', depending on 'dir'.

• **Fl_Tree_Item * next_visible_item (Fl_Tree_Item *start, int dir)**
  Returns next open(), visible item above (dir==FL_Up) or below (dir==FL_Down) the specified 'item', or 0 if no more items.

• **int open (const char *path, int docallback=1)**
  Opens the item specified by 'path'.

• **int open (Fl_Tree_Item *item, int docallback=1)**
  Open the specified 'item'.

• **void open_toggle (Fl_Tree_Item *item, int docallback=1)**
  Toggle the open state of 'item'.

• **int openchild_marginbottom () const**
  Get the amount of white space (in pixels) that should appear below an open child tree's contents.

• **void openchild_marginbottom (int val)**
  Set the amount of white space (in pixels) that should appear below an open child tree's contents.

• **Fl_Opaque* openicon () const**
  Returns the icon to be used as the 'open' icon.

• **void openicon (Fl_Opaque *val)**
  Sets the icon to be used as the 'open' icon.

• **const Fl_Tree_Prefs & prefs () const**

• **Fl_Tree_Item * prev (Fl_Tree_Item *item=0)**
Return the previous item before 'item', or 0 if no more items.

- **void recalc_tree()**
  
  Schedule tree to recalc the entire tree size.

- **int remove(Fl_Tree_Item *item)**
  
  Remove the specified 'item' from the tree.

- **void resize(int, int, int, int) FL_OVERRIDE**
  
  Resizes the Fl_Group widget and all of its children.

- **Fl_Tree_Item *root()**
  
  Returns the root item.

- **void root(Fl_Tree_Item *newitem)**
  
  Sets the root item to 'newitem'.

- **void root_label(const char *new_label)**
  
  Set the label for the root item to 'new_label'.

- **int scrollbar_size() const**
  
  Gets the default size of scrollbars' troughs for this widget in pixels.

- **void scrollbar_size(int size)**
  
  Sets the pixel size of the scrollbars' troughs to 'size' for this widget, in pixels.

- **int select(const char *path, int docallback=1)**
  
  Select the item specified by 'path'.

- **int select(Fl_Tree_Item *item, int docallback=1)**
  
  Select the specified 'item'.

- **int select_all(Fl_Tree_Item *item=0, int docallback=1)**
  
  Select 'item' and all its children.

- **int select_only(Fl_Tree_Item *selitem, int docallback=1)**
  
  Select only the specified item, deselecting all others that might be selected.

- **void select_toggle(Fl_Tree_Item *item, int docallback=1)**
  
  Toggle the select state of the specified 'item'.

- **Fl_Boxtype selectbox() const**
  
  Sets the style of box used to draw selected items.

- **void selectbox(Fl_Boxtype val)**
  
  Gets the style of box used to draw selected items.

- **Fl_Tree_Select selectmode() const**
  
  Gets the tree's current selection mode.

- **void selectmode(Fl_Tree_Select val)**
  
  Sets the tree's selection mode.

- **void set_item_focus(Fl_Tree_Item *item)**
  
  Set the item that currently should have keyboard focus.

- **void show_item(Fl_Tree_Item *item)**
  
  Adjust the vertical scrollbar to show 'item' at the top of the display IF it is currently off-screen (for instance show_item_top()).

- **void show_item(Fl_Tree_Item *item, int yoff)**
  
  Adjust the vertical scrollbar so that 'item' is visible 'yoff' pixels from the top of the Fl_Tree widget's display.

- **void show_item_bottom(Fl_Tree_Item *item)**
  
  Adjust the vertical scrollbar so that 'item' is at the bottom of the display.

- **void show_item_middle(Fl_Tree_Item *item)**
  
  Adjust the vertical scrollbar so that 'item' is in the middle of the display.

- **void show_item_top(Fl_Tree_Item *item)**
  
  Adjust the vertical scrollbar so that 'item' is at the top of the display.

- **void show_self()**
  
  Print the tree as 'ascii art' to stdout.

- **int showcollapse() const**
Returns 1 if the collapse icon is enabled, 0 if not.

- **void** `showcollapse (int val)`
  Set if we should show the collapse icon or not.

- **int** `showroot () const`
  Returns 1 if the root item is to be shown, 0 if not.

- **void** `showroot (int val)`
  Set if the root item should be shown or not.

- **Fl_Tree_Sort** `sortorder () const`
  Set the default sort order used when items are added to the tree.

- **void** `sortorder (Fl_Tree_Sort val)`
  Gets the sort order used to add items to the tree.

- **Fl_Image ** `usericon () const`
  Returns the Fl_Image being used as the default user icon for all newly created items.

- **void** `usericon (Fl_Image *val)`
  Sets the Fl_Image to be used as the default user icon for all newly created items.

- **int** `usericonmarginleft () const`
  Get the amount of white space (in pixels) that should appear to the left of the usericon.

- **void** `usericonmarginleft (int val)`
  Set the amount of white space (in pixels) that should appear to the left of the usericon.

- **int** `vposition () const`
  Returns the vertical scroll position as a pixel offset.

- **void** `vposition (int pos)`
  Sets the vertical scroll offset to position `pos`.

- **int** `widgetmarginleft () const`
  Get the amount of white space (in pixels) that should appear to the left of the child Fltk widget (if any).

- **void** `widgetmarginleft (int val)`
  Set the amount of white space (in pixels) that should appear to the left of the child Fltk widget (if any).

- **Fl_Tree ()**
  Destructor.

### Protected Member Functions

- **void** `do_callback_for_item (Fl_Tree_Item *item, Fl_Tree_Reason reason)`
  Do the callback for the specified `item` using `reason`, setting the `callback_item()` and `callback_reason()`.

- **void** `draw () FL_OVERRIDE`
  Standard Fltk `draw()` method, handles drawing the tree widget.

- **void** `item_clicked (Fl_Tree_Item *val)`
  Set the item that was last clicked.

### Protected Attributes

- **Fl_Scrollbar ** `_hscroll`
  Horizontal scrollbar.

- **int ** `_th`
  Tree widget inner xywh dimension: inside borders + scrollbars.

- **int ** `_tiw`

- **int ** `_tix`

- **int ** `_tiy`

- **int ** `_toh`
  Tree widget outer xywh dimension: outside scrollbars, inside widget border.

- **int ** `_tow`

- **int ** `_tox`
• int _toy
• int _tree_h
  the calculated height of the entire tree hierarchy. See calc_tree()
• int _tree_w
  the calculated width of the entire tree hierarchy. See calc_tree()
• Fl_Scrollbar * _vscroll
  Vertical scrollbar.

Friends

• class Fl_Tree_Item

Additional Inherited Members

34.153.1 Detailed Description

Tree widget.

Figure 34.63 Fl_Tree example program

```
Fl_Tree // Top level widget
|--- Fl_Tree_Item // Items in the tree
|--- Fl_Tree_Prefs // Preferences for the tree
  |--- Fl_Tree_Connector (enum) // Connection modes
  |--- Fl_Tree_Select (enum) // Selection modes
  |--- Fl_Tree_Sort (enum) // Sort behavior

Similar to Fl_Browser, Fl_Tree is a browser of Fl_Tree_Item's arranged in a parented hierarchy, or 'tree'. Subtrees can be expanded or closed. Items can be added, deleted, inserted, sorted and re-ordered.

The tree items may also contain other FLTK widgets, like buttons, input fields, or even "custom" widgets.

The callback() is invoked depending on the value of when():

• FL_WHEN_RELEASE – callback invoked when left mouse button is released on an item
• FL_WHEN_CHANGED – callback invoked when left mouse changes selection state

The simple way to define a tree:

```
#include <FL/Fl_Tree.H>
[..]
Fl_Tree tree(X,Y,W,H);
tree.begin();
  tree.add("Flintstones/Fred");
  tree.add("Flintstones/Wilma");
  tree.add("Flintstones/Pebbles");
  tree.add("Simpsons/Homer");
  tree.add("Simpsons/Marge");
  tree.add("Simpsons/Bart");
  tree.add("Simpsons/Lisa");
tree.end();
```
FEATURES

Items can be added with add(), removed with remove(), completely cleared with clear(), inserted with insert() and insert_above(), selected/deselected with select() and deselect(), open/closed with open() and close(), positioned on the screen with show_item_top(), show_item_middle() and show_item_bottom(), item children can be swapped around with Fl_Tree_Item::swap_children(), items can be moved around with Fl_Tree_Item::move(), an item's children can be walked with Fl_Tree_Item::first() and Fl_Tree_Item::next(), an item's children can be indexed directly with Fl_Tree_Item::child() and Fl_Tree_Item::children(), items can be moved from one subtree to another with Fl_Tree_Item::deparent() and Fl_Tree_Item::reparent(), sorting can be controlled when items are add()ed via sortorder().
You can walk the entire tree with first() and next().
You can walk visible items with first_visible_item() and next_visible_item().
You can walk selected items with first_selected_item() and next_selected_item().
Items can be found by their pathname using find_item(const char *), and an item's pathname can be found with item_pathname().
The selected items' colors are controlled by selection_color() (inherited from Fl_Widget).
A hook is provided to allow you to redefine how item's labels are drawn via Fl_Tree::item_draw_callback().
Items can be interactively dragged using FL_TREE_SELECT_SINGLE_DRAGGABLE.

SELECTION OF ITEMS

The tree can have different selection behaviors controlled by selectmode(). The background color used for selected items is the Fl_Tree::selection_color(). The foreground color for selected items is controlled internally with fl_contrast().

CHILD WIDGETS

FLTK widgets (including custom widgets) can be assigned to tree items via Fl_Tree_Item::widget().

When an Fl_Tree_Item::widget() is defined, the default behavior is for the widget() to be shown in place of the item's label (if it has one). Only the widget()'s width will be used; the widget()'s x() and y() position will be managed by the tree, and the h() will track the item's height. This default behavior can be altered (ABI 1.3.1): Setting Fl_Tree::item_draw_mode()'s FL_TREE_ITEM_DRAW_LABEL_AND_WIDGET flag causes the label + widget to be displayed together in that order, and adding the FL_TREE_ITEM_HEIGHT_FROM_WIDGET flag causes widget's height to define the widget()'s height.

ICONS

The tree's open/close icons can be redefined with Fl_Tree::openicon(), Fl_Tree::closeicon(). User icons can either be changed globally with Fl_Tree::usericon(), or on a per-item basis with Fl_Tree_Item::usericon().

Various default preferences can be globally manipulated via Fl_Tree_Prefs, including colors, margins, icons, connection lines, etc.

FONTS AND COLORS

When adding new items to the tree, the new items get the defaults for fonts and colors from:
• Fl_Tree::item_labelfont() – The default item label font (default: FL_HELVETICA)
• Fl_Tree::item_labelsize() – The default item label size (default: FL_NORMAL_SIZE)
• Fl_Tree::item_labelfgcolor() – The default item label foreground color (default: FL_FOREGROUND_COLOR)
• Fl_Tree::item_labelbgcolor() – The default item label background color (default: 0xffffffff, which tree uses as 'transparent')

Each item (Fl_Tree_Item) inherits a copy of these font/color attributes when created, and each item has its own methods to let the app change these values on a per-item basis using methods of the same name:

• Fl_Tree_Item::labelfont() – The item's label font (default: FL_HELVETICA)
• Fl_Tree_Item::labelsize() – The item's label size (default: FL_NORMAL_SIZE)
• Fl_Tree_Item::labelfgcolor() – The item's label foreground color (default: FL_FOREGROUND_COLOR)
• Fl_Tree_Item::labelbgcolor() – The item's label background color (default: 0xffffffff, which uses the tree's own bg color)

CALLBACKS

The tree's callback() will be invoked when items change state or are open/closed. when() controls when mouse/keyboard events invoke the callback. callback_item() and callback_reason() can be used to determine the cause of the callback. e.g.

```c
void MyTreeCallback(Fl_Widget *w, void *data) {
    Fl_Tree *tree = (Fl_Tree*)w;
    Fl_Tree_Item *item = (Fl_Tree_Item*)tree->callback_item(); // get selected item
    switch ( tree->callback_reason() ) {
    case FL_TREE_REASON_SELECTED: [...] 
    case FL_TREE_REASON_DESELECTED: [...] 
    case FL_TREE_REASON_RESELECTED: [...] 
    case FL_TREE_REASON_OPENED: [...] 
    case FL_TREE_REASON_CLOSED: [...] 
    }
}
```

SIMPLE EXAMPLES

To find all the selected items:

```c
for ( Fl_Tree_Item *i=first_selected_item(); i; i=next_selected_item(i) )
    printf("Item %s is selected\n", i->label());
```

To get an item's full menu pathname, use Fl_Tree::item_pathname(), e.g.

```c
[..]
char pathname[256] = "???";
tree->item_pathname(pathname, sizeof(pathname), item); // eg. "Parent/Child/Item"
[..]
```

To walk all the items of the tree from top to bottom:
// Walk all the items in the tree, and print their labels
for ( Fl_Tree_Item *item = tree->first(); item; item = tree->next(item) ) {
    printf("Item: %s\n", item->label());
}

To recursively walk all the children of a particular item, define a function that uses recursion:

// Find all of the item's children and print an indented report of their labels
void my_print_all_children(Fl_Tree_Item *item, int indent=0) {
    for ( int t=0; t<item->children(); t++ ) {
        printf("%*s Item: %s\n", indent, "", item->child(t)->label());
        my_print_all_children(item->child(t), indent+4); // recurse
    }
}

To change the default label font and color when creating new items:

tree = new Fl_Tree(...);
tree->item_labelfont(FL_COURIER); // Use Courier font for all new items
tree->item_labelfgcolor(FL_RED); // Use red color for labels of all new items
[..]
// Now create the items in the tree using the above defaults.
tree->add("Aaa");
tree->add("Bbb");

To change the font and color of all existing items in the tree:

// Change the font and color of all items currently in the tree
for ( Fl_Tree_Item *item = tree->first(); item; item = tree->next(item) ) {
    item->labelfont(FL_COURIER);
    item->labelcolor(FL_RED);
}

DISPLAY DESCRIPTION

The following image shows the tree's various visual elements and the methods that control them:

Figure 34.64 Fl_Tree elements
The following shows the protected dimension variables 'tree inner' (tix..) and 'tree outer' (tox..):

![Figure 34.65 Fl_Tree inner/outer dimensions](image)

**KEYBOARD BINDINGS**

The following table lists keyboard bindings for navigating the tree:

<table>
<thead>
<tr>
<th>Keyboard</th>
<th>FL_TREE_SELECT&lt;-&gt;MULTI</th>
<th>FL_TREE_SELECT&lt;-&gt;SINGLE</th>
<th>FL_TREE_SELECT&lt;-&gt;NONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl-A (Linux/Windows)</td>
<td>Select all items</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Command-A (Mac)</td>
<td>Select all items</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Space</td>
<td>Selects item</td>
<td>Selects item</td>
<td>N/A</td>
</tr>
<tr>
<td>Ctrl-Space</td>
<td>Toggle item</td>
<td>Toggle item</td>
<td>N/A</td>
</tr>
<tr>
<td>Shift-Space</td>
<td>Extends selection</td>
<td>Selects item</td>
<td>N/A</td>
</tr>
<tr>
<td>Enter</td>
<td>Toggles open/close</td>
<td>Toggles open/close</td>
<td>Toggles open/close</td>
</tr>
<tr>
<td>Ctrl-Enter</td>
<td>Toggles open/close</td>
<td>Toggles open/close</td>
<td>Toggles open/close</td>
</tr>
<tr>
<td>Shift-Enter</td>
<td>Toggles open/close</td>
<td>Toggles open/close</td>
<td>Toggles open/close</td>
</tr>
<tr>
<td>Right / Left</td>
<td>Open/Close item</td>
<td>Open/Close item</td>
<td>Open/Close item</td>
</tr>
<tr>
<td>Up / Down</td>
<td>Move focus box up/down</td>
<td>Move focus box up/down</td>
<td>N/A</td>
</tr>
<tr>
<td>Shift-Up / Shift-Down</td>
<td>Extend selection up/down</td>
<td>Move focus up/down</td>
<td>N/A</td>
</tr>
<tr>
<td>Home / End</td>
<td>Move to top/bottom of tree</td>
<td>Move to top/bottom of tree</td>
<td>Move to top/bottom of tree</td>
</tr>
<tr>
<td>PageUp / PageDown</td>
<td>Page up/down</td>
<td>Page up/down</td>
<td>Page up/down</td>
</tr>
</tbody>
</table>

### 34.153.2 Member Function Documentation

#### 34.153.2.1 add() [1/2]

```cpp
Fl_Tree_Item * Fl_Tree::add (const char * path,
```
Fl_Tree_Item * item = 0

Adds a new item, given a menu style 'path'.
Any parent nodes that don't already exist are created automatically. Adds the item based on the value of sortorder().
If 'item' is NULL, a new item is created.

To specify items or submenus that contain slashes ('/' or '\') use an escape character to protect them, e.g.

```
: tree->add("/Holidays/Photos/12\25\2010");   // Adds item "12/25/2010"
: tree->add("/Pathnames/c:\Program Files\MyApp"); // Adds item "c:\Program Files\MyApp"
```

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>path</th>
<th>The path to the item, e.g. &quot;Flintstone/Fred&quot;.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>item</td>
<td>The new item to be added. If NULL, a new item is created with a name that is the last element in 'path'.</td>
</tr>
</tbody>
</table>

Returns

The new item added, or 0 on error.

Version

1.3.3

### 34.153.2.2 add() [2/2]

Fl_Tree_Item * Fl_Tree::add (  
    Fl_Tree_Item * parent_item,  
    const char * name )

Add a new child item labeled 'name' to the specified 'parent_item'.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>parent_item</th>
<th>The parent item the new child item will be added to. Must not be NULL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>name</td>
<td>The label for the new item</td>
</tr>
</tbody>
</table>

Returns

The new item added.

Version

1.3.0 release

### 34.153.2.3 calc_dimensions()

void Fl_Tree::calc_dimensions ( )

Recalculate widget dimensions and scrollbar visibility, normally managed automatically.
Low overhead way to update the tree widget's outer/inner dimensions and re-determine scrollbar visibility based on these changes without recalculating the entire size of the tree data.
Assumes that either the tree's size in _tree_w/_tree_h are correct so that scrollbar visibility can be calculated easily, or are both zero indicating scrollbar visibility can't be calculated yet.
This method is called when the widget is resized or if the scrollbar's sizes are changed (affects tree widget's inner dimensions tix/y/w/h), and also used by calc_tree().
34.153.2.4 calc_tree()

```cpp
void Fl_Tree::calc_tree() { }
```

Recalculates the tree’s sizes and scrollbar visibility, normally managed automatically.

On return:

- `_tree_w` will be the overall pixel width of the entire viewable tree
- `_tree_h` will be the overall pixel height
- Scrollbar visibility and pan sizes are updated
- Internal `_tix`/`_tiy`/`_tiw`/`_tih` dimensions are updated

These dimensions include the tree’s margins (e.g. `marginleft()`), whether items are open or closed, label contents and font sizes, etc.

The tree hierarchy’s size is managed separately from the widget’s size as an optimization; this way `resize()` on the widget doesn’t involve recalculating the tree’s hierarchy needlessly, as widget size has no bearing on the tree hierarchy.

The tree hierarchy’s size only changes when items are added/removed, open/closed, label contents or font sizes changed, margins changed, etc.

This calculation involves walking the entire tree from top to bottom, potentially a slow calculation if the tree has many items (potentially hundreds of thousands), and should therefore be called sparingly.

For this reason, `recalc_tree()` is used as a way to /schedule/ calculation when changes affect the tree hierarchy’s size.

Apps may want to call this method directly if the app makes changes to the tree’s geometry, then immediately needs to work with the tree’s new dimensions before an actual redraw (and recalc) occurs. (This use by an app should only rarely be needed)

34.153.2.5 callback_item() [1/2]

```cpp
Fl_Tree_Item * Fl_Tree::callback_item() { }
```

Gets the item that caused the callback.

The `callback()` can use this value to see which item changed.

34.153.2.6 callback_item() [2/2]

```cpp
void Fl_Tree::callback_item(Fl_Tree_Item *item)
```

Sets the item that was changed for this callback.

Used internally to pass the item that invoked the callback.

34.153.2.7 callback_reason() [1/2]

```cpp
Fl_Tree_Reason Fl_Tree::callback_reason() const
```

Gets the reason for this callback.

The `callback()` can use this value to see why it was called. Example:

```cpp
void MyTreeCallback(Fl_Widget *w, void *userdata) {
  Fl_Tree *tree = (Fl_Tree*)w;
  Fl_Tree_Item *item = tree->callback_item(); // the item changed (can be NULL if more than one item was changed)
  switch (tree->callback_reason()) { // reason callback was invoked
    case FL_TREE_REASON_OPENED: ..item was opened..
    case FL_TREE_REASON_CLOSED: ..item was closed..
    case FL_TREE_REASON_SELECTED: ..item was selected..
    case FL_TREE_REASON_RESELECTED: ..item was reselected (double-clicked, etc)..
    case FL_TREE_REASON_DESELECTED: ..item was deselected..
  }
}
```
See also

- `item_reselect_mode()` – enables `FL_TREE_REASON_RESELECTED` events

### 34.153.2.8 callback_reason() [2/2]

```cpp
def callback_reason(reason)
```

Sets the reason for this callback.
Used internally to pass the reason the callback was invoked.

### 34.153.2.9 clear()

```cpp
def clear()
```

Clear the entire tree's children, including the root.
The tree will be left completely empty.

### 34.153.2.10 clear_children()

```cpp
def clear_children(item)
```

Clear all the children for 'item'.
Item may not be NULL.

### 34.153.2.11 close() [1/2]

```cpp
def close(path, docallback = 1)
```

Closes the item specified by 'path'.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling `redraw()` if anything changed.
Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. close("Holidays/12\12/25\12/2010").
The callback can use `callback_item()` and `callback_reason()` respectively to determine the item changed and the reason the callback was called.

#### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>path</th>
<th>– the tree item's pathname (e.g. &quot;Flintstones/Fred&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallback</td>
<td>– A flag that determines if the callback() is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 0 - callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - callback() is invoked if item changed (default), callback_reason() will be</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FL_TREE_REASON_CLOSED</td>
</tr>
</tbody>
</table>

#### Returns

- 1 – OK: item closed
- 0 – OK: item was already closed, no change
- -1 – ERROR: item was not found
34.153.2.12 close() [2/2]

```c
int Fl_Tree::close (  
    Fl_Tree_Item * item,  
    int docallback = 1 )
```

Closes the specified 'item'.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling `redraw()` if anything changed.
The callback can use `callback_item()` and `callback_reason()` respectively to determine the item changed and the reason the callback was called.

### Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>item</td>
<td>the item to be closed. Must not be NULL.</td>
</tr>
<tr>
<td>in</td>
<td>docallback</td>
<td>A flag that determines if the callback() is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 0 - callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - callback() is invoked if item changed (default), callback_reason() will be FL_TREE_REASON_CLOSED</td>
</tr>
</tbody>
</table>

### Returns

- 1 – item was closed
- 0 – item was already closed, no change

See also

- `open()`, `close()`, `is_open()`, `is_close()`, `callback_item()`, `callback_reason()`

34.153.2.13 closeicon() [1/2]

```c
Fl_Image * Fl_Tree::closeicon ( ) const
```

Returns the icon to be used as the 'close' icon.
If none was set, the internal default is returned, a simple '[-]' icon.

34.153.2.14 closeicon() [2/2]

```c
void Fl_Tree::closeicon (  
    Fl_Image * val )
```

Sets the icon to be used as the 'close' icon.
This overrides the built in default '[-]' icon.

### Parameters

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>val</td>
<td>The new image, or zero to use the default [-] icon.</td>
</tr>
</tbody>
</table>
34.153.2.15 connectorstyle()

```cpp
void Fl_Tree::connectorstyle ( Fl_Tree_Connector val )
```

Sets the line drawing style for inter-connecting items. See Fl_Tree_Connector for possible values.

34.153.2.16 deselect() [1/2]

```cpp
int Fl_Tree::deselect ( const char * path, int docallback = 1 )
```

Deselect an item specified by 'path'.

Invokes the callback depending on the value of optional parameter 'docallback'. Handles calling redraw() if anything changed.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. deselect("Holidays/12\25\2010").

The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>path</th>
<th>- the tree item's pathname (e.g. &quot;Flintstones/Fred&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallback</td>
<td>- A flag that determines if the callback() is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 0 - the callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - the callback() is invoked if item changed state (default), callback_reason() will be FL_TREE_REASON_DESELECTED</td>
</tr>
</tbody>
</table>

**Returns**

- 1 - OK: item's state was changed
- 0 - OK: item was already deselected, no change was made
- -1 - ERROR: item was not found

34.153.2.17 deselect() [2/2]

```cpp
int Fl_Tree::deselect ( Fl_Tree_Item * item, int docallback = 1 )
```

Deselect the specified item.

Invokes the callback depending on the value of optional parameter 'docallback'. Handles calling redraw() if anything changed.

The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>- the item to be deselected. Must not be NULL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallback</td>
<td>- A flag that determines if the callback() is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 0 - the callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - the callback() is invoked if item changed state (default), callback_reason() will be FL_TREE_REASON_DESELECTED</td>
</tr>
</tbody>
</table>
Returns

- 0 - item was already deselected, no change was made
- 1 - item's state was changed

### 34.153.2.18 deselect_all()

```c
int Fl_Tree::deselect_all (Fl_Tree_Item * item = 0, int docallback = 1)
```

Deselect `item' and all its children. If item is NULL, `first()' is used.
Invokes the callback depending on the value of optional parameter `docallback'.
Handles calling `redraw()' if anything changed.
The callback can use `callback_item()' and `callback_reason()' respectively to determine the item changed and the
reason the callback was called.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The item that will be deselected (along with all its children). If NULL, `first()' is used.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallback</td>
<td>- A flag that determines if the `callback()' is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 0 - the `callback()' is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1 - the `callback()' is invoked for each item that changed state (default),</td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>callback_reason()' will be </code>FL_TREE_REASON_DESELECTED`</td>
</tr>
</tbody>
</table>

Returns

Count of how many items were actually changed to the deselected state.

### 34.153.2.19 display()

```c
void Fl_Tree::display (Fl_Tree_Item * item)
```

Displays `item', scrolling the tree as necessary.

**Parameters**

| in   | item | The item to be displayed. If NULL, `first()' is used.                                      |

### 34.153.2.20 displayed()

```c
int Fl_Tree::displayed (Fl_Tree_Item * item)
```

See if `item' is currently displayed on-screen (visible within the widget).
This can be used to detect if the item is scrolled off-screen. Checks to see if the item's vertical position is within the
top and bottom edges of the display window. This does NOT take into account the `hide()' / `show()' or `open()' / `close()' status of the item.

**Parameters**

| in   | item | The item to be checked. If NULL, `first()' is used.                                        |
Returns

1 if displayed, 0 if scrolled off screen or no items are in tree.

34.153.2.21 draw()

decl void Fl_Tree::draw () [protected], [virtual]

Standard FLTK draw() method, handles drawing the tree widget.
Reimplemented from Fl_Group.

34.153.2.22 extend_selection()

int Fl_Tree::extend_selection (Fl_Tree_Item * from, Fl_Tree_Item * to, int val = 1, bool visible = false)

Extend a selection between 'from' and 'to' depending on 'visible'.
Similar to the more efficient extend_selection_dir(Fl_Tree_Item*,Fl_Tree_Item*,int dir,int val,bool vis) method, but
direction (up or down) doesn't need to be known.
We're less efficient because we search the tree for to/from, then operate on items in between. The more efficient
method avoids the "search", but necessitates a direction to be specified to find 'to'.
Used by SHIFT-click to extend a selection between two items inclusive.
Handles calling redraw() if anything changed.

Parameters

<table>
<thead>
<tr>
<th>in from</th>
<th>Starting item</th>
</tr>
</thead>
<tbody>
<tr>
<td>in to</td>
<td>Ending item</td>
</tr>
<tr>
<td>in val</td>
<td>Select or deselect items (0=deselect, 1=select, 2=toggle)</td>
</tr>
<tr>
<td>in visible</td>
<td>true=affect only open(), visible items, false=affect open or closed items (default)</td>
</tr>
</tbody>
</table>

Returns

The number of items whose selection states were changed, if any.

Version

1.3.3 ABI feature

34.153.2.23 extend_selection_dir()

int Fl_Tree::extend_selection_dir (Fl_Tree_Item * from, Fl_Tree_Item * to, int dir, int val, bool visible)

Extend the selection between and including 'from' and 'to' depending on direction 'dir', 'val', and 'visible'.
Efficient: does not walk entire tree; starts with 'from' and stops at 'to' while moving in direction 'dir'. Dir
must be specified though.
If dir cannot be known in advance, such as during SHIFT-click operations, the method `extend_selection(Fl_Tree_Item*, Fl_Tree_Item*, int, bool)` should be used. Handles calling `redraw()` if anything changed.

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>from</th>
<th>Starting item</th>
</tr>
</thead>
<tbody>
<tr>
<td>to</td>
<td>Ending item</td>
<td></td>
</tr>
<tr>
<td>dir</td>
<td>Direction to extend selection (FL_Up or FL_Down)</td>
<td></td>
</tr>
<tr>
<td>val</td>
<td>0=deselect, 1=select, 2=toggle</td>
<td></td>
</tr>
<tr>
<td>visible</td>
<td>true=affect only <code>open()</code>, visible items, false=affect open or closed items (default)</td>
<td></td>
</tr>
</tbody>
</table>

### Returns

The number of items whose selection states were changed, if any.

### Version

1.3.3

#### 34.153.2.24 find_clicked()

```cpp
class Fl_Tree { 
public:
  Fl_Tree_Item* find_clicked (int yonly = 0) const;
};
```

Find the item that was last clicked on. You should use `callback_item()` instead, which is fast, and is meant to be used within a callback to determine the item clicked. This method walks the entire tree looking for the first item that is under the mouse. (The value of the 'yonly' flag affects whether both x and y events are checked, or just y) Use this method /only/ if you've subclassed Fl_Tree, and are receiving events before Fl_Tree has been able to process and update `callback_item()`.

### Parameters

| in   | yonly | – 0: check both event's X and Y values. – 1: only check event's Y value, don't care about X. | |

### Returns

The item clicked, or NULL if no item was under the current event.

### Version

1.3.0

1.3.3 ABI feature: added yonly parameter

#### 34.153.2.25 find_item()

```cpp
class Fl_Tree { 
public:
  Fl_Tree_Item* find_item (const char* path) const;
};
```

Find the item, given a menu style path, e.g. "/Parent/Child/item". There is both a const and non-const version of this method. Const version allows pure const methods to use this method to do lookups without causing compiler errors. To specify items or submenus that contain slashes ("/" or ") use an escape character to protect them, e.g.
Parameters

in path – the tree item's pathname to be found (e.g. "Flintstones/Fred")

Returns

The item, or NULL if not found.

See also

item_pathname()

34.153.2.26 first()

Fl_Tree_Item * Fl_Tree::first ()

Returns the first item in the tree, or 0 if none.

Use this to walk the tree in the forward direction, e.g.

```c
for ( Fl_Tree_Item *item = tree->first(); item; item = tree->next(item) )
    printf("Item: %s\n", item->label());
```

Returns

First item in tree, or 0 if none (tree empty).

See also

first(), next(), last(), prev()

34.153.2.27 first_selected_item()

Fl_Tree_Item * Fl_Tree::first_selected_item ()

Returns the first selected item in the tree.

Use this to walk the tree from top to bottom looking for all the selected items, e.g.

```c
// Walk tree forward, from top to bottom
for ( Fl_Tree_Item *i=tree->first_selected_item(); i; i=tree->next_selected_item(i) )
    printf("Selected item: %s\n", i->label());
```

Returns

The first selected item, or 0 if none.

See also

first_selected_item(), last_selected_item(), next_selected_item()
34.153.2.28  first_visible()

*Fl_Tree_Item * Fl_Tree::first_visible ( )

Returns the first open(), visible item in the tree, or 0 if none.

**Deprecated** in 1.3.3 ABI – use first_visible_item() instead.

34.153.2.29  first_visible_item()

*Fl_Tree_Item * Fl_Tree::first_visible_item ( )

Returns the first open(), visible item in the tree, or 0 if none.

Returns

First visible item in tree, or 0 if none.

See also

first_visible_item(), last_visible_item(), next_visible_item()

Version

1.3.3

34.153.2.30  get_selected_items()

int Fl_Tree::get_selected_items ( Fl_Tree_Item_Array & ret_items )

Returns the currently selected items as an array of 'ret_items'.

Example:

```c
// Get selected items as an array
Fl_Tree_Item_Array items;
tree->get_selected_items(items);

// Manipulate the returned array
for ( int t=0; t<items.total(); t++ ) {
    Fl_Tree_Item item = items[t];
    ..do stuff with each selected item..
}
```

Parameters

| out | ret_items | The returned array of selected items. |

Returns

The number of items in the returned array.

See also

first_selected_item(), next_selected_item()

Version

1.3.3 ABI feature
### 34.153.2.31 handle()

```cpp
int Fl_Tree::handle ( int e ) [virtual]
```

Standard FLTK event handler for this widget.

**Todo** add Fl_Widget_Tracker (see Fl_Browser_cxx::handle())

Reimplemented from Fl_Group.

### 34.153.2.32 hposition() [1/2]

```cpp
int Fl_Tree::hposition ( ) const
```

Returns the horizontal scroll position as a pixel offset. The position returned is how many pixels of the tree are scrolled off the left edge of the screen.

See also

hposition(int), vposition(), vposition(int)

**Note**

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

### 34.153.2.32 hposition() [2/2]

```cpp
void Fl_Tree::hposition ( int pos )
```

Sets the horizontal scroll offset to position `pos`. The position is how many pixels of the tree are scrolled off the left edge of the screen.

**Parameters**

| in  | pos  | The vertical position (in pixels) to scroll the tree to. |

See also

hposition(), vposition(), vposition(int)

**Note**

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

### 34.153.2.34 insert()

```cpp
Fl_Tree_Item * Fl_Tree::insert ( Fl_Tree_Item * item, const char * name, int pos )
```

Insert a new item `name` into `item`'s children at position `pos`. If `pos` is out of range the new item is

- prepended if `pos < 0`
- appended if `pos > item->children()`.

**Note**: `pos == children()` is not considered out of range: the item is appended to the child list.

**Example:**

Generated by Doxygen
tree->add("Aaa/000"); // "000" is index 0 in Aaa's children
tree->add("Aaa/111"); // "111" is index 1 in Aaa's children

tree->add("Aaa/222"); // "222" is index 2 in Aaa's children

// How to use insert() to insert a new item between Aaa/111 + Aaa/222
Fl_Tree_Item *item = tree->find_item("Aaa"); // get parent item Aaa
if (item) tree->insert(item, "New item", 2); // insert as a child of Aaa at index 2

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The existing item to insert new child into. Must not be NULL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>name</td>
<td>The label for the new item</td>
</tr>
<tr>
<td>in</td>
<td>pos</td>
<td>The position of the new item in the child list</td>
</tr>
</tbody>
</table>

Returns

The new item added.

See also

insert_above()

34.153.2.35 insert_above()

Fl_Tree_Item * Fl_Tree::insert_above ( Fl_Tree_Item * above, const char * name )

Inserts a new item 'name' above the specified Fl_Tree_Item 'above'.

Example:

// How to use insert_above() to insert a new item above Aaa/222
Fl_Tree_Item *item = tree->find_item("Aaa/222"); // get item Aaa/222
if (item) tree->insert_above(item, "New item"); // insert new item above it

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>above</th>
<th>the item above which to insert the new item. Must not be NULL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>name</td>
<td>the name of the new item</td>
</tr>
</tbody>
</table>

Returns

The new item added, or 0 if 'above' could not be found.

See also

insert()

34.153.2.36 is_close() [1/2]

int Fl_Tree::is_close ( const char * path ) const
See if item specified by 'path' is closed. Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. is_close("Holidays/12\25\2010").

**Parameters**

| in | path | the tree item's pathname (e.g. "Flintstones/Fred") |

**Returns**

- 1: OK, item is closed
- 0: OK, item is open
- -1: ERROR, item was not found

---

### is_close() [2/2]

```cpp
int Fl_Tree::is_close (Fl_Tree_Item * item) const
```

See if the specified 'item' is closed.

**Parameters**

| in | item | the item to be tested. Must not be NULL. |

**Returns**

- 1: item is closed
- 0: item is open

---

### is_hscroll_visible()

```cpp
int Fl_Tree::is_hscroll_visible () const
```

See if the horizontal scrollbar is currently visible.

**Returns**

1 if scrollbar visible, 0 if not.

**Note**

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

---

### is_open() [1/2]

```cpp
int Fl_Tree::is_open (const char * path) const
```

See if item specified by 'path' is open. Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. is_open("Holidays/12\25\2010"). Items that are 'open' are themselves not necessarily visible; one of the item's parents might be closed.

**Parameters**

| in | path | the tree item's pathname (e.g. "Flintstones/Fred") |
Returns

- 1 - OK: item is open
- 0 - OK: item is closed
- -1 - ERROR: item was not found

See also

\[ \text{Fl_Tree_Item::visible()} \]

34.153.2.40 \hspace{1em} \textbf{is_open()} [2/2]

\begin{verbatim}
int Fl_Tree::is_open ( Fl_Tree_Item * item ) const
\end{verbatim}

See if 'item' is open.
Items that are 'open' are themselves not necessarily visible; one of the item's parents might be closed.

Parameters

\begin{verbatim}
in item -- the item to be tested. Must not be NULL.
\end{verbatim}

Returns

- 1 : item is open
- 0 : item is closed

34.153.2.41 \hspace{1em} \textbf{is_scrollbar()}

\begin{verbatim}
int Fl_Tree::is_scrollbar ( Fl_Widget * w )
\end{verbatim}

See if widget 'w' is one of the \texttt{Fl_Tree} widget's scrollbars.
Use this to skip over the scrollbars when walking the \texttt{child()} array. Example:

\begin{verbatim}
for ( int i=0; i<tree->children(); i++ ) { // walk children
    Fl_Widget *w = tree->child(i);
    if ( tree->is_scrollbar(w) ) continue; // skip scrollbars
    ..do work here..
}
\end{verbatim}

Parameters

\begin{verbatim}
in w -- Widget to test
\end{verbatim}

Returns

1 if \texttt{w} is a scrollbar, 0 if not.

Todo should be const

34.153.2.42 \hspace{1em} \textbf{is_selected()} [1/2]

\begin{verbatim}
int Fl_Tree::is_selected ( const char * path )
\end{verbatim}
See if item specified by 'path' is selected. Items or submenus that themselves contain slashes ("/") should be escaped, e.g. is_selected(“Holidays/12\25\22010”).

Parameters
- **path** – the tree item’s pathname (e.g. "Flintstones/Fred")

Returns
- 1 : item selected
- 0 : item deselected
- -1 : item was not found

34.153.2.43 is_selected() [2/2]

```cpp
int Fl_Tree::is_selected ( Fl_Tree_Item * item ) const
```

See if the specified 'item' is selected.

Parameters
- **item** – the item to be tested. Must not be NULL.

Returns
- 1 : item selected
- 0 : item deselected

34.153.2.44 is_vscroll_visible()

```cpp
int Fl_Tree::is_vscroll_visible ( ) const
```

See if the vertical scrollbar is currently visible.

Returns
- 1 if scrollbar visible, 0 if not.

34.153.2.45 item_clicked() [1/2]

```cpp
Fl_Tree_Item * Fl_Tree::item_clicked ( )
```

Return the item that was last clicked.
Valid only from within the `callback()`.

Returns
- The item clicked, or 0 if none. 0 may also be used to indicate several items were clicked/changed.

**Deprecated** in 1.3.3 ABI – use `callback_item()` instead.
34.153.2.46 item_clicked() [2/2]

```cpp
void Fl_Tree::item_clicked ( Fl_Tree_Item * item ) [protected]
```

Set the item that was last clicked. Should only be used by subclasses needing to change this value. Normally `Fl_Tree` manages this value.

**Deprecated** in 1.3.3 ABI – use `callback_item()` instead.

34.153.2.47 item_draw_mode() [1/3]

```cpp
Fl_Tree_Item_Draw_Mode Fl_Tree::item_draw_mode ( ) const
```

Get the 'item draw mode' used for the tree.

**Version**

1.3.1 ABI feature

34.153.2.48 item_draw_mode() [2/3]

```cpp
void Fl_Tree::item_draw_mode ( Fl_Tree_Item_Draw_Mode mode )
```

Set the 'item draw mode' used for the tree to 'mode'. This affects how items in the tree are drawn, such as when a widget() is defined. See `Fl_Tree_Item_Draw_Mode` for possible values.

**Version**

1.3.1 ABI feature

34.153.2.49 item_draw_mode() [3/3]

```cpp
void Fl_Tree::item_draw_mode ( int mode )
```

Set the 'item draw mode' used for the tree to integer 'mode'. This affects how items in the tree are drawn, such as when a widget() is defined. See `Fl_Tree_Item_Draw_Mode` for possible values.

**Version**

1.3.1 ABI feature

34.153.2.50 item_labelbgcolor() [1/2]

```cpp
void Fl_Tree::item_labelbgcolor ( Fl_Color val )
```

Set the default label background color used for creating new items. A special case is made for color 0xffffffff (default) which is treated as 'transparent'. To change the background color on a per-item basis, use `Fl_Tree_Item::labelbgcolor(Fl_Color)`

34.153.2.51 item_labelbgcolor() [2/2]

```cpp
Fl_Color Fl_Tree::item_labelbgcolor ( void ) const
```

Get the default label background color used for creating new items. If the color is 0xffffffff, it is 'transparent'.

---

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34.153.2.52 item_labelfgcolor()

void Fl_Tree::item_labelfgcolor (Fl_Color val)

Set the default label foreground color used for creating new items.
To change the foreground color on a per-item basis, use Fl_Tree_Item::labelfgcolor(Fl_Color)

34.153.2.53 item_labelfont()

void Fl_Tree::item_labelfont (Fl_Font val)

Set the default font face used for creating new items.
To change the font face on a per-item basis, use Fl_Tree_Item::labelfont(Fl_Font)

34.153.2.54 item_labelsize()

void Fl_Tree::item_labelsize (Fl_Fontsize val)

Set the default label font size used for creating new items.
To change the font size on a per-item basis, use Fl_Tree_Item::labelsize(Fl_Fontsize)

34.153.2.55 item_pathname()

int Fl_Tree::item_pathname (char * pathname, int pathnamelen, const Fl_Tree_Item * item) const

Return 'pathname' of size 'pathnamelen' for the specified 'item'.
If 'item' is NULL, root() is used.
The tree's root will be included in the pathname if showroot() is on.
Menu items or submenus that contain slashes ('/' or '\') in their names will be escaped with a backslash. This is
symmetrical with the add() function which uses the same escape pattern to set names.

Parameters

| out  | pathname | The string to use to return the pathname |
| in   | pathnamelen | The maximum length of the string (including NULL). Must not be zero. |
| in   | item      | The item whose pathname is to be returned. |

Returns

- 0 : OK (pathname returns the item's pathname)
- -1 : item not found (pathname="")
- -2 : pathname not large enough (pathname="")

See also

find_item()

34.153.2.56 item_reselect_mode() [1/2]

Fl_Tree_Item_Reselect_Mode Fl_Tree::item_reselect_mode () const

Returns the current item re/selection mode.

Version

1.3.1 ABI feature
34.153.2.57 item_reselect_mode() [2/2]

```cpp
void Fl_Tree::item_reselect_mode (
    Fl_Tree_Item_Reselect_Mode mode)
```

Sets the item re/selection mode.
See Fl_Tree_Item_Reselect_Mode for possible values.

Version

1.3.1 ABI feature

34.153.2.58 last()

```cpp
Fl_Tree_Item * Fl_Tree::last ( )
```

Returns the last item in the tree.
This can be used to walk the tree in reverse, e.g.

```cpp
for ( Fl_Tree_Item *item = tree->last(); item; item = tree->prev() )
    printf("Item: %s\n", item->label());
```

Returns

Last item in the tree, or 0 if none (tree empty).

See also

first(), next(), last(), prev()

34.153.2.59 last_selected_item()

```cpp
Fl_Tree_Item * Fl_Tree::last_selected_item ( )
```

Returns the last selected item in the tree.
Use this to walk the tree in reverse from bottom to top looking for all the selected items, e.g.

```cpp
// Walk tree in reverse, from bottom to top
for ( Fl_Tree_Item *i=tree->last_selected_item(); i; i=tree->next_selected_item(i, FL_Up) )
    printf("Selected item: %s\n", i->label());
```

Returns

The last selected item, or 0 if none.

See also

first_selected_item(), last_selected_item(), next_selected_item()

Version

1.3.3

34.153.2.60 last_visible()

```cpp
Fl_Tree_Item * Fl_Tree::last_visible ( )
```

Returns the last open(), visible item in the tree.

**Deprecated** in 1.3.3 – use last_visible_item() instead.
34.153.2.61  last_visible_item()

```c
Fl_Tree_Item * Fl_Tree::last_visible_item ( )
```

Returns the last open(), visible item in the tree.

Returns

Last visible item in the tree, or 0 if none.

See also

first_visible_item(), last_visible_item(), next_visible_item()

Version

1.3.3

34.153.2.62  load()

```c
void Fl_Tree::load ( class Fl_Preferences & prefs )
```

Load FLTK preferences.

Read a preferences database into the tree widget.

A preferences database is a hierarchical collection of data which can be directly loaded into the tree view for inspection.

Parameters

| in | prefs | the Fl_Preferences database |

34.153.2.63  next()

```c
Fl_Tree_Item * Fl_Tree::next ( Fl_Tree_Item * item = 0 )
```

Return the next item after 'item', or 0 if no more items.

Use this code to walk the entire tree:

```c
for ( Fl_Tree_Item *i = tree->first(); i; i = tree->next(i) )
    printf("Item: %s\n", i->label());
```

Parameters

| in | item | The item to use to find the next item. If NULL, returns 0. |

Returns

Next item in tree, or 0 if at last item.

See also

first(), next(), last(), prev()
34.153.2.64  next_item()

Fl_Tree_Item * Fl_Tree::next_item (  
    Fl_Tree_Item * item,  
    int dir = FL_Down,  
    bool visible = false  
)

Returns next item after 'item' in direction 'dir' depending on 'visible'.  
Next item will be above (if dir==FL_Up) or below (if dir==FL_Down). If 'visible' is true, only items whose parents are open() will be returned. If 'visible' is false, even items whose parents are close()ed will be returned.  
If item is 0, the return value will be the result of this truth table:

<table>
<thead>
<tr>
<th>dir=FL_Up:</th>
<th>dir=FL_Down:</th>
</tr>
</thead>
<tbody>
<tr>
<td>visible=true</td>
<td>last_visible_item()</td>
</tr>
<tr>
<td>visible=false</td>
<td>last()</td>
</tr>
</tbody>
</table>

Example use:

:  
// Walk down the tree showing open(), visible items  
for ( Fl_Tree_Item *i=tree->first_visible_item(); i; i=tree->next_item(i, FL_Down, true) )  
    printf("Item: %s\n", i->label());  
// Walk up the tree showing open(), visible items  
for ( Fl_Tree_Item *i=tree->last_visible_item(); i; i=tree->next_item(i, FL_Up, true) )  
    printf("Item: %s\n", i->label());  
// Walk down the tree showing all items (open or closed)  
for ( Fl_Tree_Item *i=tree->first(); i; i=tree->next_item(i, FL_Down, false) )  
    printf("Item: %s\n", i->label());  
// Walk up the tree showing all items (open or closed)  
for ( Fl_Tree_Item *i=tree->last(); i; i=tree->next_item(i, FL_Up, false) )  
    printf("Item: %s\n", i->label());  
:

Parameters

| in | item | The item to use to find the next item. If NULL, returns 0. |
| in | dir | Can be FL_Up or FL_Down (default=FL_Down or 'next') |
| in | visible | true=return only open(), visible items,  
| | | false=return open or closed items (default) |

Returns

Next item in tree in the direction and visibility specified, or 0 if no more items of specified visibility in that direction.

See also

first(), last(), next(),  
first_visible_item(), last_visible_item(), next_visible_item(),  
first_selected_item(), last_selected_item(), next_selected_item()

Version

1.3.3

34.153.2.65  next_selected_item()

Fl_Tree_Item * Fl_Tree::next_selected_item (  
    Fl_Tree_Item * item = 0,  
    int dir = FL_Down  
)

Returns the next selected item above or below 'item', depending on 'dir'.
If 'item' is 0, search starts at either first() or last(), depending on 'dir': first() if 'dir' is FL_Down (default), last() if 'dir' is FL_Up.

Use this to walk the tree looking for all the selected items, e.g.

```c
// Walk down the tree (forwards)
for ( Fl_Tree_Item *i=tree->first_selected_item(); i; i=tree->next_selected_item(i, FL_Down) )
  printf("Item: %s\n", i->label());
// Walk up the tree (backwards)
for ( Fl_Tree_Item *i=tree->last_selected_item(); i; i=tree->next_selected_item(i, FL_Up) )
  printf("Item: %s\n", i->label());
```

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The item above or below which we'll find the next selected item. If NULL, first() is used if FL_Down, last() if FL_Up. (default=NULL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>dir</td>
<td>The direction to go. FL_Up for moving up the tree, FL_Down for down the tree (default)</td>
</tr>
</tbody>
</table>

### Returns

The next selected item, or 0 if there are no more selected items.

See also

- first_selected_item(), last_selected_item(), next_selected_item()

### Version

1.3.3

---

34.153.2.66 next_visible_item()

```c
Fl_Tree_Item * Fl_Tree::next_visible_item ( Fl_Tree_Item *item, int dir )
```

Returns next open(), visible item above (dir==FL_Up) or below (dir==FL_Down) the specified 'item', or 0 if no more items.

If 'item' is 0, returns last() if 'dir' is FL_Up, or first() if dir is FL_Down.

```c
// Walk down the tree (forwards)
for ( Fl_Tree_Item *i=tree->first_visible_item(); i; i=tree->next_visible_item(i, FL_Down) )
  printf("Item: %s\n", i->label());
// Walk up the tree (backwards)
for ( Fl_Tree_Item *i=tree->last_visible_item(); i; i=tree->next_visible_item(i, FL_Up) )
  printf("Item: %s\n", i->label());
```

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The item above/below which we'll find the next visible item</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>dir</td>
<td>The direction to search. Can be FL_Up or FL_Down.</td>
</tr>
</tbody>
</table>

### Returns

The item found, or 0 if there's no visible items above/below the specified item.
34.153.2.67  open() [1/2]

int Fl_Tree::open {
    const char * path,
    int docallback = 1
}

Opens the item specified by 'path'.
This causes the item's children (if any) to be shown.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling redraw() if anything changed.
Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. open("Holidays/12\25\2010").
The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

Parameters

| in | path |  -- the tree item's pathname (e.g. "Flintstones/Fred") |
| in | docallback |  -- A flag that determines if the callback() is invoked or not: |
| | |   • 0 - callback() is not invoked |
| | |   • 1 - callback() is invoked if item changed (default), callback_reason() will be FL_TREE_REASON_OPENED |

Returns

• 1 – OK: item opened
• 0 – OK: item was already open, no change
• -1 – ERROR: item was not found

See also

open(), close(), is_open(), is_close(), callback_item(), callback_reason()

34.153.2.68  open() [2/2]

int Fl_Tree::open {
    Fl_Tree_Item * item,
    int docallback = 1
}

Open the specified 'item'.
This causes the item's children (if any) to be shown.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling redraw() if anything changed.
The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

Parameters

| in | item |  -- the item to be opened. Must not be NULL. |
| in | docallback |  -- A flag that determines if the callback() is invoked or not: |
| | |   • 0 - callback() is not invoked |
| | |   • 1 - callback() is invoked if item changed (default), callback_reason() will be FL_TREE_REASON_OPENED |
>Returns

- 1 – item was opened
- 0 – item was already open, no change

See also

`open()`, `close()`, `is_open()`, `is_close()`, `callback_item()`, `callback_reason()`

### 34.153.2.69 open_toggle()

```cpp
def open_toggle(self, item, docallback=1):
    pass
```

Toggles the open state of 'item'.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling `redraw()` if anything changed.
The callback can use `callback_item()` and `callback_reason()` respectively to determine the item changed and the reason the callback was called.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>– the item whose open state is to be toggled. Must not be NULL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallback</td>
<td>– A flag that determines if the callback() is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 0 - callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - callback() is invoked (default), callback_reason() will be either</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FL_TREE_REASON_OPENED or FL_TREE_REASON_CLOSED</td>
</tr>
</tbody>
</table>

See also

`open()`, `close()`, `is_open()`, `is_close()`, `callback_item()`, `callback_reason()`

### 34.153.2.70 openicon() [1/2]

```cpp
Fl_Image * openicon() const
```

Returns the icon to be used as the 'open' icon.
If none was set, the internal default is returned, a simple '[+]' icon.

### 34.153.2.71 openicon() [2/2]

```cpp
void openicon(Fl_Image * val)
```

Sets the icon to be used as the 'open' icon.
This overrides the built in default '[+]' icon.

**Parameters**

| in | val        | – The new image, or zero to use the default [+]. icon. |

Generated by Doxygen
34.153.2.72 prev()

Fl_Tree_Item * Fl_Tree::prev ( Fl_Tree_Item * item = 0 )

Return the previous item before 'item', or 0 if no more items.
This can be used to walk the tree in reverse, e.g.

```
for ( Fl_Tree_Item *item = tree->first(); item; item = tree->prev(item) )
  printf("Item: %s\n", item->label());
```

Parameters

| in | item | The item to use to find the previous item. If NULL, returns 0. |

Returns

Previous item in tree, or 0 if at first item.

See also

`first(), next(), last(), prev()`

34.153.2.73 recalc_tree()

void Fl_Tree::recalc_tree ( )

Schedule tree to recalc the entire tree size.

Note

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

34.153.2.74 remove()

int Fl_Tree::remove ( Fl_Tree_Item * item )

Remove the specified 'item' from the tree.
item may not be NULL. If it has children, all those are removed too. If item being removed has focus, no item will have focus.

Returns

0 if done, -1 if 'item' not found.

34.153.2.75 resize()

void Fl_Tree::resize ( int X, int Y, int W, int H ) [virtual]

Resizes the Fl_Group widget and all of its children.
The Fl_Group widget first resizes itself, and then it moves and resizes all its children according to the rules documented for Fl_Group::resizable(Fl_Widget*)
See also

Fl_Group::resizable(Fl_Widget*)
Fl_Group::resizable()
Fl_Widget::resize(int,int,int,int)

Reimplemented from Fl_Group.

34.153.2.76 root()

void Fl_Tree::root (Fl_Tree_Item * newitem)

Sets the root item to 'newitem'.
If a root item already exists, clear() is called first to clear it before replacing it with newitem.
Use this to install a custom item (derived from Fl_Tree_Item) as the root of the tree. This allows the derived class to implement custom drawing by overriding Fl_Tree_Item::draw_item_content().

Version

1.3.3

34.153.2.77 root_label()

void Fl_Tree::root_label (const char * new_label)

Set the label for the root item to 'new_label'.
Makes an internally managed copy of 'new_label'.

34.153.2.78 scrollbar_size() [1/2]

int Fl_Tree::scrollbar_size (void ) const

Gets the default size of scrollbars' troughs for this widget in pixels.
If this value is zero (default), this widget will use the global Fl::scrollbar_size() value as the scrollbar's width.

Returns

Scrollbar size in pixels, or 0 if the global Fl::scrollbar_size() is being used.

See also

Fl::scrollbar_size(int)

34.153.2.79 scrollbar_size() [2/2]

void Fl_Tree::scrollbar_size (int size)

Sets the pixel size of the scrollbars' troughs to 'size' for this widget, in pixels.
Normally you should not need this method, and should use the global Fl::scrollbar_size(int) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, and is the default behavior. Normally this is what you want.
Only use this method if you really need to override just THIS instance of the widget's scrollbar size. (This need should be rare.)
Setting size to the special value of 0 causes the widget to track the global Fl::scrollbar_size(), which is the default.
Parameters

| in     | size | Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global Fl::scrollbar_size() |

See also

Fl::scrollbar_size()

34.153.2.80 select() [1/2]

```c
int Fl_Tree::select (const char * path,
                     int docallback = 1)
```

Select the item specified by 'path'.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling redraw() if anything changed.
Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. select("Holidays/12/25/2010").
The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

Parameters

| in     | path | − the tree item's pathname (e.g. "Flintstones/Fred") |
| in     | docallback | − A flag that determines if the callback() is invoked or not:  
|        |        | • 0 - the callback() is not invoked  
|        |        | • 1 - the callback() is invoked if item changed state (default), callback_reason() will be FL_TREE_REASON_SELECTED |

Returns

• 1 : OK: item's state was changed  
• 0 : OK: item was already selected, no change was made  
• -1 : ERROR: item was not found

34.153.2.81 select() [2/2]

```c
int Fl_Tree::select (Fl_Tree_Item * item,
                     int docallback = 1)
```

Select the specified 'item'.
Use 'deselect()' to deselect it.
Invokes the callback depending on the value of optional parameter docallback.
Handles calling redraw() if anything changed.
The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

Parameters

| in     | item | − the item to be selected. Must not be NULL. |
34.153.2.82 select_all()

```c
int Fl_Tree::select_all (Fl_Tree_Item *item = 0, int docallback = 1)
```

Select `item` and all its children.

If `item` is NULL, first() is used.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling `redraw()` if anything changed.

The callback can use `callback_item()` and `callback_reason()` respectively to determine the item changed and the reason the callback was called.

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>The item that will be selected (along with all its children). If NULL, first() is used.</th>
</tr>
</thead>
</table>
| in  | docallback        | A flag that determines if the `callback()` is invoked or not:  
|     |                   | • 0 - the `callback()` is not invoked  
|     |                   | • 1 - the `callback()` is invoked for each item that changed state (default),  
|     |                   | `callback_reason()` will be FL_TREE_REASON_SELECTED                                        |

### Returns

Count of how many items were actually changed to the selected state.

34.153.2.83 select_only()

```c
int Fl_Tree::select_only (Fl_Tree_Item *selitem, int docallback = 1)
```

Select only the specified item, deselecting all others that might be selected.

If 'selitem' is 0, first() is used.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling `redraw()` if anything changed.

The callback can use `callback_item()` and `callback_reason()` respectively to determine the item changed and the reason the callback was called.

### Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>selitem</th>
<th>The item to be selected. If NULL, first() is used.</th>
</tr>
</thead>
</table>

Parameters

| in  | docallback
|-----|-------------------|--------------------------------------------------------------------------------------------|
|     |                   | • 0 - the `callback()` is not invoked  
|     |                   | • 1 - the `callback()` is invoked if item changed state, `callback_reason()` will be FL_TREE_REASON_SELECTED |

Returns

1· item's state was changed
0 · item was already selected, no change was made
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>docallback</th>
<th>-- A flag that determines if the callback() is invoked or not:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• 0 - the callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - the callback() is invoked for each item that changed state (default),</td>
</tr>
<tr>
<td></td>
<td></td>
<td>callback_reason() will be either FL_TREE_REASON_SELECTED or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FL_TREE_REASON_DESELECTED</td>
</tr>
</tbody>
</table>

Returns

The number of items whose selection states were changed, if any.

### 34.153.2.84 select_toggle()

void Fl_Tree::select_toggle (  
    Fl_Tree_Item * item,  
    int docallback = 1  
)  

Toggle the select state of the specified 'item'.
Invokes the callback depending on the value of optional parameter 'docallback'.
Handles calling redraw() if anything changed.
The callback can use callback_item() and callback_reason() respectively to determine the item changed and the reason the callback was called.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>item</th>
<th>-- the item to be selected. Must not be NULL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>docallback</td>
<td>-- A flag that determines if the callback() is invoked or not:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 0 - the callback() is not invoked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 - the callback() is invoked (default), callback_reason() will be either</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FL_TREE_REASON_SELECTED or FL_TREE_REASON_DESELECTED</td>
</tr>
</tbody>
</table>

### 34.153.2.85 selectbox() [1/2]

Fl_Boxtype Fl_Tree::selectbox ( ) const  

Sets the style of box used to draw selected items.
This is an fltk Fl_Boxtype. The default is influenced by FLTK's current Fl::scheme()  

### 34.153.2.86 selectbox() [2/2]

void Fl_Tree::selectbox (  
    Fl_Boxtype val  
)  

Gets the style of box used to draw selected items.
This is an fltk Fl_Boxtype. The default is influenced by FLTK's current Fl::scheme()  

### 34.153.2.87 selectmode() [1/2]

Fl_Tree_Select Fl_Tree::selectmode ( ) const  

Gets the tree's current selection mode.
See Fl_Tree_Select for possible values.
34.153.2.88  selectmode() [2/2]

void Fl_Tree::selectmode (  
    Fl_Tree_Select val  )

Sets the tree's selection mode.
See Fl_Tree_Select for possible values.

34.153.2.89  set_item_focus()

void Fl_Tree::set_item_focus (  
    Fl_Tree_Item ∗ item  )

Set the item that currently should have keyboard focus.
Handles calling redraw() to update the focus box (if it is visible).

Parameters

| in | item | The item that should take focus. If NULL, none will have focus. |

34.153.2.90  show_item() [1/2]

void Fl_Tree::show_item (  
    Fl_Tree_Item ∗ item  )

Adjust the vertical scrollbar to show 'item' at the top of the display IF it is currently off-screen (for instance show_item_top()).
If it is already on-screen, no change is made.

Parameters

| in | item | The item to be shown. If NULL, first() is used. |

See also

    show_item_top(), show_item_middle(), show_item_bottom()

34.153.2.91  show_item() [2/2]

void Fl_Tree::show_item (  
    Fl_Tree_Item ∗ item,  
    int yoff  )

Adjust the vertical scrollbar so that 'item' is visible 'yoff' pixels from the top of the Fl_Tree widget's display.
For instance, yoff=0 will position the item at the top.
If yoff is larger than the vertical scrollbar's limit, the value will be clipped. So if yoff=100, but scrollbar's max is 50, then 50 will be used.

Parameters

| in | item | The item to be shown. If NULL, first() is used. |
| in | yoff | The pixel offset from the top for the displayed position. |

See also

    show_item_top(), show_item_middle(), show_item_bottom()
34.153.2.92 show_item_bottom()

```cpp
void Fl_Tree::show_item_bottom (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar so that 'item' is at the bottom of the display.

Parameters

| in  | item | The item to be shown. If NULL, first() is used. |

34.153.2.93 show_item_middle()

```cpp
void Fl_Tree::show_item_middle (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar so that 'item' is in the middle of the display.

Parameters

| in  | item | The item to be shown. If NULL, first() is used. |

34.153.2.94 show_item_top()

```cpp
void Fl_Tree::show_item_top (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar so that 'item' is at the top of the display.

Parameters

| in  | item | The item to be shown. If NULL, first() is used. |

34.153.2.95 show_self()

```cpp
void Fl_Tree::show_self ( )
```

Print the tree as 'ascii art' to stdout. Used mainly for debugging.

Todo should be const

Version

1.3.0

34.153.2.96 showcollapse() [1/2]

```cpp
int Fl_Tree::showcollapse ( ) const
```

Returns 1 if the collapse icon is enabled, 0 if not.

See also

showcollapse(int)
34.153.2.97 showcollapse() [2/2]

```cpp
void Fl_Tree::showcollapse (int val)
```

Set if we should show the collapse icon or not. If collapse icons are disabled, the user will not be able to interactively collapse items in the tree, unless the application provides some other means via `open()` and `close()`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>val</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1: shows collapse icons (default), 0: hides collapse icons.</td>
</tr>
</tbody>
</table>

34.153.2.98 showroot()

```cpp
void Fl_Tree::showroot (int val)
```

Set if the root item should be shown or not.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>val</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 – show the root item (default), 0 – hide the root item.</td>
</tr>
</tbody>
</table>

34.153.2.99 sortorder()

```cpp
Fl_Tree_Sort Fl_Tree::sortorder ( ) const
```

Set the default sort order used when items are added to the tree. See `Fl_Tree_Sort` for possible values.

34.153.2.100 usericon() [1/2]

```cpp
Fl_Image * Fl_Tree::usericon ( ) const
```

Returns the `Fl_Image` being used as the default user icon for all newly created items. Returns zero if no icon has been set, which is the default.

34.153.2.101 usericon() [2/2]

```cpp
void Fl_Tree::usericon (Fl_Image * val)
```

Sets the `Fl_Image` to be used as the default user icon for all newly created items. If you want to specify user icons on a per-item basis, use `Fl_Tree_Item::usericon()` instead.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>val</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>– The new image to be used, or zero to disable user icons.</td>
</tr>
</tbody>
</table>

34.153.2.102 vposition() [1/2]

```cpp
int Fl_Tree::vposition ( ) const
```

Returns the vertical scroll position as a pixel offset. The position returned is how many pixels of the tree are scrolled off the top edge of the screen.
34.153.2.103  

### vposition()

void Fl_Tree::vposition (  
    int pos  
)  

Sets the vertical scroll offset to position 'pos'.  
The position is how many pixels of the tree are scrolled off the top edge of the screen.

**Parameters**

| in   | pos | The vertical position (in pixels) to scroll the tree to. |

See also

vposition(), hposition(), hposition(int)

The documentation for this class was generated from the following files:

- Fl_Tree.H
- Fl_Tree.cxx

34.154  

### Fl_Tree_Item Class Reference

Tree widget item.

```
#include <Fl_Tree_Item.H>
```

**Public Member Functions**

- void **activate** (int val=1)  
  
  Change the item's activation state to the optionally specified 'val'.

- Fl_Tree_Item ∗ **add** (const Fl_Tree_Prefs &prefs, char **arr)  
  
  Descend into the path specified by 'arr', and add a new child there.

- Fl_Tree_Item ∗ **add** (const Fl_Tree_Prefs &prefs, char **arr, Fl_Tree_Item ∗newitem)  
  
  Descend into path specified by 'arr' and add 'newitem' there.

- Fl_Tree_Item ∗ **add** (const Fl_Tree_Prefs &prefs, const char ∗new_label)  
  
  Add a new child to this item with the name 'new_label' and defaults from 'prefs'.

- Fl_Tree_Item ∗ **add** (const Fl_Tree_Prefs &prefs, const char ∗new_label, Fl_Tree_Item ∗newitem)  
  
  Add 'item' as immediate child with 'new_label' and defaults from 'prefs'.

- Fl_Tree_Item ∗ **child** (int index)  
  
  Return the child item for the given 'index'.

- const Fl_Tree_Item ∗ **child** (int t) const  
  
  Return the const child item for the given 'index'.

- int **children** () const  
  
  Return the number of children this item has.

- void **clear_children** ()  
  
  Clear all the children for this item.

- void **close** ()  
  
  Close this item and all its children.

- void **deactivate** ()  
  
  Deactivate the item; the callback() won't be invoked when clicked.

- Fl_Tree_Item ∗ **deparent** (int index)
Deparent child at index position \texttt{`pos'}. 

- \textbf{int depth (const)}
  \begin{quote}
  Returns how many levels deep this item is in the hierarchy.
  \end{quote}

- \textbf{void deselect (const)}
  \begin{quote}
  Disable the item's selection state.
  \end{quote}

- \textbf{int deselect_all (const)}
  \begin{quote}
  Deselect item and all its children.
  \end{quote}

- \textbf{void draw (int X, int Y, int W, Fl_Tree_Item ∗itemfocus, int &tree_item_xmax, int lastchild=1, int render=1)}
  \begin{quote}
  Draw this item and its children.
  \end{quote}

- \textbf{virtual int draw_item_content (int render)}
  \begin{quote}
  Draw the item content.
  \end{quote}

- \textbf{int event_onCollapse_icon (const Fl_Tree_Prefs &prefs) const}
  \begin{quote}
  Was the event on the 'collapse' button of this item?
  \end{quote}

- \textbf{int event_on_item (const Fl_Tree_Prefs &prefs) const}
  \begin{quote}
  Was event anywhere on the item?
  \end{quote}

- \textbf{int event_on_label (const Fl_Tree_Prefs &prefs) const}
  \begin{quote}
  Was event on the \texttt{label()} of this item?
  \end{quote}

- \textbf{int event_on_user_icon (const Fl_Tree_Prefs &prefs) const}
  \begin{quote}
  Was the event on the 'user icon' of this item, if any?
  \end{quote}

- \textbf{int find_child (const char ∗name)}
  \begin{quote}
  Return the index of the immediate child of this item that has the label \texttt{`name'}. 
  \end{quote}

- \textbf{int find_child (Fl_Tree_Item ∗item)}
  \begin{quote}
  Find the index number for the specified \texttt{item} in the current item's list of children.
  \end{quote}

- \textbf{Fl_Tree_Item ∗ find_child_item (char ∗∗arr)}
  \begin{quote}
  Non-const version of \texttt{Fl_Tree_Item::find_child_item(char ∗∗arr) const}.
  \end{quote}

- \textbf{const Fl_Tree_Item ∗ find_child_item (char ∗∗arr) const}
  \begin{quote}
  Find child item by descending array \texttt{`arr'} of names.
  \end{quote}

- \textbf{Fl_Tree_Item ∗ find_child_item (const char ∗name)}
  \begin{quote}
  Non-const version of \texttt{Fl_Tree_Item::find_child_item(const char ∗name) const}.
  \end{quote}

- \textbf{const Fl_Tree_Item ∗ find_child_item (const char ∗name) const}
  \begin{quote}
  Return the /immediate/ child of current item that has the label \texttt{`name'}. 
  \end{quote}

- \textbf{Fl_Tree_Item ∗ find_clicked (const Fl_Tree_Prefs &prefs, int yonly=0)}
  \begin{quote}
  Non-const version of \texttt{Fl_Tree_Item::find_clicked(const Fl_Tree_Prefs&, int) const}.
  \end{quote}

- \textbf{const Fl_Tree_Item ∗ find_clicked (const Fl_Tree_Prefs &prefs, int yonly=0) const}
  \begin{quote}
  Find the item that the last event was over.
  \end{quote}

- \textbf{Fl_Tree_Item ∗ find_item (char ∗∗arr)}
  \begin{quote}
  Non-const version of \texttt{Fl_Tree_Item::find_item(char ∗∗names) const}.
  \end{quote}

- \textbf{const Fl_Tree_Item ∗ find_item (char ∗∗arr) const}
  \begin{quote}
  Find item by descending array of \texttt{`names'}. 
  \end{quote}

- \textbf{Fl_Tree_Item (const Fl_Tree_Item ∗o)}
  \begin{quote}
  Copy constructor.
  \end{quote}

- \textbf{Fl_Tree_Item (const Fl_Tree_Prefs &prefs)}
  \begin{quote}
  Constructor.
  \end{quote}

- \textbf{Fl_Tree_Item (Fl_Tree ∗tree)}
  \begin{quote}
  Constructor.
  \end{quote}

- \textbf{int h (const)}
  \begin{quote}
  The item's height.
  \end{quote}

- \textbf{int has_children (const)}
  \begin{quote}
  See if this item has children.
  \end{quote}

- \textbf{Fl_Tree_Item ∗ insert (const Fl_Tree_Prefs &prefs, const char ∗new_label, int pos=0)}
  \begin{quote}
  Insert a new item named \texttt{`new_label'} into current item's children at a specified position \texttt{`pos'}. 
  \end{quote}
• **Fl_Tree_Item** * insert_above (const Fl_Tree_Prefs &prefs, const char *new_label)
  
  Insert a new item named `new_label` above this item.

• char *is_activated* () const
  
  See if the item is activated.

• char *is_active* () const
  
  See if the item is activated. Alias for is_activated().

• int *is_close* () const
  
  See if the item is 'closed'.

• int *is_open* () const
  
  See if the item is 'open'.

• int *is_root* () const
  
  Is this item the root of the tree?

• char *is_selected* () const
  
  See if the item is selected.

• int *is_visible* () const
  
  See if the item is visible.

• const char * label* () const
  
  Return the label.

• void *label* (const char *val)
  
  Set the label to `name`.

• int label_h () const
  
  The item's label height.

• int label_w () const
  
  The item's maximum label width to right edge of Fl_Tree's inner width within scrollbars.

• int label_x () const
  
  The item's label x position relative to the window.

• int label_y () const
  
  The item's label y position relative to the window.

• Fl_Color *labelbgcolor* () const
  
  Return item's label background text color.

• void *labelbgcolor* (Fl_Color val)
  
  Set item's label background color.

• Fl_Color *labelcolor* () const
  
  Return item's label text color. Alias for labelfgcolor() const).

• void *labelcolor* (Fl_Color val)
  
  Set item's label text color. Alias for labelfgcolor(Fl_Color)).

• Fl_Color *labelfgcolor* () const
  
  Return item's label foreground text color.

• void *labelfgcolor* (Fl_Color val)
  
  Set item's label foreground text color.

• Fl_Font *labelfont* () const
  
  Get item's label font face.

• void *labelfont* (Fl_Font val)
  
  Set item's label font face.

• Fl_Fontsize *labelsizewithin* () const
  
  Get item's label font size.

• void *labelsizewithin* (Fl_Fontsize val)
  
  Set item's label font size.

• int move (Fl_Tree_Item *item, int op=0, int pos=0)
  
  Move the current item above/below/into the specified 'item', where 'op' determines the type of move:

• int move (int to, int from)
Move an item within its parent using index numbers.

- **int move_above (Fl_Tree_Item *item)**
  
  Move the current item above the specified 'item'.

- **int move_below (Fl_Tree_Item *item)**
  
  Move the current item below the specified 'item'.

- **int move_into (Fl_Tree_Item *item, int pos=0)**
  
  Parent the current item as a child of the specified 'item'.

- **Fl_Tree_Item * next ()**
  
  Return the next item in the tree.

- **Fl_Tree_Item * next_displayed (Fl_Tree_Prefs &prefs)**
  
  Same as next_visible().

- **Fl_Tree_Item * next_sibling ()**
  
  Return this item's next sibling.

- **Fl_Tree_Item * next_visible (Fl_Tree_Prefs &prefs)**
  
  Return the next open(), visible() item.

- **void open ()**
  
  Open this item and all its children.

- **void open_toggle ()**
  
  Toggle the item's open/closed state.

- **Fl_Tree_Item * parent ()**
  
  Return the parent for this item. Returns NULL if we are the root.

- **const Fl_Tree_Item * parent () const**
  
  Return the const parent for this item. Returns NULL if we are the root.

- **void parent (Fl_Tree_Item *val)**
  
  Set the parent for this item.

- **const Fl_Tree_Prefs & prefs () const**
  
  Return the parent tree's prefs.

- **Fl_Tree_Item * prev ()**
  
  Return the previous item in the tree.

- **Fl_Tree_Item * prev_displayed (Fl_Tree_Prefs &prefs)**
  
  Same as prev_visible().

- **Fl_Tree_Item * prev_sibling ()**
  
  Return this item's previous sibling.

- **Fl_Tree_Item * prev_visible (Fl_Tree_Prefs &prefs)**
  
  Return the previous open(), visible() item.

- **int remove_child (const char *new_label)**
  
  Remove immediate child (and its children) by its label 'name'.

- **int remove_child (Fl_Tree_Item *item)**
  
  Remove 'item' from the current item's children.

- **int reparent (Fl_Tree_Item *newchild, int index)**
  
  Reparent specified item as a child of ourself at position 'pos'.

- **Fl_Tree_Item * replace (Fl_Tree_Item *new_item)**
  
  Replace the current item with a new item.

- **Fl_Tree_Item * replace_child (Fl_Tree_Item *olditem, Fl_Tree_Item *newitem)**
  
  Replace existing child 'olditem' with 'newitem'.

- **void select (int val=1)**
  
  Change the item's selection state to the optionally specified 'val'.

- **int select_all ()**
  
  Select item and all its children.

- **void select_toggle ()**
  
  Toggle the item's selection state.
• void show_self (const char* indent="\"") const
  
  Print the tree as 'ascii art' to stdout.
• int swap_children (Fl_Tree_Item *a, Fl_Tree_Item *b)
  
  Swap two of our immediate children, given item pointers.
• void swap_children (int ax, int bx)
  
  Swap two of our children, given two child index values 'ax' and 'bx'.
• Fl_Tree * tree ()
  
  Return the tree for this item.
• const Fl_Tree * tree () const
  
  Return the tree for this item.
• void update_prev_next (int index)
  
  Update our _prev_sibling and _next_sibling pointers to point to neighbors given index as being our current position in the parent's item array.
• void * user_data () const
  
  Retrieve the user-data value that has been assigned to the item.
• void user_data (void *data)
  
  Set a user-data value for the item.
• Fl_Image * userdeicon () const
  
  Return the deactivated version of the user icon, if any.
• void userdeicon (Fl_Image *val)
  
  Set the usericon to draw when the item is deactivated.
• Fl_Image * usericon () const
  
  Get the item's user icon as an Fl_Image. Returns '0' if disabled.
• void usericon (Fl_Image *val)
  
  Set the item's user icon as an Fl_Image.
• int visible () const
  
  See if the item is visible. Alias for is_visible().
• int visible_r () const
  
  See if item and all its parents are open() and visible().
• int w () const
  
  The entire item's width to right edge of Fl_Tree's inner width within scrollbars.
• Fl_Widget * widget () const
  
  Return FLTK widget assigned to this item.
• void widget (Fl_Widget *val)
  
  Assign an FLTK widget to this item.
• int x () const
  
  The item's x position relative to the window.
• int y () const
  
  The item's y position relative to the window.

Protected Member Functions

• void _Init (const Fl_Tree_Prefs &prefs, Fl_Tree *tree)
• int calc_item_height (const Fl_Tree_Prefs &prefs) const
  
  Return the item's 'visible' height.
• void draw_horizontal_connector (int x1, int x2, int y, const Fl_Tree_Prefs &prefs)
  
  Internal: Horizontal connector line based on preference settings.
• void draw_vertical_connector (int x, int y1, int y2, const Fl_Tree_Prefs &prefs)
  
  Internal: Vertical connector line based on preference settings.
• Fl_Color drawbgcolor () const
  
  Returns the recommended background color used for drawing this item.
34.154 Fl_Tree_Item Class Reference

• Fl_Color drawfgcolor () const
  Returns the recommended foreground color used for drawing this item.

• void hide_widgets ()
  Internal: Hide the FLTK widget() for this item and all children.

• int is_flag (unsigned short val) const
  See if flag set. Returns 0 or 1.

• void recalc_tree ()
  Call this when our geometry is changed.

• void set_flag (unsigned short flag, int val)
  Set a flag to an on or off value. val is 0 or 1.

• void show_widgets ()
  Internal: Show the FLTK widget() for this item and all children.

34.154.1 Detailed Description

Tree widget item.
This class is a single tree item, and manages all of the item's attributes. Fl_Tree_Item is used by Fl_Tree, which is
comprised of many instances of Fl_Tree_Item.
Fl_Tree_Item is hierarchical; it dynamically manages an Fl_Tree_Item_Array of children that are themselves in-
stances of Fl_Tree_Item. Each item can have zero or more children. When an item has children, close() and open()
can be used to hide or show them.
Items have their own attributes; font size, face, color. Items maintain their own hierarchy of children.
When you make changes to items, you'll need to tell the tree to redraw() for the changes to show up.
New 1.3.3 ABI feature: You can define custom items by either adding a custom widget to the item with
Fl_Tree_Item::widget(), or override the draw_item_content() method if you want to just redefine how the label is
drawn.
The following shows the Fl_Tree_Item's dimensions, useful when overriding the draw_item_content() method:

![Figure 34.66 Fl_Tree_Item's internal dimensions.](image)

34.154.2 Constructor & Destructor Documentation

34.154.2.1 Fl_Tree_Item() [1/2]

Fl_Tree_Item::Fl_Tree_Item ( const Fl_Tree_Prefs & prefs )

Constructor.
Makes a new instance of Fl_Tree_Item using defaults from 'prefs'.

Deprecated in 1.3.3 ABI – you must use Fl_Tree_Item(Fl_Tree+) for proper horizontal scrollbar behavior.
34.154.2.2 Fl_Tree_Item() [2/2]

Fl_Tree_Item::Fl_Tree_Item (Fl_Tree * tree)

Constructor.
Makes a new instance of Fl_Tree_Item for 'tree'.
This must be used instead of the older, deprecated Fl_Tree_Item(Fl_Tree_Prefs) constructor for proper horizontal scrollbar calculation.

Version
1.3.3 ABI feature

34.154.3 Member Function Documentation

34.154.3.1 activate()

void Fl_Tree_Item::activate (int val = 1) [inline]

Change the item's activation state to the optionally specified 'val'.
When deactivated, the item will be 'grayed out'; the callback() won't be invoked if the user clicks on the label. If a widget() is associated with the item, its activation state will be changed as well.
If 'val' is not specified, the item will be activated.

34.154.3.2 add() [1/4]

Fl_Tree_Item * Fl_Tree_Item::add (const Fl_Tree_Prefs & prefs, char ** arr)

Descend into the path specified by 'arr', and add a new child there.
Should be used only by Fl_Tree's internals. Adds the item based on the value of prefs.sortorder().

Returns
the item added.

Version
1.3.0 release

34.154.3.3 add() [2/4]

Fl_Tree_Item * Fl_Tree_Item::add (const Fl_Tree_Prefs & prefs, char ** arr,
Fl_Tree_Item * newitem)

Descend into path specified by 'arr' and add 'newitem' there.
Should be used only by Fl_Tree's internals. If item is NULL, a new item is created. Adds the item based on the value of prefs.sortorder().

Returns
the item added.

Version
1.3.3 ABI feature
34.154.3.4  add() [3/4]

Fl_Tree_Item * Fl_Tree_Item::add (  
    const Fl_Tree_Prefs & prefs,  
    const char * new_label )  

Add a new child to this item with the name 'new_label' and defaults from 'prefs'.
An internally managed copy is made of the label string. Adds the item based on the value of prefs.sortorder().

Returns

the item added

Version

1.3.0 release

34.154.3.5  add() [4/4]

Fl_Tree_Item * Fl_Tree_Item::add (  
    const Fl_Tree_Prefs & prefs,  
    const char * new_label,  
    Fl_Tree_Item * item )  

Add 'item' as immediate child with 'new_label' and defaults from 'prefs'.
If 'item' is NULL, a new item is created. An internally managed copy is made of the label string. Adds the item
based on the value of prefs.sortorder().

Returns

the item added

Version

1.3.3

34.154.3.6  calc_item_height()

int Fl_Tree_Item::calc_item_height {  
    const Fl_Tree_Prefs & prefs ) const [protected]

Return the item's 'visible' height.
Takes into account the item's:

• visibility (if !is_visible(), returns 0)
• labelfont() height: if label() != NULL
• widget() height: if widget() != NULL
• openicon() height (if not NULL)
• usericon() height (if not NULL) Does NOT include Fl_Tree::linespacing();

Returns

maximum pixel height

34.154.3.7  child()

const Fl_Tree_Item * Fl_Tree_Item::child (  
    int t ) const  

Return the const child item for the given 'index'.
Return const child item for the specified 'index'.

Generated by Doxygen
34.154.3.8 deactivate()

```cpp
void Fl_Tree_Item::deactivate ( ) [inline]
```

Deactivate the item; the callback() won't be invoked when clicked.
Same as activate(0)

34.154.3.9 deparent()

```cpp
Fl_Tree_Item * Fl_Tree_Item::deparent ( int pos )
```

Deparent child at index position 'pos'.
This creates an "orphaned" item that is still allocated, but has no parent or siblings. Normally the caller would want
immediately reparent the orphan elsewhere.
A successfully orphaned item will have its parent() and prev_sibling()/next_sibling() set to NULL.

Returns

- pointer to orphaned item on success
- NULL on error (could not deparent the item)

See also

- re-parent()

34.154.3.10 depth()

```cpp
int Fl_Tree_Item::depth ( ) const
```

Returns how many levels deep this item is in the hierarchy.
For instance; root has a depth of zero, and its immediate children would have a depth of 1, and so on. Use e.g. for
determining the horizontal indent of this item during drawing.

34.154.3.11 deselect_all()

```cpp
int Fl_Tree_Item::deselect_all ( ) [inline]
```

Deselect item and all its children.

Returns count of how many items were in the 'selected' state, ie. how many items were "changed".

34.154.3.12 draw()

```cpp
void Fl_Tree_Item::draw ( int X, int & Y, int W, Fl_Tree_Item * itemfocus, int & tree_item_xmax, int lastchild = 1, int render = 1 )
```

Draw this item and its children.

Parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>int</td>
<td>Horizontal position for item being drawn</td>
</tr>
<tr>
<td>Y</td>
<td>int &amp;</td>
<td>Vertical position for item being drawn, returns new position for next item</td>
</tr>
<tr>
<td>W</td>
<td>int</td>
<td>Recommended width for item</td>
</tr>
<tr>
<td>itemfocus</td>
<td>Fl_Tree_Item *</td>
<td>The tree's current focus item (if any)</td>
</tr>
<tr>
<td>tree_item_xmax</td>
<td>int &amp;</td>
<td>The tree's running xmax (right-most edge so far). Mainly used by parent tree when render==0 to calculate tree's max width.</td>
</tr>
<tr>
<td>lastchild</td>
<td>int</td>
<td>Is this item the last child in a subtree?</td>
</tr>
<tr>
<td>render</td>
<td>int</td>
<td>Whether or not to render the item: 0: no rendering, just calculate size w/out drawing. 1: render item as well as size calc</td>
</tr>
</tbody>
</table>

Generated by Doxygen
34.154.3.13 draw_horizontal_connector()

```cpp
void Fl_Tree_Item::draw_horizontal_connector (  
  int x1,  
  int x2,  
  int y,  
  const Fl_Tree_Prefs & prefs ) [protected]
```

Internal: Horizontal connector line based on preference settings.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x1</td>
<td>The left hand X position of the horizontal connector</td>
</tr>
<tr>
<td>x2</td>
<td>The right hand X position of the horizontal connector</td>
</tr>
<tr>
<td>y</td>
<td>The vertical position of the horizontal connector</td>
</tr>
<tr>
<td>prefs</td>
<td>The Fl_Tree prefs</td>
</tr>
</tbody>
</table>

34.154.3.14 draw_item_content()

```cpp
int Fl_Tree_Item::draw_item_content (  
  int render ) [virtual]
```

Draw the item content.

This method can be overridden to implement custom drawing by filling the label_[xywh]() area with content.

A minimal example of how to override draw_item_content() and draw just a normal item's background and label ourselves:

```cpp
class MyTreeItem : public Fl_Tree_Item {
  public:
    MyTreeItem() { }
    ~MyTreeItem() { }
    // DRAW OUR CUSTOM CONTENT FOR THE ITEM
    int draw_item_content(int render) {
      // Our item's dimensions + text content
      int X=label_x(), Y=label_y(), W=label_w(), H=label_h();
      const char *text = label() ? label() : "";
      // Rendering? Do any drawing that's needed
      if ( render ) {
        // Draw bg -- a filled rectangle
        fl_color(drawbgcolor()); fl_rectf(X,Y,W,H);
        // Draw label
        fl_font(labelfont(), labelsize()); // use item's label font/size
        fl_color(drawfgcolor()); // use recommended fg color
        fl_draw(text, X,Y,W,H, FL_ALIGN_LEFT); // draw the item's label
      }
      // Rendered or not, we must calculate content's max X position
      int lw=0, lh=0;
      fl_measure(text, lw, lh); // get width of label text
      return X + lw; // return X + label width
    }
};
```

You can draw anything you want inside draw_item_content() using any of the fl_draw.H functions, as long as it's within the label's xywh area.

To add instances of your custom item to the tree, you can use:

```cpp
// Example #1: using add()
MyTreeItem *bart = new MyTreeItem(...); // class derived from Fl_Tree_Item
tree->add("/Simpsons/Bart", bart); // Add item as /Simpsons/Bart
```

...or you can insert or replace existing items:

```cpp
// Example #2: using replace()
MyTreeItem *marge = new MyTreeItem(...); // class derived from Fl_Tree_Item
item = tree->add("/Simpsons/Marge"); // create item
item->replace(mi); // replace it with our own
```
Parameters

| in  | render | Whether we should render content (1), or just tally the geometry (0). Fl_Tree may want only to find the widest item in the tree for scrollbar calculations. |

Returns

the right-most X coordinate, or 'xmax' of content we drew, i.e. the "scrollable" content. The tree uses the largest xmax to determine the maximum width of the tree's content (needed for e.g. computing the horizontal scrollbar's size).

Version

1.3.3 ABI feature

34.154.3.15  draw_vertical_connector()

void Fl_Tree_Item::draw_vertical_connector (  
   int x,  
   int y1,  
   int y2,  
   const Fl_Tree_Prefs & prefs ) [protected]

Internal: Vertical connector line based on preference settings.

Parameters

| in  | x   | The x position of the vertical connector |
| in  | y1  | The top of the vertical connector     |
| in  | y2  | The bottom of the vertical connector  |
| in  | prefs | The Fl_Tree prefs                  |

34.154.3.16  drawbgcolor()

Fl_Color Fl_Tree_Item::drawbgcolor ( ) const [protected]

Returns the recommended background color used for drawing this item.

See also

   draw_item_content()

Version

1.3.3 ABI

34.154.3.17  drawfgcolor()

Fl_Color Fl_Tree_Item::drawfgcolor ( ) const [protected]

Returns the recommended foreground color used for drawing this item.

See also

   draw_item_content()

Version

1.3.3 ABI
34.154.3.18 find_child() [1/2]

int Fl_Tree_Item::find_child (
    const char * name )

Return the index of the immediate child of this item that has the label 'name'.

Returns
    index of found item, or -1 if not found.

Version
    1.3.0 release

34.154.3.19 find_child() [2/2]

int Fl_Tree_Item::find_child ( Fl_Tree_Item * item )

Find the index number for the specified 'item' in the current item's list of children.

Returns
    the index, or -1 if not found.

34.154.3.20 find_child_item() [1/2]

const Fl_Tree_Item * Fl_Tree_Item::find_child_item ( char ** arr ) const

Find child item by descending array 'arr' of names.
Does not include self in search. Only Fl_Tree should need this method.

Returns
    item, or 0 if not found

Version
    1.3.0 release

34.154.3.21 find_child_item() [2/2]

const Fl_Tree_Item * Fl_Tree_Item::find_child_item ( const char * name ) const

Return the /immediate/ child of current item that has the label 'name'.

Returns
    const found item, or 0 if not found.

Version
    1.3.3

34.154.3.22 find_clicked()

const Fl_Tree_Item * Fl_Tree_Item::find_clicked ( const Fl_Tree_Prefs & prefs, int yonly = 0 ) const

Find the item that the last event was over.
If 'yonly' is 1, only check event's y value, don't care about x.
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>in prefs</code></td>
<td>The parent tree's <code>Fl_Tree_Prefs</code></td>
</tr>
<tr>
<td><code>in only</code></td>
<td>– 0: check both event's X and Y values. – 1: only check event's Y value, don’t care about X.</td>
</tr>
</tbody>
</table>

Returns

pointer to clicked item, or NULL if none found

Version

1.3.3 ABI feature

34.154.3.23 find_item()

```cpp
const Fl_Tree_Item * Fl_Tree_Item::find_item (char ** names) const
```

Find item by descending array of 'names'. Includes self in search. Only `Fl_Tree` should need this method. Use `Fl_Tree::find_item()` instead.

Returns

const item, or 0 if not found

34.154.3.24 hide_widgets()

```cpp
void Fl_Tree_Item::hide_widgets ( ) [protected]
```

Internal: Hide the FLTK `widget()` for this item and all children. Used by `close()` to hide widgets.

34.154.3.25 insert()

```cpp
Fl_Tree_Item * Fl_Tree_Item::insert (const Fl_Tree_Prefs & prefs, const char * new_label, int pos = 0 )
```

Insert a new item named 'new_label' into current item's children at a specified position 'pos'. If `pos` is out of range the new item is

- prepended if `pos < 0` or
- appended if `pos > item->children()`.

Returns

the new item inserted

See also

`Fl_Tree::insert()`
34.154.3.26 `insert_above()`

```cpp
Fl_Tree_Item * Fl_Tree_Item::insert_above (  
    const Fl_Tree_Prefs & prefs,  
    const char * new_label )
```

Insert a new item named 'new_label' above this item.

Returns

the new item inserted, or 0 if an error occurred.

34.154.3.27 `label()`

```cpp
void Fl_Tree_Item::label (  
    const char * name )
```

Set the label to 'name'.

Makes and manages an internal copy of 'name'.

34.154.3.28 `label_h()`

```cpp
int Fl_Tree_Item::label_h ( ) const [inline]
```

The item’s label height.

Version

1.3.3

34.154.3.29 `label_w()`

```cpp
int Fl_Tree_Item::label_w ( ) const [inline]
```

The item’s maximum label width to right edge of Fl_Tree’s inner width within scrollbars.

Version

1.3.3

34.154.3.30 `label_x()`

```cpp
int Fl_Tree_Item::label_x ( ) const [inline]
```

The item’s label x position relative to the window.

Version

1.3.3

34.154.3.31 `label_y()`

```cpp
int Fl_Tree_Item::label_y ( ) const [inline]
```

The item’s label y position relative to the window.

Version

1.3.3
34.154.3.32 labelbgcolor() [1/2]

```cpp
Fl_Color Fl_Tree_Item::labelbgcolor() const [inline]
```

Return item's label background text color.
If the color is 0xffffffff, the default behavior is the parent tree's bg color will be used. (An overloaded
draw_item_content() can override this behavior.)

34.154.3.33 labelbgcolor() [2/2]

```cpp
void Fl_Tree_Item::labelbgcolor(Fl_Color val) [inline]
```

Set item's label background color.
A special case is made for color 0xffffffff which uses the parent tree's bg color.

34.154.3.34 move() [1/2]

```cpp
int Fl_Tree_Item::move(
    Fl_Tree_Item * item,
    int op = 0,
    int pos = 0)
```

Move the current item above/below/into the specified 'item', where 'op' determines the type of move:

- 0: move above 'item' ('pos' ignored)
- 1: move below 'item' ('pos' ignored)
- 2: move into 'item' as a child (at optional position 'pos')

.. and 'pos' determines an optional index position after the move.

Returns

0 on success. a negative number on error:

- -1: one of the items has no parent
- -2: item's index could not be determined
- -3: bad 'op'
- -4: index range error
- -5: could not deparent
- -6: could not reparent at 'pos'
- (Other return values reserved for future use.)

See also

move_above(), move_below(), move_into(), move(int,int)

34.154.3.35 move() [2/2]

```cpp
int Fl_Tree_Item::move(int to, int from)
```

Move an item within its parent using index numbers.
Item is moved 'to' its new position 'from' its old position.

Returns

- 0: Success
- -1: range error (e.g. if 'to' or 'from' out of range).
- (Other return values reserved for future use)
See also

move_above(), move_below(), move_into(), move(Fl_Tree_Item*,int,int)

34.154\,3.36 \hspace{1em} move_above()

```cpp
int Fl_Tree_Item::move_above (Fl_Tree_Item * item)
```

Move the current item above the specified `item`. This is the equivalent of calling move(item,0,0).

Returns

0 on success.
On error returns a negative value; see move(Fl_Tree_Item*,int,int) for possible error codes.

See also

move_below(), move_into(), move(int,int), move(Fl_Tree_Item*,int,int)

34.154\,3.37 \hspace{1em} move_below()

```cpp
int Fl_Tree_Item::move_below (Fl_Tree_Item * item)
```

Move the current item below the specified `item`. This is the equivalent of calling move(item,1,0).

Returns

0 on success.
On error returns a negative value; see move(Fl_Tree_Item*,int,int) for possible error codes.

See also

move_above(), move_into(), move(int,int), move(Fl_Tree_Item*,int,int)

34.154\,3.38 \hspace{1em} move_into()

```cpp
int Fl_Tree_Item::move_into (Fl_Tree_Item * item, int pos = 0)
```

Parent the current item as a child of the specified `item`. This is the equivalent of calling move(item,2,pos).

Returns

0 on success.
On error returns a negative value; see move(Fl_Tree_Item*,int,int) for possible error codes.

See also

move_above(), move_below(), move(int,int), move(Fl_Tree_Item*,int,int)
34.154.3.39  next()

Fl_Tree_Item * Fl_Tree_Item::next ( )
Return the next item in the tree.
This method can be used to walk the tree forward. For an example of how to use this method, see Fl_Tree::first().

Returns
the next item in the tree, or 0 if there's no more items.

34.154.3.40  next_displayed()

Fl_Tree_Item * Fl_Tree_Item::next_displayed ( Fl_Tree_Prefs & prefs )
Same as next_visible().

Deprecated in 1.3.3 for confusing name, use next_visible() instead

34.154.3.41  next_sibling()

Fl_Tree_Item * Fl_Tree_Item::next_sibling ( )
Return this item's next sibling.
Moves to the next item below us at the same level (sibling). Use this to move down the tree without changing depth(), effectively skipping over this item's children/descendents.

Returns
item's next sibling, or 0 if none.

34.154.3.42  next_visible()

Fl_Tree_Item * Fl_Tree_Item::next_visible ( Fl_Tree_Prefs & prefs )
Return the next open(), visible() item.
(If this item has children and is closed, children are skipped)
This method can be used to walk the tree forward, skipping items that are not currently open/visible to the user.

Returns
the next open() visible() item below us, or 0 if there's no more items.

Version
1.3.3

34.154.3.43  parent()

void Fl_Tree_Item::parent ( Fl_Tree_Item * val ) [inline]
Set the parent for this item.
Should only be used by Fl_Tree's internals.
34.154.3.44  prefs()

const Fl_Tree_Prefs & Fl_Tree_Item::prefs ( ) const

Return the parent tree's prefs.

Returns

a reference to the parent tree's Fl_Tree_Prefs

Version

1.3.3 ABI feature

34.154.3.45  prev()

Fl_Tree_Item * Fl_Tree_Item::prev ( )

Return the previous item in the tree.
This method can be used to walk the tree backwards. For an example of how to use this method, see Fl_Tree::last().

Returns

the previous item in the tree, or 0 if there's no item above this one (hit the root).

34.154.3.46  prev_displayed()

Fl_Tree_Item * Fl_Tree_Item::prev_displayed ( Fl_Tree_Prefs & prefs )

Same as prev_visible().

Deprecated in 1.3.3 for confusing name, use prev_visible()

34.154.3.47  prev_sibling()

Fl_Tree_Item * Fl_Tree_Item::prev_sibling ( )

Return this item's previous sibling.
Moves to the previous item above us at the same level (sibling). Use this to move up the tree without changing depth().

Returns

This item's previous sibling, or 0 if none.

34.154.3.48  prev_visible()

Fl_Tree_Item * Fl_Tree_Item::prev_visible ( Fl_Tree_Prefs & prefs )

Return the previous open(), visible() item.
(If this item above us has children and is closed, its children are skipped)
This method can be used to walk the tree backward, skipping items that are not currently open/visible to the user.

Returns

the previous open() visible() item above us, or 0 if there's no more items.
**recalc_tree()**

```cpp
void Fl_Tree_Item::recalc_tree ( ) [protected]
Call this when our geometry is changed.
(Font size, label contents, etc) Schedules tree to recalculate itself, as changes to us may affect tree widget's scrollbar visibility and tab sizes.

Version
1.3.3 ABI
```

**remove_child() [1/2]**

```cpp
int Fl_Tree_Item::remove_child ( const char ∗ name )
Remove immediate child (and its children) by its label 'name'.
If more than one item matches 'name', only the first matching item is removed.

Parameters

| in | name | The label name of the immediate child to remove |

Returns

0 if removed, -1 if not found.

Version
1.3.3
```

**remove_child() [2/2]**

```cpp
int Fl_Tree_Item::remove_child ( Fl_Tree_Item ∗ item )
Remove 'item' from the current item's children.

Returns

0 if removed, -1 if item not an immediate child.
```

**reparent()**

```cpp
int Fl_Tree_Item::reparent ( Fl_Tree_Item ∗ newchild, int pos )
Reparent specified item as a child of ourself at position 'pos'.
Typically 'newchild' was recently orphaned with deparent().

Returns

- 0: on success
- -1: on error (e.g. if 'pos' out of range) with no changes made.

See also

deparent()
```
### 34.154.3.53 replace()

```cpp
void Fl_Tree_Item::replace (Fl_Tree_Item *newitem)
```

Replace the current item with a new item. The current item is destroyed if successful. No checks are made to see if an item with the same name exists. This method can be used to, for example, install 'custom' items into the tree derived from `Fl_Tree_Item`; see `draw_item_content()`.

**Parameters**

- `newitem` The new item to replace the current item

**Returns**

- `newitem` on success, `NULL` if could not be replaced.

**See also**

- `Fl_Tree_Item::draw_item_content()`, `Fl_Tree::root(Fl_Tree_Item*)`

**Version**

- 1.3.3 ABI feature

### 34.154.3.54 replace_child()

```cpp
void Fl_Tree_Item::replace_child (Fl_Tree_Item *olditem, Fl_Tree_Item *newitem)
```

Replace existing child `olditem` with `newitem`. The `olditem` is destroyed if successful. Can be used to put custom items (derived from `Fl_Tree_Item`) into the tree. No checks are made to see if an item with the same name exists.

**Parameters**

- `olditem` The item to be found and replaced
- `newitem` The new item to take the place of `olditem`

**Returns**

- `newitem` on success and `olditem` is destroyed. `NULL` on error if `olditem` was not found as an immediate child.

**See also**

- `replace()`, `Fl_Tree_Item::draw()`

**Version**

- 1.3.3 ABI feature

### 34.154.3.55 select()

```cpp
void Fl_Tree_Item::select (int val = 1) [inline]
```

Change the item's selection state to the optionally specified `val`. If `val` is not specified, the item will be selected.
34.154.3.56 select_all()

int Fl_Tree_Item::select_all ( ) [inline]
Select item and all its children.
Returns count of how many items were in the 'deselected' state, ie. how many items were "changed".

34.154.3.57 show_self()

void Fl_Tree_Item::show_self ( 
    const char * indent = "" ) const
Print the tree as 'ascii art' to stdout.
Used mainly for debugging.

34.154.3.58 show_widgets()

void Fl_Tree_Item::show_widgets ( ) [protected]
Internal: Show the FLTK widget() for this item and all children.
Used by open() to re-show widgets that were hidden by a previous close()

34.154.3.59 swap_children() [1/2]

int Fl_Tree_Item::swap_children ( 
    Fl_Tree_Item * a,
    Fl_Tree_Item * b )
Swap two of our immediate children, given item pointers.
Use e.g. for sorting.
This method is SLOW because it involves linear lookups.
For speed, use swap_children(int,int) instead.

Parameters

in a,b The item ptrs of the two items to swap. Both must be immediate children of the current item.

Returns

• 0 : OK
• -1 : failed: item 'a' or 'b' is not our child.

34.154.3.60 swap_children() [2/2]

void Fl_Tree_Item::swap_children ( 
    int ax,
    int bx )
Swap two of our children, given two child index values 'ax' and 'bx'.
Use e.g. for sorting.
This method is FAST, and does not involve lookups.
No range checking is done on either index value.

Parameters

in ax,bx the index of the items to swap

34.154.3.61 tree() [1/2]

Fl_Tree * Fl_Tree_Item::tree ( ) [inline]
Return the tree for this item.

Version
1.3.4

34.154.3.62  tree() [2/2]

const Fl_Tree * Fl_Tree_Item::tree ( ) const [inline]
Return the tree for this item.

Version
1.3.3

34.154.3.63  update_prev_next()

void Fl_Tree_Item::update_prev_next ( int index )
Update our _prev_sibling and _next_sibling pointers to point to neighbors given index as being our current position in the parent's item array.
Call this whenever items in the array are added/removed/moved/swapped/etc.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>index</th>
<th>Our index# in the parent.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Special case if index=-1: become an orphan; null out all parent/sibling associations.</td>
</tr>
</tbody>
</table>

34.154.3.64  userdeicon() [1/2]

Fl_Image * Fl_Tree_Item::userdeicon ( ) const [inline]
Return the deactivated version of the user icon, if any.
Returns 0 if none.

34.154.3.65  userdeicon() [2/2]

void Fl_Tree_Item::userdeicon ( Fl_Image * val ) [inline]
Set the usericon to draw when the item is deactivated.
Use '0' to disable. No internal copy is made; caller must manage icon's memory.
To create a typical 'grayed out' version of your usericon image, you can do the following:

```c
// Create tree + usericon for items
Fl_Tree *tree = new Fl_Tree(..);
Fl_Image *usr_icon = new Fl_Pixmap(..); // your usericon
Fl_Image *de_icon = usr_icon->copy(); // make a copy, and..
de_icon->inactive(); // make it 'grayed out'
...
for ( .. ) { // item loop..
  item = tree->add("..."); // create new item
  item->usericon(usr_icon); // assign usericon to items
  item->userdeicon(de_icon); // assign userdeicon to items
  ..
}
```
In the above example, the app should 'delete' the two icons when they're no longer needed (e.g. after the tree is destroyed)

Version
1.3.4
### 34.154.3.66 usericon()

```cpp
void Fl_Tree_Item::usericon ( 
    Fl_Image ∗ val ) [inline]
```

Set the item's user icon to an `Fl_Image`. Use '0' to disable. No internal copy is made, caller must manage icon's memory. Note, if you expect your items to be deactivated(), use `userdeicon(Fl_Image*)` to set up a 'grayed out' version of your icon to be used for display.

See also

```cpp
userdeicon(Fl_Image*)
```

### 34.154.3.67 visible_r()

```cpp
int Fl_Tree_Item::visible_r ( ) const
```

See if item and all its parents are open() and visible(). Returns

1 – item and its parents are open() and visible() 0 – item (or one of its parents) are invisible or close()ed.

The documentation for this class was generated from the following files:

- `Fl_Tree_Item.H`
- `Fl_Tree_Item.cxx`

### 34.155 Fl_Tree_Item_Array Class Reference

Manages an array of `Fl_Tree_Item` pointers.

```cpp
#include <Fl_Tree_Item_Array.H>
```

**Public Member Functions**

- `void add (Fl_Tree_Item ∗val)`
  
  Add an item to the end of the array.
- `void clear ()`
  
  Clear the entire array.
- `int deparent (int pos)`
  
  Deparent item at 'pos' from our list of children.
- `Fl_Tree_Item_Array (const Fl_Tree_Item_Array ∗o)`
  
  Copy constructor. Makes new copy of array, with new instances of each item.
- `Fl_Tree_Item_Array (int new_chunksize=10)`
  
  Constructor; creates an empty array.
- `void insert (int pos, Fl_Tree_Item ∗new_item)`
  
  Insert an item at index position `pos`.
- `int manage_item_destroy () const`
  
  Option to control if `Fl_Tree_Item_Array`'s destructor will also destroy the `Fl_Tree_Item`'s.
- `void manage_item_destroy (int val)`
  
  Move item at 'from' to new position 'to' in the array.
- `Fl_Tree_Item ∗ operator[](int i)`
  
  Return the item and index i.
- `const Fl_Tree_Item ∗ operator[](int i) const`
  
  Const version of `operator[](int i)`
- `int remove (Fl_Tree_Item ∗item)`
Remove the item from the array.

- void remove (int index)
  Remove the item at.

- int reparent (Fl_Tree_Item *item, Fl_Tree_Item *newparent, int pos)
  Reparent specified item as a child of ourself.

- void replace (int pos, Fl_Tree_Item *new_item)
  Replace the item at index with newitem.

- void swap (int ax, int bx)
  Swap the two items at index positions ax and bx.

- int total () const
  Return the total items in the array, or 0 if empty.

- ~Fl_Tree_Item_Array ()
  Destructor. Calls each item's destructor, destroys internal_items array.

### Detailed Description

Manages an array of Fl_Tree_Item pointers. Because FLTK 1.x.x has mandated that templates and STL not be used, we use this class to dynamically manage the arrays.

None of the methods do range checking on index values; the caller must be sure that index values are within the range 0 < index < total() (unless otherwise noted).

### Constructor & Destructor Documentation

**Fl_Tree_Item_Array()**

Fl_Tree_Item_Array::Fl_Tree_Item_Array (int new_chunksize = 10)

Constructor; creates an empty array.

The optional 'chunksize' can be specified to optimize memory allocation for potentially large arrays. Default chunksize is 10.

### Member Function Documentation

**add()**

void Fl_Tree_Item_Array::add (Fl_Tree_Item *val)

Add an item* to the end of the array.

Assumes the item was created with 'new', and will remain allocated. Fl_Tree_Item_Array will handle calling the item's destructor when the array is cleared or the item remove()’ed.

**clear()**

void Fl_Tree_Item_Array::clear ()

Clear the entire array.

Each item will be deleted (destructors will be called), and the array will be cleared. total() will return 0.
### 34.155.3.3 deparent()

```cpp
text::Fl_Tree_Item_Array::deparent (int pos)
```

Deparent item at `pos` from our list of children. Similar to a `remove()` without the destruction of the item. This creates an orphaned item (still allocated, has no parent) which soon after is typically reparented elsewhere.

\returns 0 on success, -1 on error (e.g. if `pos` out of range)

### 34.155.3.4 insert()

```cpp
text::Fl_Tree_Item_Array::insert (int pos, text::Fl_Tree_Item *new_item)
```

Insert an item at index position `pos`.
Handles enlarging array if needed, total increased by 1.
If `pos` >= total(), the item is appended to the array.
If `pos` < 0, the item is prepended (works like pos == 0).

### 34.155.3.5 manage_item_destroy()

```cpp
text::Fl_Tree_Item_Array::manage_item_destroy (int val) [inline]
```

Option to control if `Fl_Tree_Item_Array`'s destructor will also destroy the `Fl_Tree_Item`'s. If set: items and item array is destroyed. If clear: only the item array is destroyed, not items themselves.

### 34.155.3.6 move()

```cpp
text::Fl_Tree_Item_Array::move (int to, int from)
```

Move item at `from` to new position `to` in the array.
Due to how the moving an item shuffles the array around, a positional `move` implies things that may not be obvious:

- When `from` moved lower in tree, appears BELOW item that was at `to`.
- When `from` moved higher in tree, appears ABOVE item that was at `to`.

\returns 0 on success, -1 on range error (e.g. if `to` or `from` out of range)

### 34.155.3.7 remove() [1/2]

```cpp
text::Fl_Tree_Item_Array::remove (text::Fl_Tree_Item *item)
```

Remove the item from the array.
\returns 0 if removed, or -1 if the item was not in the array.

### 34.155.3.8 remove() [2/2]

```cpp
text::Fl_Tree_Item_Array::remove (int index)
```

Remove the item at.
34.156 Fl_Tree_Prefs Class Reference

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>index</th>
<th>from the array.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The item will be delete’d (if non-NULL), so its destructor will be called.</td>
</tr>
</tbody>
</table>

34.155.3.9 reparent()

```cpp
int Fl_Tree_Item_Array::reparent(
    Fl_Tree_Item * item,
    Fl_Tree_Item * newparent,
    int pos )
```

Reparent specified item as a child of ourself. Typically 'newchild' was recently orphaned with deparent().

\returns 0 on success, -1 on error (e.g. if \p 'pos' out of range)

34.155.3.10 replace()

```cpp
void Fl_Tree_Item_Array::replace(
    int index,
    Fl_Tree_Item * newitem )
```

Replace the item at index with newitem. Old item at index position will be destroyed, and the new item will take it's place, and stitched into the linked list.

The documentation for this class was generated from the following files:

- Fl_Tree_Item_Array.H
- Fl_Tree_Item_Array.cxx

34.156 Fl_Tree_Prefs Class Reference

Tree widget's preferences.

```cpp
#include <Fl_Tree_Prefs.H>
```

Public Member Functions

- Fl_Image * closedeicon () const
  - Return the deactivated version of the close icon, if any.
- Fl_Image * closeicon () const
  - Gets the default 'close' icon Returns the Fl_Image+ of the icon, or 0 if none.
- void closeicon (Fl_Image +val)
  - Sets the icon to be used as the 'close' icon.
- Fl_Color connectorcolor () const
  - Get the connector color used for tree connection lines.
- void connectorcolor (Fl_Color val)
  - Set the connector color used for tree connection lines.
- Fl_Tree_Connector connectorstyle () const
  - Get the connector style.
- void connectorstyle (Fl_Tree_Connector val)
  - Set the connector style.
- void connectorstyle (int val)
  - Set the connector style [integer].
- int \texttt{connectorwidth} () const
  
  Get the tree connection line's width.

- void \texttt{connectorwidth} (int val)
  
  Set the tree connection line's width.

- void \texttt{do\_item\_draw\_callback} (Fl\_Tree\_Item ∗o) const

  \texttt{Fl\_Tree\_Prefs} ()
  
  \texttt{Fl\_Tree\_Prefs} constructor.

- Fl\_Tree\_Item\_Draw\_Callback ∗\texttt{item\_draw\_callback} () const

  \texttt{Fl\_Tree\_Item\_Draw\_Mode} \texttt{item\_draw\_mode} () const

  Get the 'item draw mode' used for the tree.

- void \texttt{item\_draw\_mode} (Fl\_Tree\_Item\_Draw\_Mode val)

  Set the 'item draw mode' used for the tree to val.

- void ∗\texttt{item\_draw\_user\_data} () const

  \texttt{Fl\_Color} \texttt{item\_labelbgcolor} () const

  Get the default label background color.

- void \texttt{item\_labelbgcolor} (Fl\_Color val)

  Set the default label background color.

- \texttt{Fl\_Color} \texttt{item\_labelfgcolor} () const

  Get the default label foreground color.

- void \texttt{item\_labelfgcolor} (Fl\_Color val)

  Set the default label foreground color.

- \texttt{Fl\_Font} \texttt{item\_labelfont} () const

  Return the label's font.

- void \texttt{item\_labelfont} (Fl\_Font val)

  Set the label's font to val.

- \texttt{Fl\_Fontsize} \texttt{item\_labelsizes} () const

  Return the label's size in pixels.

- void \texttt{item\_labelsizes} (Fl\_Fontsize val)

  Set the label's size in pixels to val.

- Fl\_Tree\_Item\_Reselect\_Mode \texttt{item\_reselect\_mode} () const

  Returns the current item re/selection mode.

- void \texttt{item\_reselect\_mode} (Fl\_Tree\_Item\_Reselect\_Mode mode)

  Sets the item re/selection mode.

- \texttt{Fl\_Color} \texttt{labelbgcolor} () const

  Obsolete: Get the default label background color. Please use \texttt{item\_labelbgcolor()} instead.

- void \texttt{labelbgcolor} (Fl\_Color val)

  Obsolete: Set the default label background color. Please use \texttt{item\_labelbgcolor(Fl\_Color)} instead.

- \texttt{Fl\_Color} \texttt{labelfgcolor} () const

  Obsolete: Get the default label foreground color. Please use \texttt{item\_labelfgcolor()} instead.

- void \texttt{labelfgcolor} (Fl\_Color val)

  Obsolete: Set the default label foreground color. Please use \texttt{item\_labelfgcolor(Fl\_Color)} instead.

- \texttt{Fl\_Font} \texttt{labelfont} () const

  Obsolete: Return the label's font. Please use \texttt{item\_labelfont()} instead.

- void \texttt{labelfont} (Fl\_Font val)

  Obsolete: Set the label's font to val. Please use \texttt{item\_labelfont(Fl\_Font)} instead.

- int \texttt{labelmarginleft} () const

  Get the label's left margin value in pixels.

- void \texttt{labelmarginleft} (int val)

  Set the label's left margin value in pixels.

- \texttt{Fl\_Fontsize} \texttt{labelsizes} () const
Obsolete: Return the label's size in pixels. Please use item_labelsize() instead.

- void labelsize (Fl_Fontsize val)
  
  Obsolete: Set the label's size in pixels to val. Please use item_labelsize(Fl_Fontsize) instead.

- int linespacing () const
  
  Get the line spacing value in pixels.

- void linespacing (int val)
  
  Set the line spacing value in pixels.

- int marginbottom () const
  
  Get the bottom margin's value in pixels.

- void marginbottom (int val)
  
  Set the bottom margin's value in pixels. This is the extra distance the vertical scroller lets you travel.

- int marginleft () const
  
  Get the left margin's value in pixels.

- void marginleft (int val)
  
  Set the left margin's value in pixels.

- int margintop () const
  
  Get the top margin's value in pixels.

- void margintop (int val)
  
  Set the top margin's value in pixels.

- int openchild_marginbottom () const
  
  Get the margin below an open child in pixels.

- void openchild_marginbottom (int val)
  
  Set the margin below an open child in pixels.

- Fl_Image * opendeicon () const
  
  Return the deactivated version of the open icon, if any.

- Fl_Image * openicon () const
  
  Get the current default 'open' icon.

- void openicon (Fl_Image * val)
  
  Sets the default icon to be used as the 'open' icon when items are added to the tree.

- Fl_Boxtype selectbox () const
  
  Get the default selection box's box drawing style as an Fl_Boxtype.

- void selectbox (Fl_Boxtype val)
  
  Set the default selection box's box drawing style to val.

- Fl_Tree_Select selectmode () const
  
  Get the selection mode used for the tree.

- void selectmode (Fl_Tree_Select val)
  
  Set the selection mode used for the tree to val.

- char showcollapse () const
  
  Returns 1 if the collapse icon is enabled, 0 if not.

- void showcollapse (int val)
  
  Set if we should show the collapse icon or not.

- int showroot () const
  
  Returns 1 if the root item is to be shown, or 0 if not.

- void showroot (int val)
  
  Set if the root item should be shown or not.

- Fl_Tree_Sort sortorder () const
  
  Get the default sort order value.

- void sortorder (Fl_Tree_Sort val)
  
  Set the default sort order value.

- Fl_Image * userdeicon () const
  
  Return the deactivated version of the user icon, if any.
• `Fl_Image * usericon() const`  
  Gets the default 'user icon' (default is 0)

• `void usericon(Fl_Image *val)`  
  Sets the default 'user icon' Returns the Fl_Image of the icon, or 0 if none (default).

• `int usericonmarginleft() const`  
  Get the user icon's left margin value in pixels.

• `void usericonmarginleft(int val)`  
  Set the user icon's left margin value in pixels.

• `int widgetmarginleft() const`  
  Get the widget()'s left margin value in pixels.

• `void widgetmarginleft(int val)`  
  Set the widget's left margin value in pixels.

• `~Fl_Tree_Prefs()`  
  Fl_Tree_Prefs destructor.

34.156.1 Detailed Description

Tree widget's preferences.  
Fl_Tree's Preferences class.  
This class manages the Fl_Tree's defaults. You should probably be using the methods in Fl_Tree instead of trying to accessing tree's preferences settings directly.

34.156.2 Member Function Documentation

34.156.2.1 closedeicon()

`Fl_Image * Fl_Tree_Prefs: :closedeicon ( ) const [inline]`

Return the deactivated version of the close icon, if any.  
Returns 0 if none.

34.156.2.2 closeicon()

`void Fl_Tree_Prefs: :closeicon ( Fl_Image * val )`

Sets the icon to be used as the 'close' icon.  
This overrides the built in default '[ ]' icon.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>val</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>– The new image, or zero to use the default [ ] icon.</td>
<td></td>
</tr>
</tbody>
</table>

34.156.2.3 item_draw_mode()

`void Fl_Tree_Prefs: :item_draw_mode ( Fl_Tree_Item_Draw_Mode val ) [inline]`

Set the 'item draw mode' used for the tree to val.  
This affects how items in the tree are drawn, such as when a widget() is defined. See Fl_Tree_Item_Draw_Mode for possible values.

34.156.2.4 item_labelbgcolor() [1/2]

`Fl_Color Fl_Tree_Prefs: :item_labelbgcolor ( void ) const [inline]`
Get the default label background color. This returns the Fl_Tree::color() unless item_labelbgcolor() has been set explicitly.

### 34.156.2.5 item_labelbgcolor() [2/2]

```
void Fl_Tree_Prefs::item_labelbgcolor (  
    Fl_Color val  )  [inline]
```

Set the default label background color. Once set, overrides the default behavior of using Fl_Tree::color().

### 34.156.2.6 marginbottom()

```
int Fl_Tree_Prefs::marginbottom ( ) const  [inline]
```

Get the bottom margin's value in pixels. This is the extra distance the vertical scroller lets you travel.

### 34.156.2.7 openeicon()

```
Fl_Image * Fl_Tree_Prefs::opendeicon ( ) const  [inline]
```

Return the deactivated version of the open icon, if any. Returns 0 if none.

### 34.156.2.8 openicon() [1/2]

```
Fl_Image * Fl_Tree_Prefs::openicon ( ) const  [inline]
```

Get the current default 'open' icon. Returns the Fl_Image* of the icon, or 0 if none.

### 34.156.2.9 openicon() [2/2]

```
void Fl_Tree_Prefs::openicon (  
    Fl_Image * val  )
```

Sets the default icon to be used as the 'open' icon when items are add()ed to the tree. This overrides the built in default '[+] icon.

**Parameters**

| in  | val  | – The new image, or zero to use the default [+] icon. |

### 34.156.2.10 selectmode()

```
void Fl_Tree_Prefs::selectmode (  
    Fl_Tree_Select val  )  [inline]
```

Set the selection mode used for the tree to val. This affects how items in the tree are selected when clicked on and dragged over by the mouse. See Fl_Tree_Select for possible values.

### 34.156.2.11 showcollapse()

```
void Fl_Tree_Prefs::showcollapse (  
    int val  )  [inline]
```

Set if we should show the collapse icon or not. If collapse icons are disabled, the user will not be able to interactively collapse items in the tree, unless the application provides some other means via open() and close().
Parameters

| in  | val | 1: shows collapse icons (default), 0: hides collapse icons. |

### 34.156.2.12 showroot()

```c
void Fl_Tree_Prefs::showroot ( int val ) [inline]
```

Set if the root item should be shown or not.

Parameters

| in  | val | 1 – show the root item (default) 0 – hide the root item. |

### 34.156.2.13 sortorder()

```c
void Fl_Tree_Prefs::sortorder ( Fl_Tree_Sort val ) [inline]
```

Set the default sort order value.

Defines the order new items appear when add()ed to the tree. See Fl_Tree_Sort for possible values.

### 34.156.2.14 userdeicon()

```c
Fl_Image * Fl_Tree_Prefs::userdeicon ( ) const [inline]
```

Return the deactivated version of the user icon, if any.

Returns 0 if none.

The documentation for this class was generated from the following files:

- Fl_Tree_Prefs.H
- Fl_Tree_Prefs.cxx

### 34.157 Fl_Valuator Class Reference

The `Fl_Valuator` class controls a single floating-point value and provides a consistent interface to set the value, range, and step, and insures that callbacks are done the same for every object.

```c
#include <Fl_Valuator.H>
```

Inheritance diagram for Fl_Valuator:
Public Member Functions

- **void bounds** (double a, double b)
  
  *Sets the minimum (a) and maximum (b) values for the valuator widget.*

- **double clamp** (double)
  
  *Clamps the passed value to the valuator range.*

- **virtual int format** (char *)
  
  *Uses internal rules to format the fields numerical value into the character array pointed to by the passed parameter.*

- **double increment** (double, int)
  
  *Adds n times the step value to the passed value.*

- **double maximum** () const
  
  *Gets the maximum value for the valuator.*

- **void maximum** (double a)
  
  *Sets the maximum value for the valuator.*

- **double minimum** () const
  
  *Gets the minimum value for the valuator.*

- **void minimum** (double a)
  
  *Sets the minimum value for the valuator.*

- **void precision** (int digits)
  
  *Sets the step value to 1.0 / 10^digits.*

- **void range** (double a, double b)
  
  *Sets the minimum and maximum values for the valuator.*

- **double round** (double)
  
  *Round the passed value to the nearest step increment.*

- **double step** () const
  
  *Gets or sets the step value.*

- **void step** (double a, int b)
  
  *See double Fl_Valuator::step() const*

- **void step** (double s)
  
  *See double Fl_Valuator::step() const.*

- **void step** (int a)
  
  *See double Fl_Valuator::step() const*

- **double value** () const
  
  *Gets the floating point(double) value.*

- **int value** (double)
  
  *Sets the current value.*
Protected Member Functions

- **Fl_Valuator** (int X, int Y, int W, int H, const char ∗L)
  Creates a new Fl_Valuator widget using the given position, size, and label string.

- **void handle_drag** (double newvalue)
  Called during a drag operation, after an FL_WHEN_CHANGED event is received and before the callback.

- **void handle_push** ()
  Stores the current value in the previous value.

- **void handle_release** ()
  Called after an FL_WHEN_RELEASE event is received and before the callback.

- **int horizontal** () const
  Tells if the valuator is an FL_HORIZONTAL one.

- **double previous_value** () const
  Gets the previous floating point value before an event changed it.

- **void set_value** (double v)
  Sets the current floating point value.

- **double softclamp** (double)
  Clamps the value, but accepts v if the previous value is not already out of range.

- **virtual void value_damage** ()
  Asks for partial redraw.

Additional Inherited Members

### 34.157.1 Detailed Description

The Fl_Valuator class controls a single floating-point value and provides a consistent interface to set the value, range, and step, and insures that callbacks are done the same for every object.

There are probably more of these classes in FLTK than any others:

![Valuators derived from Fl_Valuators](image)

In the above diagram each box surrounds an actual subclass. These are further differentiated by setting the type() of the widget to the symbolic value labeling the widget. The ones labelled "0" are the default versions with a type(0). For consistency the symbol FL_VERTICAL is defined as zero.
34.157.2 Constructor & Destructor Documentation

34.157.2.1 Fl_Valuator()

Fl_Valuator::Fl_Valuator (  
   int X,  
   int Y,  
   int W,  
   int H,  
   const char ∗ L ) [protected]  
Creates a new Fl_Valuator widget using the given position, size, and label string.  
The default boxtype is FL_NO_BOX.

34.157.3 Member Function Documentation

34.157.3.1 format()

int Fl_Valuator::format (  
   char ∗ buffer ) [virtual]  
Uses internal rules to format the fields numerical value into the character array pointed to by the passed parameter.  
The actual format used depends on the current step value. If the step value has been set to zero then a %g format  
is used. If the step value is non-zero, then a %.<f format is used, where the precision is calculated to show sufficient  
digits for the current step value. An integer step value, such as 1 or 1.0, gives a precision of 0, so the formatted  
value will appear as an integer.  
This method is used by the Fl_Valuator... group of widgets to format the current value into a text string. The return  
value is the length of the formatted text. The formatted value is written into buffer. buffer should have space  
for at least 128 bytes.  
You may override this function to create your own text formatting.

34.157.3.2 increment()

double Fl_Valuator::increment (  
   double v,  
   int n )  
Adds n times the step value to the passed value.  
If step was set to zero it uses fabs(maximum() - minimum()) / 100.

34.157.3.3 maximum() [1/2]

double Fl_Valuator::maximum ( ) const [inline]  
Gets the maximum value for the valuator.

34.157.3.4 maximum() [2/2]

void Fl_Valuator::maximum (  
   double a ) [inline]  
Sets the maximum value for the valuator.

34.157.3.5 minimum() [1/2]

double Fl_Valuator::minimum ( ) const [inline]  
Gets the minimum value for the valuator.
34.157.3.6  \texttt{minimum()} [2/2]

\begin{verbatim}
void Fl_Valuator::minimum (  
    double a ) [inline]
\end{verbatim}

Sets the minimum value for the valuator.

34.157.3.7  \texttt{precision()}

\begin{verbatim}
void Fl_Valuator::precision (  
    int digits )
\end{verbatim}

Sets the step value to $1.0 / 10^{\text{digits}}$.

Precision \texttt{digits} is limited to 0...9 to avoid internal overflow errors. Values outside this range are clamped.

\textbf{Note}

For negative values of \texttt{digits} the step value is set to $A = 1.0$ and $B = 1$, i.e. $1.0/1 = 1$.

34.157.3.8  \texttt{range()}

\begin{verbatim}
void Fl_Valuator::range (  
    double a,  
    double b ) [inline]
\end{verbatim}

Sets the minimum and maximum values for the valuator.

When the user manipulates the widget, the value is limited to this range. This clamping is done after rounding to the step value (this makes a difference if the range is not a multiple of the step).

The minimum may be greater than the maximum. This has the effect of "reversing" the object so the larger values are in the opposite direction. This also switches which end of the filled sliders is filled.

Some widgets consider this a "soft" range. This means they will stop at the range, but if the user releases and grabs the control again and tries to move it further, it is allowed.

The range may affect the display. You must \texttt{redraw()} the widget after changing the range.

34.157.3.9  \texttt{round()}

\begin{verbatim}
double Fl_Valuator::round (  
    double v )
\end{verbatim}

Round the passed value to the nearest step increment.

Does nothing if step is zero.

34.157.3.10  \texttt{step()}

\begin{verbatim}
double Fl_Valuator::step ( ) const [inline]
\end{verbatim}

Gets or sets the step value.

As the user moves the mouse the value is rounded to the nearest multiple of the step value. This is done before clamping it to the range. For most widgets the default step is zero.

For precision the step is stored as the ratio of a double $A$ and an integer $B = A/B$. You can set these values directly.

Currently setting a floating point value sets the nearest $A/1$ or $1/B$ value possible.

34.157.3.11  \texttt{value()} [1/2]

\begin{verbatim}
double Fl_Valuator::value ( ) const [inline]
\end{verbatim}

Gets the floating point(double) value.

See \texttt{int value(double)}
34.157.3.12 value() [2/2]

```cpp
int Fl_Valuator::value {
    double v
}
```

Sets the current value.

The new value is not clamped or otherwise changed before storing it. Use `clamp()` or `round()` to modify the value before calling `value()`. The widget is redrawn if the new value is different than the current one. The initial value is zero.

`changed()` will return true if the user has moved the slider, but it will be turned off by `value(x)` and just before doing a callback (the callback can turn it back on if desired).

34.157.3.13 value_damage()

```cpp
void Fl_Valuator::value_damage ( ) [protected], [virtual]
```

Asks for partial redraw.

Reimplemented in `Fl_Adjuster`.

The documentation for this class was generated from the following files:

- `Fl_Valuator.H`
- `Fl_Valuator.cxx`

### 34.158 Fl_Value_Input Class Reference

The `Fl_Value_Input` widget displays a numeric value.

```cpp
#include <Fl_Value_Input.H>
```

Inheritance diagram for `Fl_Value_Input`:

```
Fl_Widget
   ^
  /|
Fl_Valuator
  |
Fl_Value_Input
```

#### Public Member Functions

- `Fl_Color cursor_color () const`
  Gets the color of the text cursor.

- `void cursor_color (Fl_Color n)`
  Sets the color of the text cursor.

- `Fl_Value_Input (int x, int y, int w, int h, const char ∗l=0)`
  Creates a new `Fl_Value_Input` widget using the given position, size, and label string.

- `int handle (int) FL_OVERRIDE`
  Handles the specified event.

- `void resize (int, int, int, int) FL_OVERRIDE`
  Changes the size or position of the widget.

- `int shortcut () const`
  Returns the current shortcut key for the Input.

- `void shortcut (int s)`
  Sets the shortcut key to `s`.

- `char soft () const`
  If "soft" is turned on, the user is allowed to drag the value outside the range.

- `void soft (char s)`
  See void `Fl_Value_Input::soft(char s)`
• Fl_Color textcolor () const
  
  Gets the color of the text in the value box.

• void textcolor (Fl_Color n)

  Sets the color of the text in the value box.

• Fl_Font textfont () const

  Gets the typeface of the text in the value box.

• void textfont (Fl_Font s)

  Sets the typeface of the text in the value box.

• Fl_Fontsize textsize () const

  Gets the size of the text in the value box.

• void textsize (Fl_Fontsize s)

  Sets the size of the text in the value box.

Public Attributes

• Fl_Input input

Protected Member Functions

• void draw () FL_OVERRIDE

  Draws the widget.

Additional Inherited Members

34.158.1 Detailed Description

The Fl_Value_Input widget displays a numeric value. The user can click in the text field and edit it - there is in fact a hidden Fl_Input widget with type(FL_FLOAT_INPUT) or type(FL_INT_INPUT) in there - and when they hit return or tab the value updates to what they typed and the callback is done.

If step() is non-zero and integral, then the range of numbers is limited to integers instead of floating point numbers. As well as displaying the value as an integer, typed input is also limited to integer values, even if the hidden Fl_Input widget is of type(FL_FLOAT_INPUT).

If step() is non-zero, the user can also drag the mouse across the object and thus slide the value. The left button moves one step() per pixel, the middle by 10 step(), and the right button by 100 * step(). It is therefore impossible to select text by dragging across it, although clicking can still move the insertion cursor.

If step() is non-zero and integral, then the range of numbers are limited to integers instead of floating point values.

![Figure 34.68 Fl_Value_Input](image)

Figure 34.68 Fl_Value_Input

See also

Fl_Widget::shortcut_label(int)

34.158.2 Constructor & Destructor Documentation
34.158.2.1 Fl_Value_Input()

Fl_Value_Input::Fl_Value_Input (  
  int X,  
  int Y,  
  int W,  
  int H,  
  const char * l = 0 )  

Creates a new Fl_Value_Input widget using the given position, size, and label string.  
The default boxtype is FL_DOWN_BOX.

34.158.3 Member Function Documentation

34.158.3.1 cursor_color() [1/2]

Fl_Color Fl_Value_Input::cursor_color ( ) const [inline]  

Gets the color of the text cursor.  
The text cursor is black by default.

34.158.3.2 cursor_color() [2/2]

void Fl_Value_Input::cursor_color (  
  Fl_Color n ) [inline]  

Sets the color of the text cursor.  
The text cursor is black by default.

34.158.3.3 draw()

void Fl_Value_Input::draw ( ) [protected], [virtual]  

Draws the widget.  
Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead.  
Override this function to draw your own widgets.  
If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:  
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar  
s->draw(); // calls Fl_Scrollbar::draw()  

Implements Fl_Widget.

34.158.3.4 handle()

int Fl_Value_Input::handle (  
  int event ) [virtual]  

Handles the specified event.  
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.  
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.  
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.  
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.  
This requires knowledge of the details of the inherited class.  
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.
### Parameters

| in | event | the kind of event received |

### Return values

| 0 | if the event was not used or understood |
| 1 | if the event was used and can be deleted |

See also

Fl_Event

Reimplemented from Fl_Widget.

### 34.158.3.5 resize()

```cpp
void Fl_Value_Input::resize (int x, int y, int w, int h) [virtual]
```

Changes the size or position of the widget. This is a virtual function so that the widget may implement its own handling of resizing. The default version does not call the redraw() method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call resize() a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations. position(X, Y) is a shortcut for resize(X, Y, w(), h()), and size(W, H) is a shortcut for resize(x(), y(), W, H).

### Parameters

| in | x, y | new position relative to the parent window |
| in | w, h | new size |

See also

position(int, int), size(int, int)

Reimplemented from Fl_Widget.

### 34.158.3.6 shortcut() [1/2]

```cpp
int Fl_Value_Input::shortcut ( ) const [inline]
```

Returns the current shortcut key for the Input.

See also

Fl_Value_Input::shortcut(int)

### 34.158.3.7 shortcut() [2/2]

```cpp
void Fl_Value_Input::shortcut ( int s ) [inline]
```

Sets the shortcut key to s.
Setting this overrides the use of ‘&’ in the label(). The value is a bitwise OR of a key and a set of shift flags, for example FL_ALT | 'a', FL_ALT | (FL_F + 10), or just 'a'. A value of 0 disables the shortcut.

The key can be any value returned by Fl::event_key(), but usually will be an ASCII letter. Use a lower-case letter unless you require the shift key to be held down.

The shift flags can be any set of values accepted by Fl::event_state(). If the bit is on that shift key must be pushed. Meta, Alt, Ctrl, and Shift must be off if they are not in the shift flags (zero for the other bits indicates a “don’t care” setting).

34.158.3.8 soft()

char Fl_Value_Input::soft () const [inline]

If "soft" is turned on, the user is allowed to drag the value outside the range.

If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.

The default is true.

34.158.3.9 textcolor()

Fl_Color Fl_Value_Input::textcolor (void) const [inline]

Gets the color of the text in the value box.

34.158.3.10 textfont() [1/2]

Fl_Font Fl_Value_Input::textfont (void) const [inline]

Gets the typeface of the text in the value box.

34.158.3.11 textfont() [2/2]

void Fl_Value_Input::textfont (Fl_Font s) [inline]

Sets the typeface of the text in the value box.

34.158.3.12 textsize() [1/2]

Fl_Fontsize Fl_Value_Input::textsize (void) const [inline]

Gets the size of the text in the value box.

34.158.3.13 textsize() [2/2]

void Fl_Value_Input::textsize (Fl_Fontsize s) [inline]

Sets the size of the text in the value box.

The documentation for this class was generated from the following files:

- Fl_Value_Input.H
- Fl_Value_Input.cxx
### 34.159 Fl_Value_Output Class Reference

The Fl_Value_Output widget displays a floating point value.

```c
#include <Fl_Value_Output.H>
```

Inheritance diagram for Fl_Value_Output:

```
Fl_Widget
   `-- Fl_Valuator
       `-- Fl_Value_Output
```

#### Public Member Functions

- **Fl_Value_Output** (int x, int y, int w, int h, const char *l=0)
  
  Creates a new Fl_Value_Output widget using the given position, size, and label string.

- **int handle** (int) FL_OVERRIDE
  
  Handles the specified event.

- **uchar soft** () const
  
  If "soft" is turned on, the user is allowed to drag the value outside the range.

- **void soft** (uchar s)
  
  If "soft" is turned on, the user is allowed to drag the value outside the range.

- **Fl_Color textcolor** () const
  
  Sets the color of the text in the value box.

- **void textcolor** (Fl_Color s)
  
  Gets the color of the text in the value box.

- **Fl_Font textfont** () const
  
  Gets the typeface of the text in the value box.

- **void textfont** (Fl_Font s)
  
  Sets the typeface of the text in the value box.

- **Fl_Fontsize textsize** () const
  
  Gets the size of the text in the value box.

- **void textsize** (Fl_Fontsize s)

#### Protected Member Functions

- **void draw** () FL_OVERRIDE
  
  Draws the widget.

#### Additional Inherited Members

### 34.159.1 Detailed Description

The Fl_Value_Output widget displays a floating point value. If `step()` is not zero, the user can adjust the value by dragging the mouse left and right. The left button moves one step() per pixel, the middle by 10 * step(), and the right button by 100 * step().

This is much lighter-weight than Fl_Value_Input because it contains no text editing code or character buffer.

![Figure 34.69 Fl_Value_Output](image-url)
34.159.2 Constructor & Destructor Documentation

34.159.2.1 Fl_Value_Output()

Fl_Value_Output::Fl_Value_Output (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char * l = 0 )

Creates a new Fl_Value_Output widget using the given position, size, and label string. The default boxtype is FL_NO_BOX. Inherited destructor destroys the Valuator.

34.159.3 Member Function Documentation

34.159.3.1 draw()

void Fl_Value_Output::draw ( ) [protected], [virtual]

Draws the widget. Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call redraw() instead. Override this function to draw your own widgets. If you ever need to call another widget's draw method from within your own draw() method, e.g. for an embedded scrollbar, you can do it (because draw() is virtual) like this:

```c
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();              // calls Fl_Scrollbar::draw()
```

Implements Fl_Widget.

34.159.3.2 handle()

int Fl_Value_Output::handle (  
    int event ) [virtual]

Handles the specified event. You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class. In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in | event | the kind of event received |

Return values

| 0  | if the event was not used or understood |
| 1  | if the event was used and can be deleted |
See also

Fl_Event

Reimplemented from Fl_Widget.

34.159.3.3 soft() [1/2]

uchar Fl_Value_Output::soft ( ) const [inline]
If "soft" is turned on, the user is allowed to drag the value outside the range.
If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.
Default is one.

34.159.3.4 soft() [2/2]

void Fl_Value_Output::soft ( uchar s ) [inline]
If "soft" is turned on, the user is allowed to drag the value outside the range.
If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.
Default is one.

34.159.3.5 textcolor() [1/2]

Fl_Color Fl_Value_Output::textcolor ( void ) const [inline]
Sets the color of the text in the value box.

34.159.3.6 textcolor() [2/2]

void Fl_Value_Output::textcolor ( Fl_Color s ) [inline]
Gets the color of the text in the value box.

34.159.3.7 textfont() [1/2]

Fl_Font Fl_Value_Output::textfont ( void ) const [inline]
Gets the typeface of the text in the value box.

34.159.3.8 textfont() [2/2]

void Fl_Value_Output::textfont ( Fl_Font s ) [inline]
Sets the typeface of the text in the value box.

34.159.3.9 textsize()

Fl_Fontsize Fl_Value_Output::textsize ( void ) const [inline]
Gets the size of the text in the value box.
The documentation for this class was generated from the following files:

- Fl_Value_Output.H
- Fl_Value_Output.cxx

### 34.160 Fl_Value_Slider Class Reference

The Fl_Value_Slider widget is a Fl_Slider widget with a box displaying the current value.

```c
#include <Fl_Value_Slider.H>
```

Inheritance diagram for Fl_Value_Slider:

```
Fl_Widget
   ↓
Fl_Valuator
   ↓
Fl_Slider
   ↓
Fl_Value_Slider
   ↓
Fl_Hor_Value_Slider
```

**Public Member Functions**

- **Fl_Value_Slider** (int x, int y, int w, int h, const char *l=0)
  
  Creates a new Fl_Value_Slider widget using the given position, size, and label string.

- int **handle** (int) FL_OVERRIDE
  
  Handles the specified event.

- **Fl_Color** **textcolor** () const
  
  Gets the color of the text in the value box.

- void **textcolor** (Fl_Color s)
  
  Sets the color of the text in the value box.

- **Fl_Font** **textfont** () const
  
  Gets the typeface of the text in the value box.

- void **textfont** (Fl_Font s)
  
  Sets the typeface of the text in the value box.

- **Fl_Fontsize** **textsize** () const
  
  Gets the size of the text in the value box.

- void **textsize** (Fl_Fontsize s)
  
  Sets the size of the text in the value box.

- int **value_height** () const
  
  Gets the height of the value box in pixels (vertical mode only).

- void **value_height** (int s)
  
  Sets the height of the value box in pixels (vertical mode only).

- int **value_width** () const
  
  Gets the width of the value box in pixels (horizontal mode only).

- void **value_width** (int s)
  
  Sets the width of the value box in pixels (horizontal mode only).
Protected Member Functions

- void draw () FL_OVERRIDE

  Draws the widget.

Additional Inherited Members

34.160.1 Detailed Description

The `Fl_Value_Slider` widget is a `Fl_Slider` widget with a box displaying the current value.

![Figure 34.70 Fl_Value_Slider](image)

34.160.2 Constructor & Destructor Documentation

34.160.2.1 `Fl_Value_Slider()`

```cpp
Fl_Value_Slider::Fl_Value_Slider (  
    int X,  
    int Y,  
    int W,  
    int H,  
    const char ∗ l = 0 )
```

Creates a new `Fl_Value_Slider` widget using the given position, size, and label string. The default boxtype is `FL_DOWN_BOX`.

34.160.3 Member Function Documentation

34.160.3.1 `draw()`

```cpp
void Fl_Value_Slider::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's `draw` method from within your own `draw()` method, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget ∗s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Reimplemented from `Fl_Slider`.

34.160.3.2 `handle()`

```cpp
int Fl_Value_Slider::handle (  
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited `handle()` method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your `handle()` method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the `handle()` method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in  | event | the kind of event received |

Return values

| 0   | if the event was not used or understood |
| 1   | if the event was used and can be deleted |

See also

```
Fl_Event
```

Reimplemented from `Fl_Slider`.

### 34.160.3.3 `value_height()` [1/2]

```
int Fl_Value_Slider::value_height ( ) const [inline]
```

Gets the height of the value box in pixels (vertical mode only).

Since

```
1.4.0
```

### 34.160.3.4 `value_height()` [2/2]

```
void Fl_Value_Slider::value_height ( int s ) [inline]
```

Sets the height of the value box in pixels (vertical mode only). Limited range checking is applied but drawing errors may occur if the size is set too high or too low, particularly if the widget is resized (later). The programmer is responsible for setting sensible values and widget sizes. The default value set by the constructor is 25.

Parameters

| in  | s    | new height of the value box |

Generated by Doxygen
34.160.3.5 value_width() [1/2]

int Fl_Value_Slider::value_width () const [inline]
Gets the width of the value box in pixels (horizontal mode only).

Since
1.4.0

34.160.3.6 value_width() [2/2]

void Fl_Value_Slider::value_width (int s) [inline]
Sets the width of the value box in pixels (horizontal mode only).
Limited range checking is applied but drawing errors may occur if the size s is set too high or too low, particularly if
the widget is resized (later).
The programmer is responsible for setting sensible values and widget sizes.
The default value set by the constructor is 35.

Parameters

- **s** new width of the value box

Since
1.4.0

The documentation for this class was generated from the following files:
- Fl_Value_Slider.H
- Fl_Value_Slider.cxx

### 34.161 Fl_Widget Class Reference

Fl_Widget is the base class for all widgets in FLTK.
#include <Fl_Widget.H>

Inheritance diagram for Fl_Widget:
Public Member Functions

- void _clear_fullscreen ()
- void _set_fullscreen ()
- void activate ()
  
  Activates the widget.
- unsigned int active () const
  
  Returns whether the widget is active.
- int active_r () const
  
  Returns whether the widget and all of its parents are active.
- Fl_Align align () const
  
  Gets the label alignment.
- void align (Fl_Align alignment)
  
  Sets the label alignment.
- long argument () const
  
  Gets the current user data (long) argument that is passed to the callback function.
- void argument (long v)
  
  Sets the current user data (long) argument that is passed to the callback function.
- virtual class Fl_Gl_Window * as_gl_window ()
  
  Returns an Fl_Gl_Window pointer if this widget is an Fl_Gl_Window.
- virtual class Fl_Gl_Window const * as_gl_window () const
- virtual Fl_Group * as_group ()
  
  Returns an Fl_Group pointer if this widget is an Fl_Group.
- virtual Fl_Group const * as_group () const
- virtual Fl_Window * as_window ()
- virtual Fl_Window const * as_window () const
Returns an Fl_Window pointer if this widget is an Fl_Window.

- virtual Fl_Window const & as_window () const
- void bind_deimage (Fl_Image *img)
  Sets the image to use as part of the widget label when in the inactive state.
- void bind_deimage (int f)
  Bind the inactive image to the widget, so the widget will delete the image when it is no longer needed.
- void bind_image (Fl_Image *img)
  Sets the image to use as part of the widget label when in the active state.
- void bind_image (int f)
  Bind the image to the widget, so the widget will delete the image when it is no longer needed.
- Fl_Boxtype box () const
  Gets the box type of the widget.
- void box (Fl_Boxtype new_box)
  Sets the box type for the widget.
- Fl_Callback_p callback () const
  Gets the current callback function for the widget.
- void callback (Fl_Callback *cb)
  Sets the current callback function for the widget.
- void callback (Fl_Callback *cb, Fl_Callback_User_Data *p, bool auto_free)
  Sets the current callback function and managed user data for the widget.
- void callback (Fl_Callback *cb, void *p)
  Sets the current callback function and data for the widget.
- void callback (Fl_Callback0 *cb)
  Sets the current callback function for the widget.
- void callback (Fl_Callback1 *cb, long p=0)
  Sets the current callback function for the widget.
- unsigned int changed () const
  Checks if the widget value changed since the last callback.
- void clear_active ()
  Marks the widget as inactive without sending events or changing focus.
- void clear_changed ()
  Marks the value of the widget as unchanged.
- void clear_damage (uchar c=0)
  Clears or sets the damage flags.
- void clear_output ()
  Sets a widget to accept input.
- void clear_visible ()
  Hides the widget.
- void clear_visible_focus ()
  Disables keyboard focus navigation with this widget.
- Fl_Color color () const
  Gets the background color of the widget.
- void color (Fl_Color bg)
  Sets the background color of the widget.
- void color (Fl_Color bg, Fl_Color sel)
  Sets the background and selection color of the widget.
- Fl_Color color2 () const
  For back compatibility only.
- void color2 (unsigned a)
  For back compatibility only.
- int contains (const Fl_Widget *w) const
Checks if w is a child of this widget.

- void **copy_label**(const char *new_label)
  Sets the current label.

- void **copy_tooltip**(const char *text)
  Sets the current tooltip text.

- uchar **damage** () const
  Returns non-zero if draw() needs to be called.

- void **damage**(uchar c)
  Sets the damage bits for the widget.

- void **damage**(uchar c, int x, int y, int w, int h)
  Sets the damage bits for an area inside the widget.

- int **damage_resize**(int, int, int, int)
  Internal use only.

- void **deactivate** ()
  Deactivates the widget.

- FL_Image * **deimage** ()
  Gets the image that is used as part of the widget label when in the inactive state.

- const FL_Image * **deimage** () const
  Gets the image that is used as part of the widget label when in the inactive state.

- void **deimage**(FL_Image &img)
  Sets the image to use as part of the widget label when in the inactive state.

- void **deimage**(FL_Image *img)
  Sets the image to use as part of the widget label when in the inactive state.

- int **deimage_bound** () const
  Returns whether the inactive image is managed by the widget.

- void **do_callback**(FL_Callback_Reason reason=FL_REASON_UNKNOWN)
  Calls the widget callback function with default arguments.

- void **do_callback**(FL_Widget *widget, long arg, FL_Callback_Reason reason=FL_REASON_UNKNOWN)
  Calls the widget callback function with arbitrary arguments.

- void **do_callback**(FL_Widget *widget, void *arg=0, FL_Callback_Reason reason=FL_REASON_UNKNOWN)
  Calls the widget callback function with arbitrary arguments.

- virtual void **draw** ()=0
  Draws the widget.

- void **draw_label**(int, int, int, int, FL_Align) const
  Draws the label in an arbitrary bounding box with an arbitrary alignment.

- int **h** () const
  Gets the widget height.

- virtual int **handle**(int event)
  Handles the specified event.

- virtual void **hide** ()
  Makes a widget invisible.

- FL_Image * **image** ()
  Gets the image that is used as part of the widget label when in the active state.

- const FL_Image * **image** () const
  Gets the image that is used as part of the widget label when in the active state.

- void **image**(FL_Image &img)
  Sets the image to use as part of the widget label when in the active state.

- void **image**(FL_Image *img)
  Sets the image to use as part of the widget label when in the active state.

- int **image_bound** () const
  Returns whether the image is managed by the widget.
• int inside (const Fl_Widget ∗wgt) const
  Checks if this widget is a child of wgt.
• int is_label_copied () const
  Returns whether the current label was assigned with copy_label().
• const char ∗ label () const
  Gets the current label text.
• void label (const char ∗text)
  Sets the current label pointer.
• void label (Fl_Labeltype a, const char ∗b)
  Shortcut to set the label text and type in one call.
• Fl_Color labelcolor () const
  Gets the label color.
• void labelcolor (Fl_Color c)
  Sets the label color.
• Fl_Font labelfont () const
  Gets the font to use.
• void labelfont (Fl_Font f)
  Sets the font to use.
• Fl_Fontsize labelsize () const
  Gets the font size in pixels.
• void labelsize (Fl_Fontsize pix)
  Sets the font size in pixels.
• Fl_Labeltype labeltype () const
  Gets the label type.
• void labeltype (Fl_Labeltype a)
  Sets the label type.
• void measure_label (int &ww, int &hh) const
  Sets width ww and height hh accordingly with the label size.
• bool needs_keyboard () const
  Returns whether this widget needs a keyboard.
• void needs_keyboard (bool needs)
  Sets whether this widget needs a keyboard.
• unsigned int output () const
  Returns if a widget is used for output only.
• Fl_Group ∗ parent () const
  Returns a pointer to the parent widget.
• void parent (Fl_Group ∗p)
  Internal use only - "for hacks only".
• void position (int X, int Y)
  Repositions the window or widget.
• void redraw ()
  Schedules the drawing of the widget.
• void redraw_label ()
  Schedules the drawing of the label.
• virtual void resize (int x, int y, int w, int h)
  Changes the size or position of the widget.
• Fl_Color selection_color () const
  Gets the selection color.
• void selection_color (Fl_Color a)
  Sets the selection color.
• void set_active ()
Marks the widget as active without sending events or changing focus.

- void **set_changed** ()
  Marks the value of the widget as changed.

- void **set_output** ()
  Sets a widget to output only.

- void **set_visible** ()
  Makes the widget visible.

- void **set_visible_focus** ()
  Enables keyboard focus navigation with this widget.

- int **shortcut_label** () const
  Returns whether the widget's label uses ' & ' to indicate shortcuts.

- void **shortcut_label** (int value)
  Sets whether the widget's label uses ' & ' to indicate shortcuts.

- virtual void **show** ()
  Makes a widget visible.

- void **size** (int W, int H)
  Changes the size of the widget.

- int **take_focus** ()
  Gives the widget the keyboard focus.

- unsigned int **takesevents** () const
  Returns if the widget is able to take events.

- int **test_shortcut** ()
  Returns true if the widget's label contains the entered ' &x ' shortcut.

- const char ∗ **tooltip** () const
  Gets the current tooltip text.

- void **tooltip** (const char ∗ text)
  Sets the current tooltip text.

- **Fl_Window** ∗ **top_window** () const
  Returns a pointer to the top-level window for the widget.

- **Fl_Window** ∗ **top_window_offset** (int &xoff, int &yoff) const
  Finds the x/y offset of the current widget relative to the top-level window.

- uchar **type** () const
  Gets the widget type.

- void **type** (uchar t)
  Sets the widget type.

- int **use_accents_menu** ()
  Returns non zero if MAC_USE_ACCENTS_MENU flag is set, 0 otherwise.

- void ∗ **user_data** () const
  Gets the user data for this widget.

- void **user_data** (**Fl_Callback_User_Data** ∗ v, bool auto_free)
  Sets the user data for this widget.

- void **user_data** (void ∗ v)
  Sets the user data for this widget.

- unsigned int **visible** () const
  Returns whether a widget is visible.

- unsigned int **visible_focus** () const
  Checks whether this widget has a visible focus.

- void **visible_focus** (int v)
  Modifies keyboard focus navigation.

- int **visible_r** () const
  Returns whether a widget and all its parents are visible.
• int w () const
  
  Gets the widget width.
• Fl_When when () const
  
  Returns the conditions under which the callback is called.
• void when (uchar i)
  
  Sets the flags used to decide when a callback is called.
• Fl_Window ∗ window () const
  
  Returns a pointer to the nearest parent window up the widget hierarchy.
• int x () const
  
  Gets the widget position in its window.
• int y () const
  
  Gets the widget position in its window.
• virtual ~Fl_Widget ()
  
  Destroys the widget.

Static Public Member Functions

• static void default_callback (Fl_Widget ∗widget, void ∗data)
  
  The default callback for all widgets that don’t set a callback.
• static unsigned int label_shortcut (const char ∗t)
  
  Returns the Unicode value of the ‘&x’ shortcut in a given text.
• static int test_shortcut (const char ∗t, const bool require_alt=false)
  
  Returns true if the given text t contains the entered ‘&x’ shortcut.

Protected Types

• enum {
  
  INACTIVE = 1<<0 , INVISIBLE = 1<<1 , OUTPUT = 1<<2 , NOBORDER = 1<<3 ,
  FORCE_POSITION = 1<<4 , NON_MODAL = 1<<5 , SHORTCUT_LABEL = 1<<6 , CHANGED = 1<<7 ,
  OVERRIDE = 1<<8 , VISIBLE_FOCUS = 1<<9 , COPIED_LABEL = 1<<10 , CLIP_CHILDREN = 1<<11 ,
  MENU_WINDOW = 1<<12 , TOOLTIP_WINDOW = 1<<13 , MODAL = 1<<14 , NO_OVERLAY = 1<<15 ,
  GROUP_RELATIVE = 1<<16 , COPIED_TOOLTIP = 1<<17 , FULLSCREEN = 1<<18 , MAC_USE_ACCEPTS_MENU = 1<<19 ,
  NEEDS_KEYBOARD = 1<<20 , IMAGE_BOUND = 1<<21 , DEIMAGE_BOUND = 1<<22 ,
  AUTO_DELETE_USER_DATA = 1<<23 ,
  MAXIMIZED = 1<<24 , USERFLAG3 = 1<<29 , USERFLAG2 = 1<<30 , USERFLAG1 = 1<<31 }

  flags possible values enumeration.

Protected Member Functions

• void clear_flag (unsigned int c)
  
  Clears a flag in the flags mask.
• void draw_backdrop () const
  
  If FL_ALIGN_IMAGE_BACKDROP is set, the image or deimage will be drawn.
• void draw_box () const
  
  Draws the widget box according its box style.
• void draw_box (Fl_Boxtype t, Fl_Color c) const
  
  Draws a box of type t, of color c at the widget’s position and size.
• void draw_box (Fl_Boxtype t, int x, int y, int w, int h, Fl_Color c) const
  
  Draws a box of type t, of color c at the position X,Y and size W,H.
• void draw_focus () const
Fl_Widget Class Reference

Draws a focus rectangle around the widget.

- void draw_focus (Fl_Boxtype t, int X, int Y, int W, int H) const
  Draws a focus rectangle around the widget.

- void draw_focus (Fl_Boxtype t, int x, int y, int w, int h, Fl_Color bg) const
  Draws a focus box for the widget at the given position and size.

- void draw_label () const
  Draws the widget's label at the defined label position.

- void draw_label (int, int, int, int) const
  Draws the label in an arbitrary bounding box.

- Fl_Widget (int x, int y, int w, int h, const char *label=0L)
  Creates a widget at the given position and size.

- unsigned int flags () const
  Gets the widget flags mask.

- void h (int v)
  Internal use only.

- void set_flag (unsigned int c)
  Sets a flag in the flags mask.

- void w (int v)
  Internal use only.

- void x (int v)
  Internal use only.

- void y (int v)
  Internal use only.

Friends

- class Fl_Group

34.161.1 Detailed Description

Fl_Widget is the base class for all widgets in FLTK. You can't create one of these because the constructor is not public. However you can subclass it. All "property" accessing methods, such as color(), parent(), or argument() are implemented as trivial inline functions and thus are as fast and small as accessing fields in a structure. Unless otherwise noted, the property setting methods such as color(n) or label(s) are also trivial inline functions, even if they change the widget's appearance. It is up to the user code to call redraw() after these.

34.161.2 Member Enumeration Documentation

34.161.2.1 anonymous enum

anonymous enum [protected]
flags possible values enumeration.
See activate(), output(), visible(), changed(), set_visible_focus()

Enumerator

<table>
<thead>
<tr>
<th>Enum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INACTIVE</td>
<td>The widget can't receive focus, and is disabled but potentially visible</td>
</tr>
<tr>
<td>INVISIBLE</td>
<td>The widget is not drawn, but can receive a few special events</td>
</tr>
<tr>
<td>OUTPUT</td>
<td>For output only</td>
</tr>
<tr>
<td>NOBORDER</td>
<td>Don't draw a decoration (Fl_Window)</td>
</tr>
<tr>
<td>FORCE_POSITION</td>
<td>Don't let the window manager position the window (Fl_Window)</td>
</tr>
</tbody>
</table>
### Enumerator

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON_MODAL</td>
<td>this is a hovering toolbar window (Fl_Window)</td>
</tr>
<tr>
<td>SHORTCUT_LABEL</td>
<td>the label contains a shortcut we need to draw</td>
</tr>
<tr>
<td>CHANGED</td>
<td>the widget value changed</td>
</tr>
<tr>
<td>OVERRIDE</td>
<td>position window on top (Fl_Window)</td>
</tr>
<tr>
<td>VISIBLE_FOCUS</td>
<td>accepts keyboard focus navigation if the widget can have the focus</td>
</tr>
<tr>
<td>COPIED_LABEL</td>
<td>the widget label is internally copied, its destruction is handled by the widget</td>
</tr>
<tr>
<td>CLIP_CHILDREN</td>
<td>all drawing within this widget will be clipped (Fl_Group)</td>
</tr>
<tr>
<td>MENU_WINDOW</td>
<td>a temporary popup window, dismissed by clicking outside (Fl_Window)</td>
</tr>
<tr>
<td>TOOLTIP_WINDOW</td>
<td>a temporary popup, transparent to events, and dismissed easily (Fl_Window)</td>
</tr>
<tr>
<td>MODAL</td>
<td>a window blocking input to all other windows (Fl_Window)</td>
</tr>
<tr>
<td>NO_OVERLAY</td>
<td>window not using a hardware overlay plane (Fl_Menu_Window)</td>
</tr>
<tr>
<td>GROUP_RELATIVE</td>
<td>Reserved, not implemented. DO NOT USE.</td>
</tr>
<tr>
<td>COPIED_TOOLTIP</td>
<td>the widget tooltip is internally copied, its destruction is handled by the widget</td>
</tr>
<tr>
<td>FULLSCREEN</td>
<td>a fullscreen window (Fl_Window)</td>
</tr>
<tr>
<td>MAC_USE_ACCENTS_MENU</td>
<td>On the macOS platform, pressing and holding a key on the keyboard opens an accented-character menu window (Fl_Input_, Fl_Text_Editor)</td>
</tr>
<tr>
<td>NEEDS_KEYBOARD</td>
<td>set on touch screen devices if a widget needs a keyboard when it gets the focus. Reserved, not yet used in 1.4.0. See also Fl_Widget::needs_keyboard()</td>
</tr>
<tr>
<td>IMAGE_BOUND</td>
<td>binding the image to the widget will transfer ownership, so that the widget will delete the image when it is no longer needed</td>
</tr>
<tr>
<td>DEIMAGE_BOUND</td>
<td>bind the inactive image to the widget, so the widget deletes the image when it is no longer needed</td>
</tr>
<tr>
<td>AUTO_DELETE_USER_DATA</td>
<td>automatically call delete on the user_data pointer when destroying this widget; if set, user_data must point to a class derived from the class Fl_Callback_User_Data</td>
</tr>
<tr>
<td>MAXIMIZED</td>
<td>a maximized Fl_Window</td>
</tr>
<tr>
<td>USERFLAG3</td>
<td>reserved for 3rd party extensions</td>
</tr>
<tr>
<td>USERFLAG2</td>
<td>reserved for 3rd party extensions</td>
</tr>
<tr>
<td>USERFLAG1</td>
<td>reserved for 3rd party extensions</td>
</tr>
</tbody>
</table>

### 34.161.3 Constructor & Destructor Documentation

#### 34.161.3.1 Fl_Widget()

Fl_Widget::Fl_Widget (  
    int x,  
    int y,  
    int w,  
    int h,  
    const char * label = 0L ) [protected]

Creates a widget at the given position and size. The Fl_Widget is a protected constructor, but all derived widgets have a matching public constructor. It takes a value for x(), y(), w(), h(), and an optional value for label().
34.161 Fl_Widget Class Reference

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x, y</td>
<td>the position of the widget relative to the enclosing window</td>
</tr>
<tr>
<td>w, h</td>
<td>size of the widget in pixels</td>
</tr>
<tr>
<td>label</td>
<td>optional text for the widget label</td>
</tr>
</tbody>
</table>

34.161.3.2 ~Fl_Widget()

Fl_Widget::~Fl_Widget ( ) [virtual]

Destroys the widget.
Destroys the widget, taking care of throwing focus before if any.
Destroying single widgets is not very common. You almost always want to destroy the parent group instead, which
will destroy all of the child widgets and groups in that group.

Since

Since FLTK 1.3, the widget's destructor removes the widget from its parent group, if it is member of a group.

Destruction removes the widget from any parent group! And groups when destroyed destroy all their children. This
is convenient and fast.

34.161.4 Member Function Documentation

34.161.4.1 activate()

void Fl_Widget::activate ( )

Activates the widget.
Changing this value will send FL_ACTIVATE to the widget if active_r() is true.

See also

active(), active_r(), deactivate()

34.161.4.2 active()

unsigned int Fl_Widget::active ( ) const [inline]

Returns whether the widget is active.

Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the widget is inactive</td>
</tr>
</tbody>
</table>

See also

active_r(), activate(), deactivate()

34.161.4.3 active_r()

int Fl_Widget::active_r ( ) const

Returns whether the widget and all of its parents are active.
Return values

0 if this or any of the parent widgets are inactive

See also

active(), activate(), deactivate()

34.161.4.4 align() [1/2]

Fl_Align Fl_Widget::align ( ) const [inline]

Gets the label alignment.

Returns

label alignment

See also

label(), align(Fl_Align), Fl_Align

34.161.4.5 align() [2/2]

void Fl_Widget::align ( Fl_Align alignment ) [inline]

Sets the label alignment.

This controls how the label is displayed next to or inside the widget. The default value is FL_ALIGN_CENTER, which centers the label inside the widget.

Parameters

| in  | alignment | new label alignment |

See also

align(), Fl_Align

34.161.4.6 argument() [1/2]

long Fl_Widget::argument ( ) const [inline]

Gets the current user data (long) argument that is passed to the callback function.

Note

On platforms with sizeof(long) < sizeof(void*), particularly on Windows 64-bit platforms, this method can truncate stored addresses (void*) to the size of a long value. Use with care and only if you are sure that the stored user_data value fits in a long value because it was stored with argument(long) or another method using only long values. You may want to use user_data() instead.

See also

user_data()
34.161.4.7 argument() [2/2]

void Fl_Widget::argument (long v) [inline]

Sets the current user data (long) argument that is passed to the callback function.

See also

argument()

34.161.4.8 as_gl_window()

virtual class Fl_Gl_Window * Fl_Widget::as_gl_window () [inline], [virtual]

Returns an Fl_Gl_Window pointer if this widget is an Fl_Gl_Window.

Use this method if you have a widget (pointer) and need to know whether this widget is derived from Fl_Gl_Window. If it returns non-NULL, then the widget in question is derived from Fl_Gl_Window.

Return values

NULL if this widget is not derived from Fl_Gl_Window.

Note

This method is provided to avoid dynamic_cast.

See also

Fl_Widget::as_group(), Fl_Widget::as_window()

Reimplemented in Fl_Gl_Window.

34.161.4.9 as_group()

virtual Fl_Group * Fl_Widget::as_group () [inline], [virtual]

Returns an Fl_Group pointer if this widget is an Fl_Group.

Use this method if you have a widget (pointer) and need to know whether this widget is derived from Fl_Group. If it returns non-NULL, then the widget in question is derived from Fl_Group, and you can use the returned pointer to access its children or other Fl_Group-specific methods.

Example:

void my_callback (Fl_Widget *w, void *) {
  Fl_Group *g = w->as_group();
  if (g)
    printf ("This group has %d children
", g->children());
  else
    printf ("This widget is not a group!
");
}

Return values

NULL if this widget is not derived from Fl_Group.

Note

This method is provided to avoid dynamic_cast.

See also

Fl_Widget::as_window(), Fl_Widget::as_gl_window()

Reimplemented in Fl_Group.
34.161.4.10 as_window()

virtual Fl_Window * Fl_Widget::as_window ( ) [inline], [virtual]
Returns an Fl_Window pointer if this widget is an Fl_Window.
Use this method if you have a widget (pointer) and need to know whether this widget is derived from Fl_Window. If it returns non-NULL, then the widget in question is derived from Fl_Window, and you can use the returned pointer to access its children or other Fl_Window-specific methods.

Return values

NULL if this widget is not derived from Fl_Window.

Note

This method is provided to avoid dynamic_cast.

See also

Fl_Widget::as_group(), Fl_Widget::as_gl_window()

Reimplemented in Fl_Window.

34.161.4.11 bind_deimage() [1/2]

void Fl_Widget::bind_deimage ( Fl_Image * img )
Sets the image to use as part of the widget label when in the inactive state.

Parameters

in img the new image for the deactivated widget

Note

The image will be bound to the widget. When the widget is deleted, the image will be deleted as well.

See also

void deimage(Fl_Image* img)

34.161.4.12 bind_deimage() [2/2]

void Fl_Widget::bind_deimage ( int f ) [inline]
Bind the inactive image to the widget, so the widget will delete the image when it is no longer needed.

Parameters

f 1: mark the image as bound, 0: mark the image as managed by the user

See also

deimage_bound(), bind_image()
34.161.4.13  bind_image() [1/2]

void Fl_Widget::bind_image (  
    Fl_Image * img  
)  

Sets the image to use as part of the widget label when in the active state. The image will be bound to the widget. When the widget is deleted, the image will be deleted as well. Calling bind_image() with a new image will delete the old image if it was bound, and then set the new image, and bind that. If old and new image are the same, nothing happens. Calling bind_image() with NULL will delete the old image if it was bound and not set a new image.

Parameters

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>img</td>
<td>the new image for the label</td>
</tr>
</tbody>
</table>

See also

void image(Fl_Image* img)

34.161.4.14  bind_image() [2/2]

void Fl_Widget::bind_image (  
    int f  ) [inline]  

Bind the image to the widget, so the widget will delete the image when it is no longer needed.

Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>1: mark the image as bound, 0: mark the image as managed by the user</td>
</tr>
</tbody>
</table>

See also

image_bound(), bind_deimage()

34.161.4.15  box() [1/2]

Fl_Boxtype Fl_Widget::box (  
    void ) const [inline]  

Gets the box type of the widget.

Returns

the current box type

See also

box(Fl_Boxtype), Fl_Boxtype

34.161.4.16  box() [2/2]

void Fl_Widget::box (  
    Fl_Boxtype new_box  ) [inline]  

Sets the box type for the widget. This identifies a routine that draws the background of the widget. See Fl_Boxtype for the available types. The default depends on the widget, but is usually FL_NO_BOX or FL_UP_BOX.
Parameters

| in  | new_box | the new box type |

See also

`box()`, `Fl_Boxtype`

### 34.161.4.17 callback() [1/6]

**Fl_Callback_p Fl_Widget::callback () const [inline]**

Gets the current callback function for the widget. Each widget has a single callback.

**Returns**

current callback

### 34.161.4.18 callback() [2/6]

```cpp
default Fl_Widget::callback ( Fl_Callback * cb ) [inline]
```

Sets the current callback function for the widget. Each widget has a single callback.

**Parameters**

| in  | cb | new callback |

### 34.161.4.19 callback() [3/6]

```cpp
default Fl_Widget::callback ( Fl_Callback * cb, Fl_Callback_User_Data * p, bool auto_free ) [inline]
```

Sets the current callback function and managed user data for the widget. Setting `auto_free` will transfer ownership of the callback user data to the widget. Deleting the widget will then also delete the user data.

**Parameters**

| in  | cb  | new callback |
| in  | p   | user data    |
| in  | auto_free | if set, the widget will free user data when destroyed |

### 34.161.4.20 callback() [4/6]

```cpp
default Fl_Widget::callback ( Fl_Callback * cb, void * p ) [inline]
```

Sets the current callback function and data for the widget.
Each widget has a single callback.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cb</th>
<th>new callback</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>p</td>
<td>user data</td>
</tr>
</tbody>
</table>

34.161.4.21 callback [5/6]

```c
void Fl_Widget::callback (Fl_Callback0 * cb) [inline]
```

Sets the current callback function for the widget.
Each widget has a single callback.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cb</th>
<th>new callback</th>
</tr>
</thead>
</table>

34.161.4.22 callback [6/6]

```c
void Fl_Widget::callback (Fl_Callback1 * cb, long p = 0) [inline]
```

Sets the current callback function for the widget.
Each widget has a single callback.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>cb</th>
<th>new callback</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>p</td>
<td>user data</td>
</tr>
</tbody>
</table>

34.161.4.23 changed()

```c
unsigned int Fl_Widget::changed () const [inline]
```

Checks if the widget value changed since the last callback.
"Changed" is a flag that is turned on when the user changes the value stored in the widget. This is only used by subclasses of Fl_Widget that store values, but is in the base class so it is easier to scan all the widgets in a panel and do_callback() on the changed ones in response to an "OK" button.
Most widgets turn this flag off when they do the callback, and when the program sets the stored value.

Note

do_callback() turns this flag off after the callback.

Return values

| 0  | if the value did not change |

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34.161.4.24  clear_active()

void Fl_Widget::clear_active ( ) [inline]
Marks the widget as inactive without sending events or changing focus.
This is mainly for specialized use, for normal cases you want deactivate().
See also
disable()

34.161.4.25  clear_changed()

void Fl_Widget::clear_changed ( ) [inline]
Marks the value of the widget as unchanged.
See also
changed(), set_changed()

34.161.4.26  clear_damage()

void Fl_Widget::clear_damage (  
    uchar c = 0  ) [inline]
Clears or sets the damage flags.
Damage flags are cleared when parts of the widget drawing is repaired.
The optional argument c specifies the bits that are set after the call (default: 0) and not the bits that are cleared!

Note
Therefore it is possible to set damage bits with this method, but this should be avoided. Use damage(uchar)
instead.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>c</th>
<th>new bitmask of damage flags (default: 0)</th>
</tr>
</thead>
</table>

See also
damage(uchar), damage()

34.161.4.27  clear_output()

void Fl_Widget::clear_output ( ) [inline]
Sets a widget to accept input.
See also
set_output(), output()
34.161.4.28 clear_visible()

void Fl_Widget::clear_visible ( ) [inline]
Hides the widget.
You must still redraw the parent to see a change in the window. Normally you want to use the hide() method instead.

34.161.4.29 clear_visible_focus()

void Fl_Widget::clear_visible_focus ( ) [inline]
Disables keyboard focus navigation with this widget.
Normally, all widgets participate in keyboard focus navigation.
See also

clear_visible(), visible_focus(), visible_focus(int)

34.161.4.30 color() [1/3]

Fl_Color Fl_Widget::color ( ) const [inline]
Gets the background color of the widget.

Returns

current background color

See also

color(Fl_Color), color(Fl_Color, Fl_Color)

34.161.4.31 color() [2/3]

void Fl_Widget::color ( Fl_Color bg ) [inline]
Sets the background color of the widget.
The color is passed to the box routine. The color is either an index into an internal table of RGB colors or an RGB color value generated using fl_rgb_color().
The default for most widgets is FL_BACKGROUND_COLOR. Use Fl::set_color() to redefine colors in the color map.

Parameters

| in | bg | background color |

See also

color(), color(Fl_Color, Fl_Color), selection_color(Fl_Color)

34.161.4.32 color() [3/3]

void Fl_Widget::color ( Fl_Color bg,
                        Fl_Color sel ) [inline]
Sets the background and selection color of the widget.
The two color form sets both the background and selection colors.
Parameters

<table>
<thead>
<tr>
<th>in</th>
<th><strong>bg</strong></th>
<th>background color</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><strong>sel</strong></td>
<td>selection color</td>
</tr>
</tbody>
</table>

See also

`color(unsigned), selection_color(unsigned)`

34.161.4.33 color2() [1/2]

`Fl_Color Fl_Widget::color2 ( ) const [inline]`
For back compatibility only.

**Deprecated** Use `selection_color()` instead.

34.161.4.34 color2() [2/2]

`void Fl_Widget::color2 ( unsigned a ) [inline]`
For back compatibility only.

**Deprecated** Use `selection_color(unsigned)` instead.

34.161.4.35 contains()

`int Fl_Widget::contains ( const Fl_Widget * w ) const`
Checks if w is a child of this widget.

Parameters

|  in | **w** | potential child widget |

Returns

Returns 1 if w is a child of this widget, or is equal to this widget. Returns 0 if w is NULL.

34.161.4.36 copy_label()

`void Fl_Widget::copy_label ( const char * new_label )`
Sets the current label.

Unlike `label()`, this method allocates a copy of the label string instead of using the original string pointer.
The internal copy will automatically be freed whenever you assign a new label or when the widget is destroyed.

Parameters

|  in | **new_label** | the new label text |
34.161.4.37  copy_tooltip()

void Fl_Widget::copy_tooltip (const char * text )

Sets the current tooltip text. Unlike tooltip(), this method allocates a copy of the tooltip string instead of using the original string pointer. The internal copy will automatically be freed whenever you assign a new tooltip or when the widget is destroyed. If no tooltip is set, the tooltip of the parent is inherited. Setting a tooltip for a group and setting no tooltip for a child will show the group's tooltip instead. To avoid this behavior, you can set the child's tooltip to an empty string ("").

Parameters:

- **text**: New tooltip text (an internal copy is made and managed)

See also:

- tooltip(const char *), tooltip()

34.161.4.38  damage() [1/3]

uchar Fl_Widget::damage ( ) const [inline]

Returns non-zero if draw() needs to be called. The damage value is actually a bit field that the widget subclass can use to figure out what parts to draw.

Returns:

- a bitmap of flags describing the kind of damage to the widget

See also:

- damage(uchar), clear_damage(uchar)

34.161.4.39  damage() [2/3]

void Fl_Widget::damage ( uchar c )

Sets the damage bits for the widget. Setting damage bits will schedule the widget for the next redraw.

Parameters:

- **c**: bitmask of flags to set

See also:

- damage(), clear_damage(uchar)

34.161.4.40  damage() [3/3]
uchar c,
    int x,
    int y,
    int w,
    int h)

Sets the damage bits for an area inside the widget.
Setting damage bits will schedule the widget for the next redraw.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>c</th>
<th>bitmask of flags to set</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>x,y,w,h</td>
<td>size of damaged area</td>
</tr>
</tbody>
</table>

See also

damage(), clear_damage(uchar)

34.161.4.41 deactivate()

void Fl_Widget::deactivate ( )

Deactivates the widget.
Inactive widgets will be drawn "grayed out", e.g. with less contrast than the active widget. Inactive widgets will not receive any keyboard or mouse button events. Other events (including FL_ENTER, FL_MOVE, FL_LEAVE, FL_SHORTCUT, and others) will still be sent. A widget is only active if active() is true on it and all of its parents. Changing this value will send FL_DEACTIVATE to the widget if active_r() is true.
Currently you cannot deactivate Fl_Window widgets.

See also

activate(), active(), active_r()

34.161.4.42 default_callback()

void Fl_Widget::default_callback ( Fl_Widget * widget,
                                    void * data ) [static]

The default callback for all widgets that don't set a callback.
This callback function puts a pointer to the widget on the queue returned by Fl::readqueue(). This is the default for all widgets if you don't set a callback.
You can avoid the overhead of this default handling if you set the callback to NULL explicitly.
Relying on the default callback and reading the callback queue with Fl::readqueue() is not recommended. If you need a callback, you should set one with Fl_Widget::callback(Fl_Callback *cb, void *data) or one of its variants.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>widget</th>
<th>the Fl_Widget given to the callback</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>data</td>
<td>user data associated with that callback</td>
</tr>
</tbody>
</table>

See also

callback(), Fl::readqueue()

do_callback(Fl_Widget *widget, void *data)
34.161.4.43 deimage() [1/4]

Fl_Image * Fl_Widget::deimage ( ) [inline]

Gets the image that is used as part of the widget label when in the inactive state.

Returns

the current image for the deactivated widget

34.161.4.44 deimage() [2/4]

const Fl_Image * Fl_Widget::deimage ( ) const [inline]

Gets the image that is used as part of the widget label when in the inactive state.

Returns

the current image for the deactivated widget

34.161.4.45 deimage() [3/4]

void Fl_Widget::deimage ( Fl_Image & img )

Sets the image to use as part of the widget label when in the inactive state.

Parameters

in img the new image for the deactivated widget

See also

void deimage(Fl_Image* img)

34.161.4.46 deimage() [4/4]

void Fl_Widget::deimage ( Fl_Image * img )

Sets the image to use as part of the widget label when in the inactive state.

Parameters

in img the new image for the deactivated widget

Note

The caller is responsible for making sure img is not deleted while it's used by the widget, and, if appropriate, for deleting it after the widget's deletion.

See also

void bind_deimage(Fl_Image* img)

34.161.4.47 deimage_bound()

int Fl_Widget::deimage_bound ( ) const [inline]

Generated by Doxygen
Returns whether the inactive image is managed by the widget.
34.161.48 do_callback() [1/3]

void Fl_Widget::do_callback (
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) [inline]

Calls the widget callback function with default arguments.
This is the same as calling
do_callback(this, user_data(), reason);

Parameters

| in  | reason | give a reason to why this callback was called, defaults to FL_REASON_UNKNOWN |

See also

callback()

do_callback(Fl_Widget *widget, void *data, Fl_Callback_Reason reason), Fl_Callback_Reason

34.161.49 do_callback() [2/3]

void Fl_Widget::do_callback (
    Fl_Widget * widget,
    long arg,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) [inline]

Calls the widget callback function with arbitrary arguments.

Parameters

| in   | widget | call the callback with widget as the first argument |
| in   | arg    | call the callback with arg as the user data (second) argument |
| in   | reason | give a reason to why this callback was called, defaults to FL_REASON_UNKNOWN |

See also

callback()

do_callback(Fl_Widget *widget, void *data), Fl_Callback_Reason

34.161.50 do_callback() [3/3]

void Fl_Widget::do_callback (
    Fl_Widget * widget,
    void * arg = 0,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN )

Calls the widget callback function with arbitrary arguments.

Return values

| 0   | if the image is not bound to the widget |
| 1   | if the image will be deleted when the widget is deleted |

See also

image_bound(), bind_deimage()
All overloads of `do_callback()` call this method. It does nothing if the widget's `callback()` is NULL. It clears the widget's `changed` flag after the callback was called unless the callback is the default callback. Hence it is not necessary to call `clear_changed()` after calling `do_callback()` in your own widget's `handle()` method.

A reason must be set for widgets if different actions can trigger the same callback.

**Note**

It is legal to delete the widget in the callback (i.e. in user code), but you must not access the widget in the `handle()` method after calling `do_callback()` if the widget was deleted in the callback. We recommend to use `Fl_Widget_Tracker` to check whether the widget was deleted in the callback.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th><code>widget</code></th>
<th>call the callback with <code>widget</code> as the first argument</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>arg</code></td>
<td>use <code>arg</code> as the user data (second) argument</td>
</tr>
<tr>
<td>in</td>
<td><code>reason</code></td>
<td>give a reason to why this callback was called, defaults to <code>FL_REASON_UNKNOWN</code></td>
</tr>
</tbody>
</table>

**See also**

- `default_callback()`
- `callback()`
- `class Fl_Widget_Tracker`
- `Fl::callback_reason()`

### 34.161.4.51 draw()

```cpp
default void Fl_Widget::draw ( ) [pure virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method from within your own `draw()` method, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Implemented in `Fl_Adjuster`, `Fl_Box`, `Fl_Browser`, `Fl_Button`, `Fl_Cairo_Window`, `Fl_Chart`, `FlChoice`,
`Fl_Clock_Output`, `Fl_Counter`, `Fl.Dial`, `Fl_File_Input`, `Fl_Flex`, `Fl_FormsBitmap`, `Fl_FormsPixmap`, `Fl_Free`,
`Fl_GL_Window`, `Fl_Grid`, `Fl_Group`, `Fl_Help_View`, `Fl_Input`, `Fl_Light_Button`, `Fl_Menu_Bar`, `Fl_Menu_Button`,
`Fl_Pack`, `Fl_Positioner`, `Fl_Progress`, `Fl_Return_Button`, `Fl_Roller`, `Fl_Scroll`, `Fl.Scrollbar`,
`Fl_ScrollBar`, `Fl_ScrollWindow`, `Fl_Simple_Terminal`, `Fl_Slider`, `Fl_Spinner`, `Fl_Sys_Menu_Bar`, `Fl_Table`,
`Fl_Tabs`, `Fl_Text_Display`, `Fl_Timer`, `Fl_Tree`, `Fl_Value_Input`, `Fl_Value_Output`, `Fl_Value_Slider`, `Fl_Window`,
`Fl_Wizard`, `Fl_FormsText`, `Fl_Gl_Window`, and `Fl_Terminal`.

### 34.161.4.52 draw_focus() [1/3]

```cpp
void Fl_Widget::draw_focus ( ) const [inline], [protected]
```

Draws a focus rectangle around the widget.

This method uses the widget's boxtype and coordinates and its background color `color()`.

**See also**

- `Fl_Widget::draw_focus(Fl_Boxtype, int, int, int, Fl_Color)` const
### 34.161.4.53 `draw_focus()` [2/3]

```cpp
define Fl_Widget::draw_focus (Fl_Boxtype t, int X, int Y, int W, int H) const [inline], [protected]
```

Draws a focus rectangle around the widget. This method uses the given boxtype and coordinates and the widget's background color `color()`.

See also

```cpp
Fl_Widget::draw_focus(Fl_Boxtype, int, int, int, Fl_Color) const
```

### 34.161.4.54 `draw_focus()` [3/3]

```cpp
define Fl_Widget::draw_focus (Fl_Boxtype bt, int X, int Y, int W, int H, Fl_Color bg) const [protected]
```

Draws a focus box for the widget at the given position and size. This method does nothing if

- the global option `Fl::visible_focus()` or
- the per-widget option `visible_focus()` is false (off).

This means that `Fl_Widget::draw_focus()` or one of the more specialized methods can be called without checking these visible focus options.

**Note**

This method must only be called if the widget has the focus. This is not tested internally.

The boxtype `bt` is used to calculate the inset so the focus box is drawn inside the box borders. The default focus box drawing color is black. The background color `bg` is used to determine a better visible color if necessary by using `fl_contrast()` with the given background color.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>bt</th>
<th>Boxtyle that needs to be considered (frame width)</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>X,Y,W,H</td>
<td>Bounding box</td>
</tr>
<tr>
<td>in</td>
<td>bg</td>
<td>Background color</td>
</tr>
</tbody>
</table>

See also

```cpp
Fl_Widget::draw_focus()
Fl_Widget::draw_focus(Fl_Boxtype, int, int, int) const
```

### 34.161.4.55 `draw_label()` [1/3]

```cpp
define Fl_Widget::draw_label () const [protected]
```

Draws the widget's label at the defined label position. This is the normal call for a widget's `draw()` method.
34.161.4.56  draw_label() [2/3]

    void Fl_Widget::draw_label (  
        int X,
        int Y,
        int W,
        int H ) const [protected]  

Draws the label in an arbitrary bounding box.  

draw() can use this instead of draw_label(void) to change the bounding box.

34.161.4.57  draw_label() [3/3]

    void Fl_Widget::draw_label (  
        int X,
        int Y,
        int W,
        int H,
        Fl_Align a ) const  

Draws the label in an arbitrary bounding box with an arbitrary alignment.  
Anybody can call this to force the label to draw anywhere.

34.161.4.58  h() [1/2]

    int Fl_Widget::h (  
                    ) const [inline]  

Gets the widget height.  

    Returns  
                  the height of the widget in pixels.

34.161.4.59  h() [2/2]

    void Fl_Widget::h (  
                      ) [inline], [protected]  

Internal use only.  

Use position(int,int), size(int,int) or resize(int,int,int) instead.

34.161.4.60  handle()

    int Fl_Widget::handle (  
      int event ) [virtual]  

Handles the specified event.  

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.  
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.  
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.  
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class. This requires knowledge of the details of the inherited class.  
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

in  event  the kind of event received
Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the event was not used or understood</td>
</tr>
<tr>
<td>1</td>
<td>if the event was used and can be deleted</td>
</tr>
</tbody>
</table>

See also

Fl_Event


34.161.4.61 hide()

```cpp
void Fl_Widget::hide ( ) [virtual]
```

Makes a widget invisible.

See also

show(), visible(), visible_r()

Reimplemented in Fl_Browser, Fl_Double_Window, Fl_Gl_Window, Fl_Overlay_Window, and Fl_Window.

34.161.4.62 image() [1/4]

```cpp
Fl_Image * Fl_Widget::image ( ) [inline]
```

Gets the image that is used as part of the widget label when in the active state.

Returns

the current image

34.161.4.63 image() [2/4]

```cpp
const Fl_Image * Fl_Widget::image ( ) const [inline]
```

Gets the image that is used as part of the widget label when in the active state.

Returns

the current image

34.161.4.64 image() [3/4]

```cpp
void Fl_Widget::image ( 
    Fl_Image & img )
```

Sets the image to use as part of the widget label when in the active state.

Parameters

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>img</td>
</tr>
</tbody>
</table>
See also

```cpp
void image(Fl_Image* img)
```

### 34.161.4.65 image() [4/4]

```cpp
void Fl_Widget::image ( 
  Fl_Image* img )
```

Sets the image to use as part of the widget label when in the active state.
The caller is responsible for making sure `img` is not deleted while it's used by the widget, and, if appropriate, for deleting it after the widget's deletion.
Calling `image()` with a new image will delete the old image if it was bound, and set the new image without binding it.
If old and new are the same, the image will not be deleted, but it will be unbound.
Calling `image()` with NULL will delete the old image if it was bound and not set a new image.

**Parameters**

```cpp
in img the new image for the label
```

See also

```cpp
bind_image(Fl_Image* img)
```

### 34.161.4.66 image_bound()

```cpp
int Fl_Widget::image_bound ( ) const [inline]
```

Returns whether the image is managed by the widget.

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the image is not bound to the widget</td>
</tr>
<tr>
<td>1</td>
<td>if the image will be deleted when the widget is deleted</td>
</tr>
</tbody>
</table>

See also

```cpp
deimage_bound(), bind_image()
```

### 34.161.4.67 inside()

```cpp
int Fl_Widget::inside ( 
  const Fl_Widget* wgt ) const [inline]
```

Checks if this widget is a child of `wgt`.
Returns 1 if this widget is a child of `wgt`, or is equal to `wgt`. Returns 0 if `wgt` is NULL.

**Parameters**

```cpp
in wgt the possible parent widget
```

See also

```cpp
contains()
```
### is_label_copied()

```cpp
int Fl_Widget::is_label_copied ( ) const [inline]
```

Returns whether the current label was assigned with `copy_label()`. This can be useful for temporarily overwriting the widget's label and restoring it later.

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>current label was assigned with <code>label()</code></td>
</tr>
<tr>
<td>1</td>
<td>current label was assigned with <code>copy_label()</code></td>
</tr>
</tbody>
</table>

### label() [1/3]

```cpp
const char * Fl_Widget::label ( ) const [inline]
```

Gets the current label text.

Returns

a pointer to the current label text

See also

`label(const char *)`, `copy_label(const char *)`

### label() [2/3]

```cpp
void Fl_Widget::label ( const char * text )
```

Sets the current label pointer.

The label is shown somewhere on or next to the widget. See Labels and Label Types for details about what can be put in a label. The passed pointer is stored unchanged in the widget (the string is not copied), so if you need to set the label to a formatted value, make sure the buffer is static, global, or allocated. The `copy_label()` method can be used to make a copy of the label string automatically.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>text</td>
<td>pointer to new label text</td>
</tr>
</tbody>
</table>

See also

`copy_label()`

### label() [3/3]

```cpp
void Fl_Widget::label ( Fl_Labeltype a, const char * b ) [inline]
```

Shortcut to set the label text and type in one call.

See also

`label(const char *)`, `labeltype(Fl_Labeltype)`
34.161.4.72 label_shortcut()

`unsigned int Fl_Widget::label_shortcut (const char * t)` [static]

Returns the Unicode value of the '&x' shortcut in a given text. The given text `t` (usually a widget's label or a menu text) is searched for a '&x' shortcut label, and if found, the Unicode value (code point) of the '&x' shortcut is returned.

Parameters

- `t` text or label to search for '&x' shortcut.

Returns

- Unicode (UCS-4) value of shortcut in `t` or 0.

Note

Internal use only.

34.161.4.73 labelcolor() [1/2]

`Fl_Color Fl_Widget::labelcolor ( ) const` [inline]

Gets the label color. The default color is FL_FOREGROUND_COLOR.

Returns

- the current label color

34.161.4.74 labelcolor() [2/2]

`void Fl_Widget::labelcolor ( Fl_Color c)` [inline]

Sets the label color. The default color is FL_FOREGROUND_COLOR.

Parameters

- `c` the new label color

34.161.4.75 labelfont() [1/2]

`Fl_Font Fl_Widget::labelfont ( ) const` [inline]

Gets the font to use. Fonts are identified by indexes into a table. The default value uses a Helvetica typeface (Arial for Microsoft® Windows®). The function Fl::set_font() can define new typefaces.

Returns

- current font used by the label

See also

- Fl_Font
34.161.4.76  labelfont() [2/2]

void Fl_Widget::labelfont (  
    Fl_Font  f  ) [inline]

Sets the font to use.  
Fonts are identified by indexes into a table.  The default value uses a Helvetica typeface (Arial for Microsoft®  
Windows®).  The function Fl::set_font() can define new typefaces.

Parameters

    in  f  the new font for the label

See also

    Fl_Font

34.161.4.77  labelsize() [1/2]

Fl_Fontsize Fl_Widget::labelsize ( ) const [inline]

Gets the font size in pixels.  
The default size is 14 pixels.

Returns

    the current font size

34.161.4.78  labelsize() [2/2]

void Fl_Widget::labelsize (  
    Fl_Fontsize  pix  ) [inline]

Sets the font size in pixels.

Parameters

    in  pix  the new font size

See also

    Fl_Fontsize labelsize()

34.161.4.79  labeltype() [1/2]

Fl_Labeltype Fl_Widget::labeltype ( ) const [inline]

Gets the label type.

Returns

    the current label type.

See also

    Fl_Labeltype
34.161.4.80  labeltype() [2/2]

void Fl_Widget::labeltype (  
    Fl_Labeltype  a )  [inline]

Sets the label type.
The label type identifies the function that draws the label of the widget. This is generally used for special effects such as embossing or for using the label() pointer as another form of data such as an icon. The value FL_NORMAL_←LABEL prints the label as plain text.

Parameters

    in  a  new label type

See also

    Fl_Labeltype

34.161.4.81  measure_label()

void Fl_Widget::measure_label (  
    int &  ww,  
    int &  hh )  const  [inline]

Sets width ww and height hh accordingly with the label size.
Labels with images will return w() and h() of the image.
This calls fl_measure() internally. For more information about the arguments ww and hh and word wrapping

See also

    fl_measure(const char*, int&, int&, int)

34.161.4.82  needs_keyboard() [1/2]

bool Fl_Widget::needs_keyboard ( )  const  [inline]

Returns whether this widget needs a keyboard.

Returns

    true or false

See also

    needs_keyboard(bool)

34.161.4.83  needs_keyboard() [2/2]

void Fl_Widget::needs_keyboard (  
    bool  needs )  [inline]

Sets whether this widget needs a keyboard.
Set this on touch screen devices if a widget needs a keyboard when it gets the focus.

Note

    This flag can be set but is not yet used in FLTK 1.4.0. It is intended to be used in the future on real touch devices.
### 34.161.4.84 output()

```c
unsigned int Fl_Widget::output ( ) const [inline]
```

Returns if a widget is used for output only.

output() means the same as !active() except it does not change how the widget is drawn. The widget will not receive any events. This is useful for making scrollbars or buttons that work as displays rather than input devices.

**Return values**

- **0** if the widget is used for input and output

**See also**

- `set_output()`, `clear_output()`

### 34.161.4.85 parent() [1/2]

```c
Fl_Group ∗ Fl_Widget::parent ( ) const [inline]
```

Returns a pointer to the parent widget.

Usually this is a Fl_Group or Fl_Window.

**Return values**

- **NULL** if the widget has no parent

**See also**

- `Fl_Group::add(Fl_Widget ∗)`

### 34.161.4.86 parent() [2/2]

```c
void Fl_Widget::parent ( Fl_Group ∗ p ) [inline]
```

Internal use only - "for hacks only".

It is **STRONGLY recommended** not to use this method, because it short-circuits Fl_Group's normal widget adding and removing methods, if the widget is already a child widget of another Fl_Group. Use `Fl_Group::add(Fl_Widget ∗)` and/or `Fl_Group::remove(Fl_Widget ∗)` instead.

### 34.161.4.87 position()

```c
void Fl_Widget::position ( int X, int Y ) [inline]
```

Repositions the window or widget.

position(X, Y) is a shortcut for resize(X, Y, w(), h()).

**Parameters**

- **in X, Y** new position relative to the parent window
See also

    resize(int,int,int,int), size(int,int)

### 34.161.4.88 redraw()

```cpp
void Fl_Widget::redraw ( )
```

Schedules the drawing of the widget.
Marks the widget as needing its `draw()` routine called.

### 34.161.4.89 redraw_label()

```cpp
void Fl_Widget::redraw_label ( )
```

Schedules the drawing of the label.
Marks the widget or the parent as needing a redraw for the label area of a widget.

### 34.161.4.90 resize()

```cpp
void Fl_Widget::resize ( int x, int y, int w, int h ) [virtual]
```

Changes the size or position of the widget.
This is a virtual function so that the widget may implement its own handling of resizing. The default version does not call the `redraw()` method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.
Some window managers under X11 call `resize()` a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.
`position(X, Y)` is a shortcut for `resize(X, Y, w(), h())`, and `size(W, H)` is a shortcut for `resize(x(), y(), W, H)`.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th>x, y</th>
<th>new position relative to the parent window</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>w, h</td>
<td>new size</td>
</tr>
</tbody>
</table>

See also

    position(int,int), size(int,int)


### 34.161.4.91 selection_color() [1/2]

```cpp
Fl_Color Fl_Widget::selection_color ( ) const [inline]
```

Gets the selection color.

**Returns**

the current selection color

See also

    selection_color(Fl_Color), color(Fl_Color, Fl_Color)
### 34.161.4.92 selection_color() [2/2]

void Fl_Widget::selection_color ( Fl_Color a ) [inline]

Sets the selection color.
The selection color is defined for Forms compatibility and is usually used to color the widget when it is selected, although some widgets use this color for other purposes. You can set both colors at once with color(Fl_Color bg, Fl_Color sel).

**Parameters**

- **in a** the new selection color

**See also**

- selection_color(), color(Fl_Color, Fl_Color)

### 34.161.4.93 set_active()

void Fl_Widget::set_active ( ) [inline]

Marks the widget as active without sending events or changing focus. This is mainly for specialized use, for normal cases you want activate().

**See also**

- activate()

### 34.161.4.94 set_changed()

void Fl_Widget::set_changed ( ) [inline]

Marks the value of the widget as changed.

**See also**

- changed(), clear_changed()

### 34.161.4.95 set_output()

void Fl_Widget::set_output ( ) [inline]

Sets a widget to output only.

**See also**

- output(), clear_output()

### 34.161.4.96 set_visible()

void Fl_Widget::set_visible ( ) [inline]

Makes the widget visible.
You must still redraw the parent widget to see a change in the window. Normally you want to use the show() method instead.
34.161.4.97  set_visible_focus()

void Fl_Widget::set_visible_focus ( ) [inline]
Enables keyboard focus navigation with this widget.
Note, however, that this will not necessarily mean that the widget will accept focus, but for widgets that can accept
focus, this method enables it if it has been disabled.
See also
visible_focus(), clear_visible_focus(), visible_focus(int)

34.161.4.98  shortcut_label() [1/2]

int Fl_Widget::shortcut_label ( ) const [inline]
Returns whether the widget's label uses '&' to indicate shortcuts.
See also
void shortcut_label(int value)

34.161.4.99  shortcut_label() [2/2]

void Fl_Widget::shortcut_label ( int value ) [inline]
Sets whether the widget's label uses '&' to indicate shortcuts.
By default, all objects of classes Fl_Menu_ (and derivatives), Fl_Button (and derivatives), Fl_Text_Display,
Fl_Value_Input, and Fl_Input_ (and derivatives) use character '&' in their label, unless '&' is repeated, to indicate
shortcuts: '&' does not appear in the drawn label, the next character after '&' in the label is drawn underlined, and
typing this character triggers the corresponding menu window, button, or other widget. If the label contains 2 con-
secutive '&', only one is drawn and the next character is not underlined and not used as a shortcut. If value is set
to 0, all these labels don't process character '&' as indicating a shortcut: '&' is drawn in the label, the next character
is not underlined and does not define a shortcut.

34.161.4.100  show()

void Fl_Widget::show ( ) [virtual]
Makes a widget visible.
An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other
events like FL_SHOW.
The visible() method returns true if the widget is set to be visible. The visible_r() method returns true if the widget
and all of its parents are visible. A widget is only visible if visible() is true on it and all of its parents.
Changing it will send FL_SHOW or FL_HIDE events to the widget. Do not change it if the parent is not visible, as
this will send false FL_SHOW or FL_HIDE events to the widget. redraw() is called if necessary on this or the parent.
See also
hide(), visible(), visible_r()
Reimplemented in Fl_Browser, Fl_Double_Window, Fl_Gl_Window, Fl_Overlay_Window, Fl_Single_Window, and
Fl_Window.

34.161.4.101  size()

void Fl_Widget::size ( int W, int H ) [inline]
Changes the size of the widget.
size(W, H) is a shortcut for resize(x(), y(), W, H).
34.161.4.102 take_focus()

int Fl_Widget::take_focus() const

Gives the widget the keyboard focus. Tries to make this widget be the Fl::focus() widget, by first sending it an FL_FOCUS event, and if it returns non-zero, setting Fl::focus() to this widget. You should use this method to assign the focus to a widget.

Returns

true if the widget accepted the focus.

34.161.4.103 takesevents()

unsigned int Fl_Widget::takesevents() const [inline]

Returns if the widget is able to take events. This is the same as (active() && !output() && visible()) but is faster.

Return values

0 if the widget takes no events

34.161.4.104 testShortcut() [1/2]

int Fl_Widget::testShortcut() const

Returns true if the widget's label contains the entered '&x' shortcut. This method must only be called in handle() methods or callbacks after a keypress event (usually FL_KEYDOWN or FL_SHORTCUT). The widget's label is searched for a '&x' shortcut, and if found, this is compared with the entered key value. Fl::event_text() is used to get the entered key value.

Returns

true, if the entered text matches the widget's '&x' shortcut, false (0) otherwise.

Note

Useful when a widget's handle(int) method needs dedicated processing of FL_SHORTCUT.

34.161.4.105 testShortcut() [2/2]

int Fl_Widget::testShortcut(const char * t,
const bool require_alt = false) [static]

Returns true if the given text t contains the entered '&x' shortcut.
This method must only be called in handle() methods or callbacks after a keypress event (usually FL_KEYDOWN or FL_SHORTCUT). The given text \( t \) (usually a widget's label or menu text) is searched for a ‘&x’ shortcut, and if found, this is compared with the entered key value. \( \text{Fl::event_text()} \) is used to get the entered key value. \( \text{Fl::event_state()} \) is used to get the Alt modifier, if \textit{require_alt} is true.

**Parameters**

- \texttt{t} text or label to search for ‘&x’ shortcut.
- \texttt{require_alt} if true: match only if Alt key is pressed.

**Returns**

true, if the entered text matches the ‘&x’ shortcut in \( t \): false (0) otherwise.

**Note**

Useful when a widget's handle(int) method needs dedicated processing of FL_SHORTCUT.

### 34.161.4.106 tooltip() [1/2]

```cpp
const char * Fl_Widget::tooltip ( ) const [inline]
```

Gets the current tooltip text.

**Returns**

a pointer to the tooltip text or NULL

**See also**

tooltip(const char*), copy_tooltip(const char*)

### 34.161.4.107 tooltip() [2/2]

```cpp
void Fl_Widget::tooltip (const char * text )
```

Sets the current tooltip text.

Sets a string of text to display in a popup tooltip window when the user hovers the mouse over the widget. The string is not copied, so make sure any formatted string is stored in a static, global, or allocated buffer. If you want a copy made and managed for you, use the \texttt{copy_tooltip()} method, which will manage the tooltip string automatically. If no tooltip is set, the tooltip of the parent is inherited. Setting a tooltip for a group and setting no tooltip for a child will show the group's tooltip instead. To avoid this behavior, you can set the child's tooltip to an empty string (""").

**Parameters**

- \texttt{in text} New tooltip text (no copy is made)

**See also**

copy_tooltip(const char*), tooltip()

### 34.161.4.108 top_window()

```cpp
Fl_Window * Fl_Widget::top_window ( ) const
```

Generated by Doxygen
Returns a pointer to the top-level window for the widget. In other words, the ‘window manager window’ that contains this widget. This method differs from window() in that it won’t return sub-windows (if there are any).

Returns

the top-level window, or NULL if no top-level window is associated with this widget.

See also

window()

34.161.4.109  top_window_offset()

Fl_Window * Fl_Widget::top_window_offset (  
    int & xoff,  
    int & yoff ) const  

Finds the x/y offset of the current widget relative to the top-level window.

Parameters

| out | xoff,yoff | Returns the x/y offset |

Returns

the top-level window (or NULL for a widget that’s not in any window)

34.161.4.110  type() [1/2]

uchar Fl_Widget::type ( ) const [inline]

Gets the widget type.

Returns the widget type value, which gives some information about the derived widget class to which the object belongs. Noticeably, the condition type() >= FL_WINDOW indicates a widget is an Fl_Window or derived object.

34.161.4.111  type() [2/2]

void Fl_Widget::type (  
    uchar t ) [inline]

Sets the widget type.

See also

type()

34.161.4.112  user_data()

void * Fl_Widget::user_data ( ) const [inline]

Gets the user data for this widget.

Gets the current user data (void *) argument that is passed to the callback function.

Returns

user data as a pointer
34.161.4.113  visible()

unsigned int Fl_Widget::visible ( ) const [inline]
Returns whether a widget is visible.

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the widget is not drawn and hence invisible.</td>
</tr>
</tbody>
</table>

See also

    show(), hide(), visible_r()

34.161.4.114  visible_focus() [1/2]

unsigned int Fl_Widget::visible_focus ( ) const [inline]
Checks whether this widget has a visible focus.

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if this widget has no visible focus.</td>
</tr>
</tbody>
</table>

See also

    visible_focus(int), set_visible_focus(), clear_visible_focus()

34.161.4.115  visible_focus() [2/2]

void Fl_Widget::visible_focus (    
    int v          ) [inline]
Modifies keyboard focus navigation.

Parameters

| in | v  | set or clear visible focus |

See also

    set_visible_focus(), clear_visible_focus(), visible_focus()

34.161.4.116  visible_r()

int Fl_Widget::visible_r ( ) const
Returns whether a widget and all its parents are visible.

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>if the widget or any of its parents are invisible.</td>
</tr>
</tbody>
</table>

See also

    show(), hide(), visible()
34.161.4.117  w() [1/2]

int Fl_Widget::w ( ) const [inline]

Gets the widget width.

Returns

the width of the widget in pixels.

34.161.4.118  w() [2/2]

void Fl_Widget::w (  [inline], [protected]

Internal use only.

Use position(int,int), size(int,int) or resize(int,int,int,int) instead.

34.161.4.119  when() [1/2]

Fl_When Fl_Widget::when ( ) const [inline]

Returns the conditions under which the callback is called.

You can set the flags with when(uchar), the default value is FL_WHEN_RELEASE.

Returns

set of flags

See also

when(uchar), Fl_When, do_callback(), Fl::callback_reason()

34.161.4.120  when() [2/2]

void Fl_Widget::when (  [inline]

Sets the flags used to decide when a callback is called.

This controls when callbacks are done. The following values are useful, the default value is FL_WHEN_RELEASE:

• 0: The callback is not done, but changed() is turned on.

• FL_WHEN_CHANGED: The callback is done each time the text is changed by the user.

• FL_WHEN_RELEASE: The callback will be done when this widget loses the focus, including when the window is unmapped. This is a useful value for text fields in a panel where doing the callback on every change is wasteful. However the callback will also happen if the mouse is moved out of the window, which means it should not do anything visible (like pop up an error message). You might do better setting this to zero, and scanning all the items for changed() when the OK button on a panel is pressed.

• FL_WHEN_ENTER_KEY: If the user types the Enter key, the entire text is selected, and the callback is done if the text has changed. Normally the Enter key will navigate to the next field (or insert a newline for a Fl_Multiline_Input) - this changes the behavior.

• FL_WHEN_ENTER_KEY|FL_WHEN_NOT_CHANGED: The Enter key will do the callback even if the text has not changed. Useful for command fields.

• FL_WHEN_CLOSED : If the user requests that the widget is closed, the callback is called with FL_REASON_CLOSED. The Fl_Tabs widget checks this flag on its children to determine whether to display a close button on the tab of that widget.

Fl_Widget::when() is a set of bitflags used by subclasses of Fl_Widget to decide when to do the callback.

If the value is zero then the callback is never done. Other values are described in the individual widgets. This field is in the base class so that you can scan a panel and do_callback() on all the ones that don't do their own callbacks in response to an "OK" button.
Parameters

| in | i | set of flags |

See also

Fl_When, do_callback(), Fl::callback_reason()

34.161.4.121 window()

Fl_Window * Fl_Widget::window ( ) const

Returns a pointer to the nearest parent window up the widget hierarchy. This will return sub-windows if there are any, or the parent window if there's no sub-windows. If this widget IS the top-level window, NULL is returned.

Return values

| NULL | if no window is associated with this widget |

Note

for an Fl_Window widget, this returns its parent window (if any), not this window.

See also

top_window()

34.161.4.122 x() [1/2]

int Fl_Widget::x ( ) const [inline]

Gets the widget position in its window.

Returns

the x position relative to the window

34.161.4.123 x() [2/2]

void Fl_Widget::x ( int v ) [inline], [protected]

Internal use only. Use position(int,int), size(int,int) or resize(int,int,int,int) instead.

34.161.4.124 y() [1/2]

int Fl_Widget::y ( ) const [inline]

Gets the widget position in its window.

Returns

the y position relative to the window
34.161.4.125  y() [2/2]

void Fl_Widget::y (  
    int v   ) [inline], [protected]

Internal use only.
Use position(int,int), size(int,int) or resize(int,int,int,int) instead.
The documentation for this class was generated from the following files:

- Fl_Widget.H
- Fl.cxx
- fl_boxtype.cxx
- fl_labeltype.cxx
- fl_shortcut.cxx
- Fl_Tooltip.cxx
- Fl_Widget.cxx
- Fl_Window.cxx

34.162  Fl_Widget_Surface Class Reference

A surface on which any FLTK widget can be drawn.
#include <Fl_Widget_Surface.H>

Inheritance diagram for Fl_Widget_Surface:

```plaintext
Fl_Surface_Device  
<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
</table>
Fl_Widget_Surface
<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
</table>
Fl_Copy_Surface  Fl_EPS_File_Surface  Fl_Image_Surface  Fl_Paged_Device  Fl_SVG_File_Surface

Fl_PostScript_File_Device  Fl_Printer
```

Public Member Functions

- **void draw (Fl_Widget *widget, int delta_x=0, int delta_y=0)**  
  Draws the widget on the drawing surface.
- **void draw_decorated_window (Fl_Window *win, int x_offset=0, int y_offset=0)**  
  Draws a window with its title bar and frame if any.
- **virtual void origin (int *x, int *y)**  
  Computes the coordinates of the current origin of graphics functions.
- **virtual void origin (int x, int y)**  
  Sets the position of the origin of graphics in the drawable part of the drawing surface.
- **void print_window_part (Fl_Window *win, int x, int y, int w, int h, int delta_x=0, int delta_y=0)**  
  Draws a rectangular part of an on-screen window.
- **virtual int printable_rect (int *w, int *h)**  
  Computes the width and height of the drawable area of the drawing surface.
- **virtual void translate (int x, int y)**  
  Translates the current graphics origin accounting for the current rotation.
- **virtual void untranslate ()**  
  Undoes the effect of a previous translate() call.

Protected Member Functions

- **Fl_Widget_Surface (Fl_Graphics_Driver *d)**  
  The constructor.
Protected Attributes

- int x_offset
  horizontal offset to the origin of graphics coordinates
- int y_offset
  vertical offset to the origin of graphics coordinates

Additional Inherited Members

34.162.1 Detailed Description
A surface on which any FLTK widget can be drawn.

34.162.2 Constructor & Destructor Documentation

34.162.2.1 Fl_Widget_Surface()

Fl_Widget_Surface::Fl_Widget_Surface ( Fl_Graphics_Driver * d ) [protected]
The constructor.

Parameters

- d can be nul.

34.162.3 Member Function Documentation

34.162.3.1 draw()

void Fl_Widget_Surface::draw ( Fl_Widget * widget, int delta_x = 0, int delta_y = 0 )
Draws the widget on the drawing surface.
The widget's position on the surface is determined by the last call to origin() and by the optional delta_x and delta_y arguments. Its dimensions are in points unless there was a previous call to scale().

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>widget</th>
<th>Any FLTK widget (e.g., standard, custom, window).</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>delta_x, delta_y</td>
<td>Optional horizontal and vertical offsets for positioning the widget top left relatively to the current origin of graphics.</td>
</tr>
</tbody>
</table>

34.162.3.2 draw_decorated_window()

void Fl_Widget_Surface::draw_decorated_window ( Fl_Window * win, int win_offset_x = 0, int win_offset_y = 0 )
Draws a window with its title bar and frame if any.
win_offset_x and win_offset_y are optional coordinates of where to position the window top
left. Equivalent to draw() if win is a subwindow or has no border. Use Fl_Window::decorated_w() and Fl_Window::decorated_h() to get the size of the framed window.

### 34.162.3.3 origin() [1/2]

```cpp
class Fl_Widget_Surface:
    void origin(int *x, int *y) [virtual];
```

Computes the coordinates of the current origin of graphics functions.

**Parameters**

| out | x, y | If non-null, *x* and *y* are set to the horizontal and vertical coordinates of the graphics origin. |


### 34.162.3.4 origin() [2/2]

```cpp
class Fl_Widget_Surface:
    void origin(int x, int y) [virtual];
```

Sets the position of the origin of graphics in the drawable part of the drawing surface. Arguments should be expressed relatively to the result of a previous printable_rect() call. That is, printable_rect(&w, &h); origin(w/2, 0); sets the graphics origin at the top center of the drawable area. Successive origin() calls don’t combine their effects. Origin() calls are not affected by rotate() calls (for classes derived from Fl_Paged_Device).

**Parameters**

| in | x, y | Horizontal and vertical positions in the drawing surface of the desired origin of graphics. |


### 34.162.3.5 print_window_part()

```cpp
class Fl_Widget_Surface:
    void print_window_part(Fl_Window *win, int x, int y, int w, int h, int delta_x = 0, int delta_y = 0);
```

Draws a rectangular part of an on-screen window.

**Parameters**

<table>
<thead>
<tr>
<th>win</th>
<th>The window from where to capture. Can be an Fl_Gl_Window. Sub-windows that intersect the rectangle are also captured.</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>The rectangle left</td>
</tr>
<tr>
<td>y</td>
<td>The rectangle top</td>
</tr>
<tr>
<td>w</td>
<td>The rectangle width</td>
</tr>
<tr>
<td>h</td>
<td>The rectangle height</td>
</tr>
</tbody>
</table>
Parameters

| delta_x, delta_y | Optional horizontal and vertical offsets from current graphics origin where to draw the top left of the captured rectangle. |

### 34.162.3.6 printable_rect()

```c
int Fl_Widget_Surface::printable_rect ( int * w, int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface. Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to `origin()`. If the object is derived from class `Fl_Paged_Device`, values account for the user-selected paper type and print orientation and are changed by `scale()` calls.

Returns

0 if OK, non-zero if any error


### 34.162.3.7 translate()

```c
void Fl_Widget_Surface::translate ( int x, int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation. Each `translate()` call must be matched by an `untranslate()` call. Successive `translate()` calls add up their effects.


### 34.162.3.8 untranslate()

```c
void Fl_Widget_Surface::untranslate ( void ) [virtual]
```

Undoes the effect of a previous `translate()` call.


The documentation for this class was generated from the following files:

- `Fl_Widget_Surface.H`
- `Fl_Widget_Surface.cxx`

### 34.163 Fl_Widget_Tracker Class Reference

This class should be used to control safe widget deletion.

```cpp
#include <Fl.H>
```

**Public Member Functions**

- `int deleted ()`
  
  Returns 1, if the watched widget has been deleted.

- `int exists ()`
  
  Returns 1, if the watched widget exists (has not been deleted).
**Fl_Widget_Tracker** (Fl_Widget *wi)

The constructor adds a widget to the watch list.

**Fl_Widget * widget ()**

Returns a pointer to the watched widget.

**~Fl_Widget_Tracker ()**

The destructor removes a widget from the watch list.

### 34.163.1 Detailed Description

This class should be used to control safe widget deletion. You can use an **Fl_Widget_Tracker** object to watch another widget, if you need to know whether this widget has been deleted during a callback. This simplifies the use of the “safe widget deletion” methods Fl::watch_widget_pointer() and Fl::release_widget_pointer() and makes their use more reliable, because the destructor automatically releases the widget pointer from the widget watch list. **Fl_Widget_Tracker** is intended to be used as an automatic (local/stack) variable, such that its destructor is called when the object’s scope is left. This ensures that no stale widget pointers are left in the widget watch list (see example below). You can also create **Fl_Widget_Tracker** objects with **new**, but then it is your responsibility to delete the object (and thus remove the widget pointer from the watch list) when it is no longer needed.

Example:

```cpp
#include <fl/fl.h>

int MyClass::handle (int event) {  
  if (...) {  
    Fl_Widget_Tracker wp(this); // watch myself  
    do_callback(); // call the callback  
    if (wp.deleted()) return 1; // exit, if deleted  
    // Now we are sure that the widget has not been deleted,  
    // and it is safe to access the widget:  
    box(FL_FLAT_BOX);  
    color(FL_WHITE);  
    redraw();  
  }  
}
```

### 34.163.2 Member Function Documentation

#### 34.163.2.1 deleted()

```cpp
int Fl_Widget_Tracker::deleted () [inline]
```

Returns 1, if the watched widget has been deleted. This is a convenience method. You can also use something like if (wp.widget() == 0) // ...

where **wp** is an **Fl_Widget_Tracker** object.

#### 34.163.2.2 exists()

```cpp
int Fl_Widget_Tracker::exists () [inline]
```

Returns 1, if the watched widget exists (has not been deleted). This is a convenience method. You can also use something like if (wp.widget() != 0) // ...

where **wp** is an **Fl_Widget_Tracker** object.

#### 34.163.2.3 widget()

```cpp
Fl_Widget * Fl_Widget_Tracker::widget () [inline]
```

Returns a pointer to the watched widget. This pointer is NULL, if the widget has been deleted. The documentation for this class was generated from the following files:

- Fl.H
- Fl.cxx
34.164 Fl_Window Class Reference

This widget produces an actual window.

```c
#include <Fl_Window.H>
```

Inheritance diagram for Fl_Window:

```
Fl_Widget
  ↓
Fl_Group
  ↓
Fl_Window
  ↓
Fl_Double_Window
  ↓
Fl_Gl_Window
  ↓
Fl_Single_Window
  ↓
Fl_Cairo_Window
  ↓
Fl_Overlay_Window
  ↓
Fl_Glut_Window
  ↓
Fl_Menu_Window
```

**Public Types**

- typedef struct HICON__ * HICON

**Public Member Functions**

- virtual class Fl_Double_Window * as_double_window ()
  
  Returns non-null if this is an Fl_Double_Window object.

- virtual class Fl_Overlay_Window * as_overlay_window ()
  
  Return non-null if this is an Fl_Overlay_Window object.

- Fl_Window const & as_window () const FL_OVERRIDE
  
  Returns an Fl_Window pointer if this widget is an Fl_Window.

- unsigned int border () const
  
  Returns whether the window possesses a border.

- void border (int b)
  
  Sets whether or not the window manager border is around the window.

- void clear_border ()
  
  Fast inline function to turn the window manager border off.

- void clear_modal_states ()
  
  Clears the "modal" flags and converts a "modal" or "non-modal" window back into a "normal" window.

- void copy_label (const char *a)
  
  Sets the window titlebar label to a copy of a character string.

- void cursor (const Fl_RGB_Image *, int, int)
  
  Changes the cursor for this window using the provided image as cursor’s shape.

- void cursor (Fl_Cursor c, Fl_Color, Fl_Color=FL_WHITE)
  
  For back compatibility only.

- void cursor (Fl_Cursor)
  
  Changes the cursor for this window.

- int decorated_h () const
  
  Returns the window height including any window title bar and any frame added by the window manager.

- int decorated_w () const
  
  Returns the window width including any frame added by the window manager.

- void default_cursor (Fl_Cursor c, Fl_Color, Fl_Color=FL_WHITE)
For back compatibility only.

- void `default_cursor (FL_Cursor)`
  Sets the default window cursor.

- void `draw_backdrop ()`
  Draw the background image if one is set and is aligned inside.

- `FL_Window (int w, int h, const char *title=0)`
  Creates a window from the given width `w`, height `h`, and `title`.

- `FL_Window (int x, int y, int w, int h, const char *title=0)`
  Creates a window from the given position `(x, y)`, size `(w, h)` and `title`.

- void `free_position ()`
  Undoes the effect of a previous `resize()` or `show()` so that the next time `show()` is called the window manager is free to position the window.

- void `fullscreen ()`
  Makes the window completely fill one or more screens, without any window manager border visible.

  - unsigned int `fullscreen_active () const`
    Returns non zero if FULLSCREEN flag is set, 0 otherwise.

- void `fullscreen_off ()`
  Turns off any side effects of `fullscreen()`

- void `fullscreen_off (int X, int Y , int W, int H)`
  Turns off any side effects of `fullscreen()` and does resize(x,y,w,h).

- void `fullscreen_screens (int top, int bottom, int left, int right)`
  Sets which screens should be used when this window is in fullscreen mode.

- `int handle (int) FL_OVERRIDE`
  Handles the specified event.

- void `hid e () FL_OVERRIDE`
  Removes the window from the screen.

- void `hotspot (const FL_Widget &p, int offscreen=0)`
  See void `FL_Window::hotspot(int x, int y, int offscreen = 0)`

- void `hotspot (const FL_Widget *, int offscreen=0)`
  See void `FL_Window::hotspot(int x, int y, int offscreen = 0)`

- void `hotspot (int x, int y, int offscreen=0)`
  Positions the window so that the mouse is pointing at the given position, or at the center of the given widget, which may be the window itself.

- const void * `icon () const`
  Gets the current icon window target dependent data.

- void `ico n (const Fl_RGB_Image *)`
  Sets or resets a single window icon.

- void `ico n (const void *ic)`
  Platform-specific method to set the window icon usable on Windows and X11 only.

- void `ico nize ()`
  Iconifies the window.

- const char * `iconlabel () const`
  See void `FL_Window::iconlabel(const char*)`

- void `iconlabel (const char *)`
  Sets the icon label.

- void `ico ns (const FL_RGB_Image *[], int)`
  Sets the window icons.

- void `ico ns (HICON big_icon, HICON small_icon)`
  Sets the window icons using HICON handles (Windows platform only).

- const char * `label () const`
See void Fl_Window::label(const char *)

- void label (const char *)
  Sets the window title bar label.
- void label (const char *label, const char *iconlabel)
  Sets the icon label.
- void make_current ()
  Sets things up so that the drawing functions in <FL/fl_draw.H> will go into this window.
- void maximize ()
  Maximizes a top-level window to its current screen.
  
  unsigned int maximize_active () const
  Returns whether the window is currently maximized.
- unsigned int menu_window () const
  Returns true if this window is a menu window.
- unsigned int modal () const
  Returns true if this window is modal.
- unsigned int non_modal () const
  Returns true if this window is modal or non-modal.
- fl_uintptr_t os_id ()
  Returns a platform-specific identification of a shown window, or 0 if not shown.
- unsigned int override () const
  Returns non zero if OVERRIDE flag is set, 0 otherwise.
- void resize (int X, int Y, int W, int H) FL_OVERRIDE
  Changes the size and position of the window.
- int screen_num ()
  The number of the screen containing the mapped window.
- void screen_num (int screen_num)
  Set the number of the screen where to map the window.
- void set_menu_window ()
  Marks the window as a menu window.
- void set_modal ()
  A "modal" window, when shown(), will prevent any events from being delivered to other windows in the same program, and will also remain on top of the other windows (if the X window manager supports the "transient for" property).
- void set_non_modal ()
  A "non-modal" window (terminology borrowed from Microsoft Windows) acts like a modal() one in that it remains on top, but it has no effect on event delivery.
- void set_override ()
  Activates the flags NOBORDER|OVERRIDE.
- void set_tooltip_window ()
  Marks the window as a tooltip window.
- const Fl_Image * shape ()
  Returns the image controlling the window shape or NULL.
- void shape (const Fl_Image &b)
  Set the window's shape with an Fl_Image.
- void shape (const Fl_Image *img)
  Assigns a non-rectangular shape to the window.
- void show () FL_OVERRIDE
  Puts the window on the screen.
- void show (int argc, char **argv)
  Puts the window on the screen with show() and parses command-line arguments.
- int shown ()
Returns non-zero if show() has been called (but not hide() ).

- void size_range (int minw, int minh, int maxw=0, int maxh=0, int dw=0, int dh=0, int aspect=0)
  Sets the allowable range the user can resize this window to.

- unsigned int tooltip_window () const
  Returns true if this window is a tooltip window.

- void un_maximize ()
  Returns a previously maximized top-level window to its previous size.

- void wait_for_expose ()
  Waits for the window to be displayed after calling show().

- int x_root () const
  Gets the x position of the window on the screen.

- const char * xclass () const
  Returns the xclass for this window, or a default.

- void xclass (const char *c)
  Sets the xclass for this window.

- int y_root () const
  Gets the y position of the window on the screen.

- virtual ~Fl_Window ()
  The destructor also deletes all the children.

### Static Public Member Functions

- static Fl_Window * current ()
  Returns the last window that was made current.

- static void default_callback (Fl_Window *, void *)
  Back compatibility: Sets the default callback v for win to call on close event.

- static void default_icon (const Fl_RGB_Image *)
  Sets a single default window icon.

- static void default_icons (const Fl_RGB_Image *[], int)
  Sets the default window icons.

- static void default_icons (HICON big_icon, HICON small_icon)
  Sets the default window icons (Windows platform only).

- static const char * default_xclass ()
  Returns the default xclass.

- static void default_xclass (const char *)
  Sets the default window xclass.

- static bool is_a_rescale ()
  Returns true when a window is being rescaled.

- static char show_next_window_iconic ()
  Returns the static flag whether the next window should be opened iconified.

- static void show_next_window_iconic (char stat)
  Sets a static flag whether the next window should be opened iconified.

### Protected Member Functions

- void default_size_range ()
  Protected method to calculate the default size range of a window.

- void draw () FL_OVERRIDE
  Draws the widget.

- virtual void flush ()
  Forces the window to be drawn, this window is also made current and calls draw().

- int force_position () const
Returns the internal state of the window's FORCE_POSITION flag.

- void force_position (int force)
  
  Sets an internal flag that tells FLTK and the window manager to honor position requests.

- void free_icons ()
  
  Deletes all icons previously attached to the window.

- int is_resizable ()
  
  Protected method to determine whether a window is resizable.

### Static Protected Attributes

- static Fl_Window * current_
  
  Stores the last window that was made current.

### Friends

- class Fl_Window_Driver
- class Fl_X

### Additional Inherited Members

#### 34.164.1 Detailed Description

This widget produces an actual window. This can either be a main window, with a border and title and all the window management controls, or a "subwindow" inside a window. This is controlled by whether or not the window has a parent(). Once you create a window, you usually add children Fl_Widget's to it by using window->add(child) for each new widget. See Fl_Group for more information on how to add and remove children.

There are several subclasses of Fl_Window that provide double-buffering, overlay, menu, and OpenGL support. The window's callback is done if the user tries to close a window using the window manager and Fl::modal() is zero or equal to the window. Fl_Window has a default callback that calls Fl_Window::hide(). Callback reasons can be FL_REASON_CANCELLED if the Escape key was pressed, or FL_REASON_CLOSED when the close button is clicked. FL_WHEN_... flags are ignored.

#### 34.164.2 Constructor & Destructor Documentation

##### 34.164.2.1 Fl_Window() [1/2]

`Fl_Window::Fl_Window ( int w, int h, const char * title = 0 )`

Creates a window from the given width w, height h, and title. If Fl_Group::current() is not NULL, the window is created as a subwindow of the parent window. The (w, h) form of the constructor creates a top-level window and asks the window manager to position the window. The (x, y, w, h) form of the constructor either creates a subwindow or a top-level window at the specified location (x, y), subject to window manager configuration. If you do not specify the position of the window, the window manager will pick a place to show the window or allow the user to pick a location. Use position(x, y) or hotspot() before calling show() to request a position on the screen. See Fl_Window::resize() for some more details on positioning windows.

Top-level windows initially have visible() set to 0 and parent() set to NULL. Subwindows initially have visible() set to 1 and parent() set to the parent window pointer. Fl_Widget::box() defaults to FL_FLAT_BOX. If you plan to completely fill the window with children widgets you should change this to FL_NO_BOX. If you turn the window border off you may want to change this to FL_UP_BOX.

See also

- Fl_Window(int x, int y, int w, int h, const char *title)
34.164.2.2  Fl_Window() [2/2]

Fl_Window::Fl_Window(
    int x,
    int y,
    int w,
    int h,
    const char * title = 0)

Creates a window from the given position (x, y), size (w, h) and title.
On a multi-screen system, the values computed by Fl::screen_xywh(int &X, int &Y, int &W, int &H, int n) can be used
to discover the coordinates of the area of screen #n. When these screens have various scale factor values, an (x, y)
pair may not be enough to specify the targeted screen for the window, because the same (x, y) pair can belong to
several screens. In that situation, a call to Fl_Window::screen_num(int) is to be used to identify unambiguously the
targeted screen.

See also
    Fl_Window(int w, int h, const char *title)
    Fl::screen_xywh(int &X, int &Y, int &W, int &H, int n)

Note
    Under Wayland, it's generally not possible for the client app to control the position of a window in the system.
    It's only possible to specify on what screen should the compositor place a full screen window.

34.164.2.3  ~Fl_Window()

Fl_Window::~Fl_Window() [virtual]
The destructor also deletes all the children.
This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code.
A kludge has been done so the Fl_Window and all of its children can be automatic (local) variables, but you must
declare the Fl_Window first so that it is destroyed last.

34.164.3  Member Function Documentation

34.164.3.1  as_double_window()

virtual class Fl_Double_Window * Fl_Window::as_double_window() [inline], [virtual]
Return non-null if this is an Fl_Double_Window object.
Reimplemented in Fl_Double_Window.

34.164.3.2  as_overlay_window()

virtual class Fl_Overlay_Window * Fl_Window::as_overlay_window() [inline], [virtual]
Return non-null if this is an Fl_Overlay_Window object.
Reimplemented in Fl_Overlay_Window.

34.164.3.3  as_window() [1/2]

Fl_Window const * Fl_Window::as_window() const [inline], [virtual]
Reimplemented from Fl_Widget.
34.164.3.4 as_window() [2/2]

Fl_Window * Fl_Window::as_window () [inline], [virtual]
Returns an Fl_Window pointer if this widget is an Fl_Window.
Use this method if you have a widget (pointer) and need to know whether this widget is derived from Fl_Window. If
it returns non-NULL, then the widget in question is derived from Fl_Window, and you can use the returned pointer
to access its children or other Fl_Window-specific methods.

Return values

NULL if this widget is not derived from Fl_Window.

Note
This method is provided to avoid dynamic_cast.

See also
Fl_Widget::as_group(), Fl_Widget::as_gl_window()

Reimplemented from Fl_Widget.

34.164.3.5 border()

void Fl_Window::border ( int b )
Sets whether or not the window manager border is around the window.
The default value is true. With some X window managers, this does not work after show() has been called.

34.164.3.6 clear_border()

void Fl_Window::clear_border () [inline]
Fast inline function to turn the window manager border off.
It only works before show() is called.

34.164.3.7 clear_modal_states()

void Fl_Window::clear_modal_states () [inline]
Clears the "modal" flags and converts a "modal" or "non-modal" window back into a "normal" window.
Note that there are three states for a window: modal, non-modal, and normal.
You can not change the "modality" of a window whilst it is shown, so it is necessary to first hide() the window, change
its "modality" as required, then re-show the window for the new state to take effect.
This method can also be used to change a "modal" window into a "non-modal" one. On several supported platforms,
the "modal" state over-rides the "non-modal" state, so the "modal" state must be cleared before the window can be
set into the "non-modal" state. In general, the following sequence should work:
win->hide();
win->clear_modal_states();
// Set win to new state as desired, or leave "normal", e.g..
win->set_non_modal();
win->show();

Note
Under some window managers, the sequence of hiding the window and changing its modality will often cause
it to be re-displayed at a different position when it is subsequently shown. This is an irritating feature but
appears to be unavoidable at present. As a result we would advise to use this method only when absolutely
necessary.

See also
void set_modal(), void set_non_modal()
34.164.3.8  current()

```
Fl_Window * Fl_Window::current ( ) [static]
```

Returns the last window that was made current.

See also

```
Fl_Window::make_current()
```

---

34.164.3.9  cursor() [1/3]

```
void Fl_Window::cursor ( 
    const Fl_RGB_Image * image,
    int hotx,
    int hoty )
```

Changes the cursor for this window using the provided image as cursor's shape.
The window must be show()’n for this function to have any effect. This always calls the system. If you are changing
the cursor a lot you may want to keep track of how you set it in a static variable and call this only if the new cursor
is different.
The default cursor will be used if the provided image cannot be used as a cursor.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>image</td>
<td>Sets the cursor size and shape</td>
</tr>
<tr>
<td>hotx,hoty</td>
<td>Sets the cursor's active location relatively to top-left of image when clicking</td>
</tr>
</tbody>
</table>

See also

```
cursor(Fl_Cursor), default_cursor()
```

---

34.164.3.10  cursor() [2/3]

```
void Fl_Window::cursor ( 
    Fl_Cursor c,
    Fl_Color ,
    Fl_Color = FL_WHITE )
```

For back compatibility only.
Same as Fl_Window::cursor(Fl_Cursor)

---

34.164.3.11  cursor() [3/3]

```
void Fl_Window::cursor ( 
    Fl_Cursor c )
```

Changes the cursor for this window.
The window must be show()'n for this function to have any effect. This always calls the system. If you are changing
the cursor a lot you may want to keep track of how you set it in a static variable and call this only if the new cursor
is different.
The type Fl_Cursor is an enumeration defined in `<FL/Enumerations.H>`.

See also

```
cursor(const Fl_RGB_Image*, int, int), default_cursor()
```

---

34.164.3.12  decorated_h()

```
int Fl_Window::decorated_h ( ) const
```

Generated by Doxygen
Returns the window height including any window title bar and any frame added by the window manager. Same as h() if applied to a subwindow, or if window is not yet mapped.

Note
Under X11, FLTK is able to compute the size of window titlebars and borders only if these decoration elements are strictly X11-based. When that's not the case, decorated_h() returns the same value as h() and decorated_w() as w(), and FLTK cannot access window decorations.

Under X11 again, the values returned by decorated_h() and decorated_w() may not be reliable during a resize operation. The size of decoration elements of a window is best computed when the window is first mapped.

34.164.3.13 decorated_w()

int Fl_Window::decorated_w ( ) const
Returns the window width including any frame added by the window manager. Same as w() if applied to a subwindow, or if window is not yet mapped.

See also
decorated_h().

34.164.3.14 default_cursor() [1/2]

void Fl_Window::default_cursor ( Fl_Cursor c, Fl_Color , Fl_Color = FL_WHITE )
For back compatibility only.
same as Fl_Window::default_cursor(Fl_Cursor)

34.164.3.15 default_cursor() [2/2]

void Fl_Window::default_cursor ( Fl_Cursor c )
Sets the default window cursor.
This is the cursor that will be used after the mouse pointer leaves a widget with a custom cursor set.

See also
cursor(const Fl_RGB_Image*, int, int), default_cursor()

34.164.3.16 default_icon()

void Fl_Window::default_icon ( const Fl_RGB_Image * icon ) [static]
Sets a single default window icon.
If icon is NULL the current default icons are removed.

Parameters

| in   | icon                  | default icon for all windows subsequently created or NULL |

Generated by Doxygen
See also

Fl_Window::default_icons(const Fl_RGB_Image *, int)
Fl_Window::icon(const Fl_RGB_Image *)
Fl_Window::icons(const Fl_RGB_Image *[], int)

Note

See Window icons for the Wayland platform.

34.164.3.17  defaultIcons() [1/2]

void Fl_Window::defaultIcons (
    const Fl_RGB_Image * icons[],
    int count ) [static]

Sets the default window icons.
The default icons are used for all windows that don't have their own icons set before show() is called. You can change the default icons whenever you want, but this only affects windows that are created (and shown) after this call.
The given images in icons are copied. You can use a local variable or free the images immediately after this call.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>icons</th>
<th>default icons for all windows subsequently created</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>count</td>
<td>number of images in icons. Set to 0 to remove the current default icons</td>
</tr>
</tbody>
</table>

See also

Fl_Window::default_icon(const Fl_RGB_Image *)
Fl_Window::icon(const Fl_RGB_Image *)
Fl_Window::icons(const Fl_RGB_Image *[], int)

Note

See Window icons for the Wayland platform.

34.164.3.18  defaultIcons() [2/2]

static void Fl_Window::defaultIcons (
    HICON big_icon,
    HICON small_icon ) [static]

Sets the default window icons (Windows platform only).
Convenience function to set the default icons using Windows' native HICON icon handles.
The given icons are copied. You can free the icons immediately after this call.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>big_icon</th>
<th>default large icon for all windows subsequently created</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>small_icon</td>
<td>default small icon for all windows subsequently created</td>
</tr>
</tbody>
</table>
See also

Fl_Window::default_icon(const Fl_RGB_Image *)
Fl_Window::default_icons(const Fl_RGB_Image *[], int)
Fl_Window::icon(const Fl_RGB_Image *)
Fl_Window::icons(const Fl_RGB_Image *[], int)
Fl_Window::icons(HICON, HICON)

34.164.3.19  default_size_range()

void Fl_Window::default_size_range ( ) [protected]

Protected method to calculate the default size range of a window.
This method is called internally prior to showing a window to ensure that the window's size range values are calculated if a resizable() widget has been set but size_range() has not been called explicitly.
This method does nothing if size_range() has been called before.
Otherwise FLTK tries to figure out the window's size range from the setting of the window's resizable() widget as follows and roughly in the given order.

1. If resizable() is NULL (this is the default) then the window cannot be resized and the resize border and max-size control will not be displayed for the window.
2. If either dimension of resizable() is zero, then the window cannot resize in that direction.
3. The resizable() widget is clipped to the window area.
4. The non-resizable portion of the window is calculated as the difference of the window's size and the clipped resizable() widget's size.
5. If either dimension of the clipped resizable() widget is greater than 100, then 100 is considered its minimum width/height. This allows the resizable widget to shrink below its original size.
6. Finally the minimum width/height of the window is set to the non-resizable portion plus the width/height of the resizable() widget as calculated above.

In simple words:

- It is assumed that the resizable() widget can be indefinitely enlarged and/or shrunk to a minimum width/height of 100 unless it is smaller than that, which is then considered the minimum.
- The window's size_range() minimum values are set to the sum of the non-resizable portion of the window and the previously calculated minimum size of the resizable() widget.

Examples:

```cpp
Fl_Window win(400, 400);
win.resizable(win);
// win.size_range(100, 100, 0, 0);
The minimum size of the resizable is 100, hence the minimum size of the total window is also 100 in both directions.
Fl_Window win(400, 400);
Fl_Box box(20, 20, 360, 360);
win.resizable(box);
// win.size_range(140, 140, 0, 0);
The calculated minimum width and height would be 20 + 100 + 20 in both dimensions.
Fl_Window win(400, 400);
Fl_Box box(200, 0, 500, 300); // note: width 500 too large: clipped
win.resizable(box);
// win.size_range(300, 200, 0, 0);
The width of the resizable is clipped to 200, hence the minimum size of the total window is also 200 (fix) + 100 (min.
resizable) in x direction. The minimum value in y direction is 100 (resizable) + 100 (fixed part).
The calculation is based on clipping the resizable widget to the window area to prevent programming errors and the assumption that the resizable widget can be shrunk to 100x100 or its original size, whichever is smaller.
If this is not what you want, please use Fl_Window::size_range() explicitly so you can set any appropriate range.
```
### default_xclass()

**`const char * Fl_Window::default_xclass ( ) [static]`**

Returns the default xclass.

See also

`Fl_Window::default_xclass(const char *)`

---

### default_xclass()

**`void Fl_Window::default_xclass ( const char * xc ) [static]`**

Sets the default window xclass.

The default xclass is used for all windows that don't have their own xclass set before `show()` is called. You can change the default xclass whenever you want, but this only affects windows that are created (and shown) after this call.

The given string `xc` is copied. You can use a local variable or free the string immediately after this call.

If you don't call this, the default xclass for all windows will be "FLTK". You can reset the default xclass by specifying NULL for `xc`.

If you call `Fl_Window::xclass(const char *)` for any window, then this also sets the default xclass, unless it has been set before.

**Parameters**

- **`in xc`**: default xclass for all windows subsequently created

See also

`Fl_Window::xclass(const char *)`

---

### draw()

**`void Fl_Window::draw ( ) [protected], [virtual]`**

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method from within your own `draw()` method, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```cpp
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Reimplemented from `Fl_Group`.

Reimplemented in `Fl_Glut_Window`.

---

### flush()

**`void Fl_Window::flush ( ) [protected], [virtual]`**

Forces the window to be drawn, this window is also made current and calls `draw()`.

Reimplemented in `Fl_Double_Window`, `Fl_Gl_Window`, and `Fl_Overlay_Window`.

---

### force_position()

**`int Fl_Window::force_position ( ) const [inline], [protected]`**

Returns the internal state of the window's FORCE_POSITION flag.
Return values

<table>
<thead>
<tr>
<th>i</th>
<th>0 if flag is set</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>otherwise</td>
</tr>
</tbody>
</table>

See also

- `force_position(int)`

### 34.164.3.25 force_position() [2/2]

```cpp
void Fl_Window::force_position ( int force ) [inline], [protected]
```

Sets an internal flag that tells FLTK and the window manager to honor position requests. This is used internally and should not be needed by user code.

**Parameters**

- `force` [in] 1 to set the FORCE_POSITION flag, 0 to clear it

### 34.164.3.26 free_icons()

```cpp
void Fl_Window::free_icons ( ) [protected]
```

Deletes all icons previously attached to the window.

See also

- `Fl_Window::icons(const Fl_RGB_Image *icons[], int count)`

### 34.164.3.27 free_position()

```cpp
void Fl_Window::free_position ( ) [inline]
```

Undoes the effect of a previous `resize()` or `show()` so that the next time `show()` is called the window manager is free to position the window.

This is for Forms compatibility only.

**Deprecated** please use `force_position(0)` instead

### 34.164.3.28 fullscreen()

```cpp
void Fl_Window::fullscreen ( )
```

Makes the window completely fill one or more screens, without any window manager border visible.

You must use `fullscreen_off()` to undo this.

**Note**

On some platforms, this can result in the keyboard being grabbed. The window may also be recreated, meaning `hide()` and `show()` will be called.

See also

- `Fl_Window::fullscreen_screens()`
34.164.3.29 fullscreen_screens()

void Fl_Window::fullscreen_screens {
    int top,
    int bottom,
    int left,
    int right
}

Sets which screens should be used when this window is in fullscreen mode. The window will be resized to the top of the screen with index top, the bottom of the screen with index bottom, etc.
If this method is never called, or if any argument is < 0, then the window will be resized to fill the screen it is currently on.

See also
    void Fl_Window::fullscreen()

34.164.3.30 handle()

int Fl_Window::handle ( 
    int event ) [virtual]

Handles the specified event.
You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.
When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.
Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.
One exception to the rule in the previous paragraph is if you really want to override the behavior of the base class.
This requires knowledge of the details of the inherited class.
In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to filter event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you consumed the event by returning 1 even if you didn't do anything with it.

Parameters

| in event | the kind of event received |

Return values

| 0 | if the event was not used or understood |
| t | if the event was used and can be deleted |

See also
    Fl_Event

Reimplemented from Fl_Group.
Reimplemented in Fl_Glut_Window.

34.164.3.31 hide()

void Fl_Window::hide ( ) [virtual]

Removes the window from the screen.
If the window is already hidden or has not been shown then this does nothing and is harmless.
Reimplemented from Fl_Widget.
34.164.3.32 hotspot()

```cpp
void Fl_Window::hotspot (int x, int y, int offscreen = 0)
```

Positions the window so that the mouse is pointing at the given position, or at the center of the given widget, which may be the window itself.
If the optional offscreen parameter is non-zero, then the window is allowed to extend off the screen (this does not work with some X window managers).

See also

```
position()
```

34.164.3.33 icon() [1/3]

```cpp
const void * Fl_Window::icon ( ) const
```

Gets the current icon window target dependent data.

**Deprecated** in 1.3.3

34.164.3.34 icon() [2/3]

```cpp
void Fl_Window::icon (const Fl_RGB_Image * icon)
```

Sets or resets a single window icon.
A window icon can be changed while the window is shown, but this may be platform and/or window manager dependent. To be sure that the window displays the correct window icon you should always set the icon before the window is shown.
If a window icon has not been set for a particular window, then the default window icon (see links below) or the system default icon will be used.
This method makes an internal copy of the icon pixel buffer, so once set, the `Fl_RGB_Image` instance can be freed by the caller.

**Parameters**

| in | icon | icon for this window, NULL to reset window icon. |

See also

- `Fl_Window::default_icon(const Fl_RGB_Image *)`
- `Fl_Window::default_icons(const Fl_RGB_Image *[ ], int)`
- `Fl_Window::icons(const Fl_RGB_Image *[ ], int)`

**Note**

See [Window icons](#) for the Wayland platform.

34.164.3.35 icon() [3/3]

```cpp
void Fl_Window::icon (const void * ic)
```

Platform-specific method to set the window icon usable on Windows and X11 only.
See [Setting the Icon of a Window](#) for its use under X11, and [Setting the Icon of a Window](#) under Windows.
34.164 Fl_Window Class Reference

**Deprecated** in 1.3.3 in favor of platform-independent methods Fl_Window::icon(const Fl_RGB_Image *icon) and Fl_Window::icons(const Fl_RGB_Image *icons[], int count).

### 34.164.3.36 iconize()

```c
void Fl_Window::iconize ()
```

Iconifies the window.

If you call this when shown() is false it will show() it as an icon. If the window is already iconified this does nothing. Call show() to restore the window.

When a window is iconified/restored (either by these calls or by the user) the handle() method is called with FL_HIDE and FL_SHOW events and visible() is turned on and off.

There is no way to control what is drawn in the icon except with the string passed to Fl_Window::xclass(). You should not rely on window managers displaying the icons.

### 34.164.3.37 icons() [1/2]

```c
void Fl_Window::icons (const Fl_RGB_Image *icons[], int count)
```

Sets the window icons.

You may set multiple window icons with different sizes. Dependent on the platform and system settings the best (or the first) icon will be chosen.

The given images in `icons` are copied. You can use a local variable or free the images immediately after this call.

If `count` is zero, current icons are removed. If `count` is greater than zero (must not be negative), then `icons[]` must contain at least `count` valid image pointers (not NULL). Otherwise the behavior is undefined.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th><code>icons</code></th>
<th>icons for this window</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>count</code></td>
<td>number of images in <code>icons</code>. Set to 0 to remove the current icons</td>
</tr>
</tbody>
</table>

**See also**

Fl_Window::default_icon(const Fl_RGB_Image *)

Fl_Window::default_icons(const Fl_RGB_Image *[][], int)

Fl_Window::icon(const Fl_RGB_Image *)

**Note**

See Window icons for the Wayland platform.

### 34.164.3.38 icons() [2/2]

```c
void Fl_Window::icons (HICON big_icon, HICON small_icon)
```

Sets the window icons using HICON handles (Windows platform only).

The given icons are copied. You can free the icons immediately after this call.

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
<th><code>big_icon</code></th>
<th>large window icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><code>small_icon</code></td>
<td>small window icon</td>
</tr>
</tbody>
</table>
34.164.3.39  is_resizable()

int Fl_Window::is_resizable ( ) [protected]
Protected method to determine whether a window is resizable.
If size_range() has not yet been called this method calculates the default size range values by calling
default_size_range().
This method is for internal use only. The returned value is a bit mask and non-zero if the window is resizable in at
least one direction.
Returns
    non-zero if the window is resizable

Return values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>the window is not resizable</td>
</tr>
<tr>
<td>1</td>
<td>the window is resizable in horizontal direction (w)</td>
</tr>
<tr>
<td>2</td>
<td>the window is resizable in vertical direction (h)</td>
</tr>
<tr>
<td>3</td>
<td>the window is resizable in both directions (w and h)</td>
</tr>
</tbody>
</table>

See also
    default_size_range()

34.164.3.40  make_current()

void Fl_Window::make_current ( )
Sets things up so that the drawing functions in `<FL/fl_draw.H>` will go into this window.
This is useful for incremental update of windows, such as in an idle callback, which will make your program behave
much better if it draws a slow graphic. Danger: incremental update is very hard to debug and maintain!
This method only works for the Fl_Window and Fl_Gl_Window derived classes.

34.164.3.41  maximize()

void Fl_Window::maximize ( )
Maximizes a top-level window to its current screen.
This function is effective only with a show()'n, resizable, top-level window. Bordered and borderless windows can
be used.
See also
    Fl_Window::un_maximize(), Fl_Window::maximize_active()

34.164.3.42  modal()

unsigned int Fl_Window::modal ( ) const [inline]
Returns true if this window is modal.

34.164.3.43  os_id()

fl_uintptr_t Fl_Window::os_id ( )
Returns a platform-specific identification of a shown window, or 0 if not shown.
Note

This identification may differ from the platform-specific reference of an Fl_Window object used by functions fl_x11_xid(), fl_mac_xid(), fl_x11_find(), and fl_mac_find().

- X11 platform: the window's XID.
- macOS platform: The window number of the window's window device.
- other platforms: 0.

34.164.3.44 resize()

void Fl_Window::resize {
    int X, Y, W, H;
    [virtual]

Changes the size and position of the window.

If shown() is true, these changes are communicated to the window server (which may refuse that size and cause a further resize). If shown() is false, the size and position are used when show() is called. See Fl_Group for the effect of resizing on the child widgets.

You can also call the Fl_Widget methods size(x,y) and position(w,h), which are inline wrappers for this virtual function.

A top-level window can not force, but merely suggest a position and size to the operating system. The window manager may not be willing or able to display a window at the desired position or with the given dimensions. It is up to the application developer to verify window parameters after the resize request.

Reimplemented from Fl_Group.

34.164.3.45 screen_num()

void Fl_Window::screen_num {
    int screen_num
}

Set the number of the screen where to map the window.

Call this and set also the window's desired position before show()'ing the window. This can be necessary when a system has several screens with distinct scaling factor values because the window's x() and y() may not suffice to uniquely identify one screen. To see that, consider a system with two screens where the screen at left is A pixel-wide and has a scale factor of 1 whereas the screen at right has a scale factor of 2. For the sake of simplicity, consider only the X coordinates of windows. FLTK coordinates translate directly to pixel coordinates on the left screen, whereas FLTK coordinates multiplied by 2 correspond to pixel coordinates on the right screen. Consequently, FLTK coordinates between A/2 + 1 and A-1 can map to both screens. Both window coordinates and screen number are necessary to uniquely identify where a window is to be mapped.

34.164.3.46 set_menu_window()

void Fl_Window::set_menu_window () [inline]

Marks the window as a menu window.

This is intended for internal use, but it can also be used if you write your own menu handling. However, this is not recommended.

This flag is used for correct "parenting" of windows in communication with the windowing system. Modern X window managers can use different flags to distinguish menu and tooltip windows from normal windows. This must be called before the window is shown and cannot be changed later.

34.164.3.47 set_modal()

void Fl_Window::set_modal () [inline]

A "modal" window, when shown(), will prevent any events from being delivered to other windows in the same program, and will also remain on top of the other windows (if the X window manager supports the "transient for" property).
Several modal windows may be shown at once, in which case only the last one shown gets events. You can see which window (if any) is modal by calling Fl::modal().

### 34.164.3.48 set_non_modal()

```cpp
void Fl_Window::set_non_modal ( ) [inline]
```

A “non-modal” window (terminology borrowed from Microsoft Windows) acts like a modal() one in that it remains on top, but it has no effect on event delivery. There are three states for a window: modal, non-modal, and normal.

### 34.164.3.49 set_tooltip_window()

```cpp
void Fl_Window::set_tooltip_window ( ) [inline]
```

Marks the window as a tooltip window. This is intended for internal use, but it can also be used if you write your own tooltip handling. However, this is not recommended. This flag is used for correct “parenting” of windows in communication with the windowing system. Modern X window managers can use different flags to distinguish menu and tooltip windows from normal windows. This must be called before the window is shown and cannot be changed later.

**Note**

Since Fl_Tooltip_Window is derived from Fl_Menu_Window, this also clears the menu_window() state.

### 34.164.3.50 shape() [1/2]

```cpp
void Fl_Window::shape ( const Fl_Image & img )
```

Set the window's shape with an Fl_Image.

See also

```cpp
void shape(const Fl_Image * img)
```

### 34.164.3.51 shape() [2/2]

```cpp
void Fl_Window::shape ( const Fl_Image * img )
```

Assigns a non-rectangular shape to the window. This function gives an arbitrary shape (not just a rectangular region) to an Fl_Window. An Fl_Image of any dimension can be used as mask; it is rescaled to the window's dimension as needed. The layout and widgets inside are unaware of the mask shape, and most will act as though the window's rectangular bounding box is available to them. It is up to you to make sure they adhere to the bounds of their masking shape.

The `img` argument can be an Fl_Bitmap, Fl_Pixmap, Fl_RGB_Image or Fl_Shared_Image:

- With Fl_Bitmap or Fl_Pixmap, the shaped window covers the image part where bitmap bits equal one, or where the pixmap is not fully transparent.
- With an Fl_RGB_Image with an alpha channel (depths 2 or 4), the shaped window covers the image part that is not fully transparent.
- With an Fl_RGB_Image of depth 1 (gray-scale) or 3 (RGB), the shaped window covers the non-black image part.
- With an Fl_Shared_Image, the shape is determined by rules above applied to the underlying image. The shared image should not have been scaled through Fl_Image::scale().

**Platform details:**
• On the unix/linux platform, the SHAPE extension of the X server is required. This function does control the shape of Fl_Gl_Window instances.

• On the Windows platform, this function does nothing with class Fl_Gl_Window.

• On the Mac platform, OS version 10.4 or above is required. An 8-bit shape-mask is used when img is an Fl_RGB_Image: with depths 2 or 4, the image alpha channel becomes the shape mask such that areas with alpha = 0 are out of the shaped window; with depths 1 or 3, white and black are in and out of the shaped window, respectively, and other colors give intermediate masking scores. This function does nothing with class Fl_Gl_Window.

The window borders and caption created by the window system are turned off by default. They can be re-enabled by calling Fl_Window::border(1).

A usage example is found at example/shapedwindow.cxx.

Version

1.3.3

34.164.3.52 show() [1/2]

void Fl_Window::show ( ) [virtual]
Puts the window on the screen.
This has the side effect of opening the display, if not done before.
If the window is already shown then it is restored and raised to the top. This is really convenient because your program can call show() at any time, even if the window is already up. It also means that show() serves the purpose of raise() in other toolkits.

Fl_Window::show(int argc, char **argv) is used for top-level windows and allows standard arguments to be parsed from the command-line.

Note

For some obscure reasons Fl_Window::show() resets the current group by calling Fl_Group::current(0). The comments in the code say "get rid of very common user bug: forgot end()". Although this is true it may have unwanted side effects if you show() an unrelated window (maybe for an error message or warning) while building a window or any other group widget.

Todo Check if we can remove resetting the current group in a later FLTK version (after 1.3.x). This may break "already broken" programs though if they rely on this "feature".

See also

Fl_Window::show(int argc, char **argv)

Reimplemented from Fl_Widget.

34.164.3.53 show() [2/2]

void Fl_Window::show ( int argc,
      char ** argv )

Puts the window on the screen with show() and parses command-line arguments.
This call should be used for top-level windows, at least for the first (main) window. It allows standard arguments to be parsed, as done by Fl::args(int, char **), from the command-line. You can use argc and argv from main(int argc, char **argv) for this call.

This call also sets up some system-specific internal variables, that is, it sets FL_SELECTION_COLOR and calls Fl::background(), Fl::background2(), Fl::foreground() with default or X resources-given values, and calls Fl::scheme(const char *) for the current scheme. On X11, it also calls Fl::dnd_text_ops(int), Fl::Tooltip::enable(int), Fl::visible_focus(int) with X resources-given values.

Generated by Doxygen
Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>argc</td>
<td>command-line argument count, usually from main()</td>
</tr>
<tr>
<td>argv</td>
<td>command-line argument vector, usually from main()</td>
</tr>
</tbody>
</table>

See also

virtual void Fl_Window::show()
Fl::args(int, char **)

34.164.3.54  show_next_window_iconic() [1/2]

static char Fl_Window::show_next_window_iconic ( ) [inline], [static]
Returns the static flag whether the next window should be opened iconified.

Note

This is an internal function, you should not use this in user code.

Please use Fl_Window::iconize() to iconify a window.

34.164.3.55  show_next_window_iconic() [2/2]

static void Fl_Window::show_next_window_iconic ( char stat ) [inline], [static]
Sets a static flag whether the next window should be opened iconified.

Note

This is an internal function, you should not use this in user code.

Please use Fl_Window::iconize() instead.

34.164.3.56  shown()

int Fl_Window::shown ( ) [inline]
Returns non-zero if show() has been called (but not hide() ).
You can tell if a window is iconified with (w->shown() && w->visible()).

34.164.3.57  size_range()

void Fl_Window::size_range ( int minWidth, int minHeight, int maxWidth = 0, int maxHeight = 0, int deltaX = 0, int deltaY = 0, int aspectRatio = 0 )
Sets the allowable range the user can resize this window to.
We recommend to call size_range() if you have a resizable() widget in a main window, and to call it after setting the resizable() and before show()ing the window for best cross platform compatibility.
If this function is not called, FLTK tries to figure out the range when the window is shown. Please see the protected method default_size_range() for details.
It is undefined what happens if the current window size does not fit in the constraints passed to size_range().
Note

This only works for top-level windows and the exact behavior can be platform specific. To work correctly across all platforms size_range() must be called after setting the resizable() widget of the window and before the window is shown().

Calling size_range() after the window has been shown may work on some but not all platforms. If you need to change the size_range() after the window has been shown, then you should consider to hide() and show() the window again, i.e. call hide(), size_range(), and show() in this order.

Typical usage: call

```
size_range(minWidth, minHeight);
```

after setting the resizable widget and before calling show(). This ensures that the window cannot be resized smaller than the given values by user interaction.

maxWidth and maxHeight might be useful in some special cases but less frequently used.

The other optional parameters deltaX, deltaY, and aspectRatio are not recommended because they may not work on all platforms and may even under X11 not be supported by all Window Managers.

Parameters

| in | minWidth, minHeight | The smallest the window can be. Either value must be greater than 0. |
| in | maxWidth, maxHeight | The largest the window can be. If either is equal to the minimum then you cannot resize in that direction. If either is zero then FLTK picks a maximum size in that direction such that the window will fill the screen. |
| in | deltaX, deltaY | These are size increments. The window will be constrained to widths of minWidth + N * deltaX, where N is any non-negative integer. If these are less or equal to 1 they are ignored (this is always ignored on Windows). |
| in | aspectRatio | A flag that indicates that the window should preserve its aspect ratio. This only works if both the maximum and minimum have the same aspect ratio (ignored on Windows and by many X window managers). |

34.164.3.58 un_maximize()

```cpp
void Fl_Window::un_maximize ()
```

Returns a previously maximized top-level window to its previous size.

See also

```
Fl_Window::maximize()
```

34.164.3.59 wait_for_expose()

```cpp
void Fl_Window::wait_for_expose ()
```

Waits for the window to be displayed after calling show().

`Fl_Window::show()` is not guaranteed to show and draw the window on all platforms immediately. Instead this is done in the background; particularly on X11 it will take a few messages (client server roundtrips) to display the window. Usually this small delay doesn’t matter, but in some cases you may want to have the window instantiated and displayed synchronously.

Currently (as of FLTK 1.3.4) this method has an effect on X11 and Mac OS. On Windows, show() is always synchronous. The effect of show() varies with versions of Mac OS X: early versions have the window appear on the screen when show() returns, later versions don’t. If you want to write portable code and need this synchronous show() feature, add win->wait_for_expose() on all platforms, and FLTK will just do the right thing.

This method can be used for displaying splash screens before calling Fl::run() or for having exact control over which window has the focus after calling show().

If the window is not shown(), this method does nothing.
Note
Depending on the platform and window manager `wait_for_expose()` may not guarantee that the window is fully drawn when it is called. Under X11 it may only make sure that the window is mapped, i.e. the internal (OS dependent) window object was created (and maybe shown on the desktop as an empty frame or something like that). You may need to call Fl::flush() after `wait_for_expose()` to make sure the window and all its widgets are drawn and thus visible.

FLTK does the best it can do to make sure that all widgets get drawn if you call `wait_for_expose()` and Fl::flush(). However, dependent on the window manager it can not be guaranteed that this does always happen synchronously. The only guaranteed behavior that all widgets are eventually drawn is if the FLTK event loop is run continuously, for instance with Fl::run().

See also

```cpp
virtual void Fl_Window::show()
```

Example code for displaying a window before calling Fl::run()
```cpp
Fl_Double_Window win = new Fl_Double_Window(...);
// do more window initialization here ...
win->show(); // show window
win->wait_for_expose(); // wait, until displayed
Fl::flush(); // make sure everything gets drawn
// do more initialization work that needs some time here ...
Fl::run(); // start FLTK event loop
```

Note that the window will not be responsive until the event loop is started with Fl::run().

34.164.3.60 xclass() [1/2]

```cpp
const char * Fl_Window::xclass () const
```

Returns the xclass for this window, or a default.

See also

```cpp
Fl_Window::default_xclass(const char *)
Fl_Window::xclass(const char *)
```

34.164.3.61 xclass() [2/2]

```cpp
void Fl_Window::xclass (const char * xc )
```

Sets the xclass for this window.
A string used to tell the system what type of window this is. Mostly this identifies the picture to draw in the icon. This only works if called before calling show().

*Under X*, this is turned into a XA_WM_CLASS pair by truncating at the first non-alphanumeric character and capitalizing the first character, and the second one if the first is 'x'. Thus "foo" turns into "foo, Foo", and "xprog.1" turns into "xprog, XProg".

*Under Microsoft Windows*, this string is used as the name of the WNDCLASS structure, though it is not clear if this can have any visible effect.

Since

FLTK 1.3 the passed string is copied. You can use a local variable or free the string immediately after this call. Note that FLTK 1.1 stores the pointer without copying the string.

If the default xclass has not yet been set, this also sets the default xclass for all windows created subsequently.

See also

```cpp
Fl_Window::default_xclass(const char *)
```

34.164.4 Member Data Documentation
34.164.4.1  current_

Fl_Window * Fl_Window::current_ [static], [protected]
Stores the last window that was made current.
See current() const
The documentation for this class was generated from the following files:
  • Fl_Window.H
  • Fl_arg.cxx
  • fl_cursor.cxx
  • Fl_Window.cxx
  • Fl_Windowfullscreen.cxx
  • Fl_Window_hotspot.cxx
  • Fl_Window_iconize.cxx

34.165  Fl_Wizard Class Reference

This widget is based off the Fl_Tabs widget, but instead of displaying tabs it only changes “tabs” under program
control.
#include <Fl_Wizard.H>
Inheritance diagram for Fl_Wizard:

Public Member Functions
  • Fl_Wizard (int, int, int, int, const char *=0)
    The constructor creates the Fl_Wizard widget at the specified position and size.
  • void next ()
    This method shows the next child of the wizard.
  • void prev ()
    Shows the previous child.
  • Fl_Widget * value ()
    Gets the current visible child widget.
  • void value (Fl_Widget *)
    Sets the child widget that is visible.

Protected Member Functions
  • void draw () FL_OVERRIDE
    Draws the wizard border and visible child.

Additional Inherited Members

34.165.1  Detailed Description

This widget is based off the Fl_Tabs widget, but instead of displaying tabs it only changes “tabs” under program
control.
Its primary purpose is to support “wizards” that step a user through configuration or troubleshooting tasks.
As with Fl_Tabs, wizard panes are composed of child (usually Fl_Group) widgets. Navigation buttons must be
added separately.
34.165.2 Constructor & Destructor Documentation

34.165.2.1 Fl_Wizard()

```cpp
Fl_Wizard::Fl_Wizard (  
    int xx,  
    int yy,  
    int ww,  
    int hh,  
    const char ∗ l = 0 )
```

The constructor creates the Fl_Wizard widget at the specified position and size. The inherited destructor destroys the widget and its children.

34.165.3 Member Function Documentation

34.165.3.1 draw()

```cpp
void Fl_Wizard::draw (  
    void ) [protected], [virtual]
```

Draws the wizard border and visible child. Reimplemented from Fl_Group.

34.165.3.2 next()

```cpp
void Fl_Wizard::next ( )
```

This method shows the next child of the wizard. If the last child is already visible, this function does nothing.

The documentation for this class was generated from the following files:

- Fl_Wizard.H
- Fl_Wizard.cxx

34.166 Fl_XBM_Image Class Reference

The Fl_XBM_Image class supports loading, caching, and drawing of X Bitmap (XBM) bitmap files.

```cpp
#include <Fl_XBM_Image.H>
```

Inheritance diagram for Fl_XBM_Image:

```
Fl_XBM_Image
   |   
|   Fl_Bitmap
   |   Fl_Image
```

Public Member Functions

- Fl_XBM_Image (const char ∗filename)

  The constructor loads the named XBM file from the given name filename.
Additional Inherited Members

34.166.1 Detailed Description

The Fl_XBM_Image class supports loading, caching, and drawing of X Bitmap (XBM) bitmap files.

34.166.2 Constructor & Destructor Documentation

34.166.2.1 Fl_XBM_Image()

Fl_XBM_Image::Fl_XBM_Image (const char * name)

The constructor loads the named XBM file from the given name filename. The destructor frees all memory and server resources that are used by the image. The documentation for this class was generated from the following files:

• Fl_XBM_Image.H
• Fl_XBM_Image.cxx

34.167 Fl_XColor Struct Reference

Public Attributes

• unsigned char b
• unsigned char g
• unsigned char mapped
• unsigned long pixel
• unsigned char r

The documentation for this struct was generated from the following file:

• Fl_XColor.H

34.168 Fl_XPM_Image Class Reference

The Fl_XPM_Image class supports loading, caching, and drawing of X Pixmap (XPM) images, including transparency.

#include <Fl_XPM_Image.H>

Inheritance diagram for Fl_XPM_Image:

```
Fl_XPM_Image
|   
V
Fl_Pixmap
|   
V
Fl_Image
```

Public Member Functions

• Fl_XPM_Image (const char *filename)

  The constructor loads the XPM image from the name filename.
### Additional Inherited Members

#### 34.168.1 Detailed Description

The Fl_XPM_Image class supports loading, caching, and drawing of X Pixmap (XPM) images, including transparency.

#### 34.168.2 Constructor & Destructor Documentation

##### 34.168.2.1 Fl_XPM_Image()

Fl_XPM_Image::Fl_XPM_Image (const char *name)

The constructor loads the XPM image from the name filename. The destructor frees all memory and server resources that are used by the image. The documentation for this class was generated from the following files:

- Fl_XPM_Image.H
- Fl_XPM_Image.hxx

### 34.169 Fl_GIF_Image::GIF_FRAME Struct Reference

#### Classes

- struct CPAL

#### Public Member Functions

- void colors (int nclrs, int bg, int tp)
- void disposal (int mode, int delay)
- GIF_FRAME (int frame, int W, int H, int fx, int fy, int fw, int fh, uchar *data)
- GIF_FRAME (int frame, uchar *data)

#### Public Attributes

- int bkgd
- const uchar * bptr
- int clrs
- const struct Fl_GIF_Image::GIF_FRAME::CPAL * cpal
- int delay
- int dispose
- int h
- int height
- int ifrm
- int trans
- int w
- int width
- int x
- int y

The documentation for this struct was generated from the following file:

- Fl_GIF_Image.H
34.170 Fl_ICO_Image::IconDirEntry Struct Reference

Windows ICONDIRENTRY structure

```
#include <Fl_ICO_Image.H>
```

Public Attributes

- int bColorCount
  Number of colors (0 if 8bpp)
- int bHeight
  Image height.
- int bReserved
  Reserved.
- int bWidth
  Image width.
- int dwBytesInRes
  Resource size in bytes.
- int dwImageOffset
  Offset to the image.
- int wBitCount
  Bits per pixel.
- int wPlanes
  Color Planes.

34.170.1 Detailed Description

Windows ICONDIRENTRY structure

The documentation for this struct was generated from the following file:

- Fl_ICO_Image.H

34.171 Fl_Text_Editor::Key_Binding Struct Reference

Simple linked list item associating a key/state to a function.

```
#include <Fl_Text_Editor.H>
```

Public Attributes

- Key_Func function
  associated function
- int key
  the key pressed
- Key_Binding * next
  next key binding in the list
- int state
  the state of key modifiers

34.171.1 Detailed Description

Simple linked list item associating a key/state to a function.

The documentation for this struct was generated from the following file:

- Fl_Text_Editor.H
34.172  Fl_Terminal::Margin Class Reference

Public Member Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void bottom(int val)</td>
<td></td>
</tr>
<tr>
<td>int bottom(void) const</td>
<td></td>
</tr>
<tr>
<td>void left(int val)</td>
<td></td>
</tr>
<tr>
<td>int left(void) const</td>
<td></td>
</tr>
<tr>
<td>void right(int val)</td>
<td></td>
</tr>
<tr>
<td>int right(void) const</td>
<td></td>
</tr>
<tr>
<td>void top(int val)</td>
<td></td>
</tr>
<tr>
<td>int top(void) const</td>
<td></td>
</tr>
</tbody>
</table>

The documentation for this class was generated from the following file:

- Fl_Terminal.H

34.173  Fl_Preferences::Name Class Reference

'Name' provides a simple method to create numerical or more complex procedural names for entries and groups on the fly.

```c
#include <Fl_Preferences.H>
```

Public Member Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name (const char ∗ format,...)</td>
<td>Creates a group name or entry name on the fly.</td>
</tr>
<tr>
<td>Name (unsigned int n)</td>
<td>Creates a group name or entry name on the fly.</td>
</tr>
<tr>
<td>operator const char ∗ ()</td>
<td>Return the Name as a &quot;C&quot; string.</td>
</tr>
</tbody>
</table>

34.173.1  Detailed Description

'Name' provides a simple method to create numerical or more complex procedural names for entries and groups on the fly.

Example: prefs.set(Fl_Preferences::Name("File%d",i),file[i]).

See test/preferences.cxx as a sample for writing arrays into preferences.

'Name' is actually implemented as a class inside Fl_Preferences. It casts into const char ∗ and gets automatically destroyed after the enclosing call ends.

34.173.2  Constructor & Destructor Documentation

34.173.2.1  Name() [1/2]

Fl_Preferences::Name::Name (unsigned int n)

Creates a group name or entry name on the fly.
This version creates a simple unsigned integer as an entry name.

```c
int n, i;
Fl_Preferences prev( appPrefs, "PreviousFiles" );
prev.get("n", 0);
for (i=0; i<n; i++)
    prev.get( Fl_Preferences::Name(i), prevFile[i], "" );
```
34.173.2.2 Name() [2/2]

```
Fl_Preferences::Name::Name (  
    const char * format,  
    ... )
```

Creates a group name or entry name on the fly. This version creates entry names as in 'printf'.

```c
int n, i;
Fl_Preferences prefs( USER, "matthiasm.com", "test" );
prev.get( "nFiles", 0 );
for ( i=0; i<n; i++ )
    prev.get( Fl_Preferences::Name( "File%d", i ), prevFile[i], "" );
```

The documentation for this class was generated from the following files:

- Fl_Preferences.H
- Fl_Preferences.cxx

### 34.174 Fl_Preferences::Node Class Reference

#### Public Member Functions

- `void add (const char *line)`
- `Node * addChild (const char *path)`
- `const char * child (int ix)`
- `Node * childNode (int ix)`
- `void clearDirtyFlags ()`
- `void deleteAllChildren ()`
- `void deleteAllEntries ()`
- `char deleteEntry (const char *name)`
- `char dirty ()`
- `Entry & entry (int i)`
- `Node * find (const char *path)`
- `RootNode * findRoot ()`
- `const char * get (const char *name)`
- `int getEntry (const char *name)`
- `const char * name ()`
- `int nChildren ()`
- `int nEntry ()`
- `Node (const char *path)`
- `Node * parent ()`
- `const char * path ()`
- `char remove ()`
- `Node * search (const char *path, int offset=0)`
- `void set (const char *line)`
- `void set (const char *name, const char *value)`
- `void setParent (Node *parent)`
- `void setRoot (RootNode *r)`
- `int write (FILE *f)`

#### Static Public Attributes

- `static int lastEntrySet = -1`

The documentation for this class was generated from the following files:

- Fl_Preferences.H
- Fl_Preferences.cxx
34.175  Fl_Paged_Device::page_format Struct Reference

width, height and name of a page format
#include <Fl_Paged_Device.H>

Public Attributes

- int height
  
  height in points
- const char * name
  
  format name
- int width
  
  width in points

34.175.1  Detailed Description

width, height and name of a page format
The documentation for this struct was generated from the following file:

- Fl_Paged_Device.H

34.176  Fl_Terminal::PartialUtf8Buf Class Reference

Public Member Functions

- bool append (const char *p, int len)
- const char * buf (void) const
- int buflen (void) const
- void clear (void)
- bool is_complete (void) const
- bool is_continuation (char c)

The documentation for this class was generated from the following file:

- Fl_Terminal.H

34.177  Fl_Terminal::RingBuffer Class Reference

Public Member Functions

- void change_disp_cols (int dcols, const CharStyle &style)
- void change_disp_rows (int drows, const CharStyle &style)
- void clear (void)
- void clear_disp_row (int drow, const CharStyle &style)
- void clear_hist (void)
- void create (int drows, int dcols, int hrows)
- int disp_cols (void) const
- int disp_erow (void) const
- int disp_rows (void) const
- int disp_srow (void) const
- int hist_cols (void) const
- int hist_erow (void) const
- int hist_rows (void) const
- int hist_srow (void) const
- void hist_use (int val)
- int hist_use (void) const
34.178 Fl_Preferences::RootNode Class Reference

Public Member Functions

- int hist_use_srow (void) const
- bool is_disp_ring_row (int grow) const
- bool is_hist_ring_row (int grow) const
- void move_disp_row (int src_row, int dst_row)
- int offset (void) const
- void resize (int drows, int dcols, int hrows, const CharStyle &style)
- Utf8Char * ring_chars (void)
- Utf8Char * ring_chars (void) const
- int ring_cols (void) const
- int ring_erow (void) const
- int ring_rows (void) const
- int ring_srow (void) const
- RingBuffer (int drows, int dcols, int hrows)
- void scroll (int rows, const CharStyle &style)
- Utf8Char * u8c_disp_row (int drow)
- const Utf8Char * u8c_disp_row (int drow) const
- Utf8Char * u8c_hist_row (int hrow)
- const Utf8Char * u8c_hist_row (int hrow) const
- Utf8Char * u8c_hist_use_row (int hurow)
- const Utf8Char * u8c_hist_use_row (int hurow) const
- Utf8Char * u8c_ring_row (int row)
- const Utf8Char * u8c_ring_row (int row) const

The documentation for this class was generated from the following files:

- Fl_Terminal.H
- Fl_Terminal.cxx

34.178 Fl_Preferences::RootNode Class Reference

Public Member Functions

- char * filename ()
- char getPath (char *path, int pathlen)
- int read ()
- Root root ()
- RootNode (Fl_Preferences *)
- RootNode (Fl_Preferences *, const char *path, const char *vendor, const char *application, Root flags)
- RootNode (Fl_Preferences *, Root root, const char *vendor, const char *application)
- int write ()

The documentation for this class was generated from the following files:

- Fl_Preferences.H
- Fl_Preferences.cxx

34.179 Fl_Scroll::ScrollInfo Struct Reference

Structure to manage scrollbar and widget interior sizes.
#include <Fl_Scroll.H>

Generated by Doxygen
Public Attributes

- **FlRegion_LRTB** child
  
  child bounding box: left/right/top/bottom

- **int** hneeded
  
  horizontal scrollbar visibility

- **FlScrollbar_Data** hscroll
  
  horizontal scrollbar region + values

- **FlRegion_XYWH** innerbox
  
  widget's inner box, excluding scrollbars

- **FlRegion_XYWH** innerchild
  
  widget's inner box, including scrollbars

- **int** scrollsize
  
  the effective scrollbar thickness (local or global)

- **int** vneeded
  
  vertical scrollbar visibility

- **FlScrollbar_Data** vscroll
  
  vertical scrollbar region + values

34.179.1 Detailed Description

Structure to manage scrollbar and widget interior sizes. This is filled out by `recalc_scrollbars()` for use in calculations that need to know the visible scroll area size, etc.

Version

1.3.3

The documentation for this struct was generated from the following file:

- **FlScroll.H**

34.180 FlTerminal::Selection Class Reference

Public Member Functions

- **bool** clear (void)
- **bool** dragged_off (int row, int col)
- **int** ecol (void) const
- **void** end (void)
- **int** erow (void) const
- **bool** extend (int row, int col)
- **bool** get_selection (int &srow, int &scol, int &erow, int &ecol) const
  
  Return selection start/end.
- **bool** is_selection (void) const
- **void** push_clear ()
- **void** push_rowcol (int row, int col)
- **int** scol (void) const
- **void** scroll (int nrows)
- **void** select (int srow, int scol, int erow, int ecol)
- **void** selectionbgcolor (**FlColor** val)
- **FlColor** selectionbgcolor (void) const
- **void** selectionfgcolor (**FlColor** val)
- **FlColor** selectionfgcolor (void) const
- **int** srow (void) const
- **bool** start (int row, int col)
- **void** start_push ()
- **int** state (void) const

Generated by Doxygen
34.180.1 Member Function Documentation

34.180.1.1 get_selection()

bool Fl_Terminal::Selection::get_selection (  
  int & srow,  
  int & scol,  
  int & erow,  
  int & ecol ) const

Return selection start/end.
Ensures (start < end) to allow walking ‘forward’ thru selection, left-to-right, top-to-bottom.
Returns:

• true – valid selection values returned
• false – no selection was made, returned values undefined

The documentation for this class was generated from the following files:

• FL_Terminal.H
• FL_Terminal.cxx

34.181 Fl_Tile::Size_Range Struct Reference

Public Attributes

• int maxh
• int maxw
• int minh
• int minw

The documentation for this struct was generated from the following file:

• Fl_Tile.H

34.182 Fl_Text_Display::Style_Table_Entry Struct Reference

This structure associates the color, font, and font size of a string to draw with an attribute mask matching attr.
#include <Fl_Text_Display.H>

Public Attributes

• unsigned attr  
  further attributes for the text style (see ATTR_BGCOLOR, etc.)
• Fl_Color bgcolor  
  text background color if ATTR_BGCOLOR or ATTR_BGCOLOR_EXT is set
• Fl_Color color  
  text color
• Fl_Font font  
  text font
• Fl_Fontsize size  
  text font size

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34.182.1 Detailed Description

This structure associates the color, font, and font size of a string to draw with an attribute mask matching attr. There must be one entry for each style that can be used in an Fl_Text_Display for displaying text. The style table is an array of struct Style_Table_Entry. The style table is associated with an Fl_Text_Display by using Fl_Text_Display::highlight_data().

See also

Fl_Text_Display::highlight_data()

The documentation for this struct was generated from the following file:

- Fl_Text_Display.H

34.183 Fl_Terminal::Utf8Char Class Reference

Public Member Functions

- Fl_Color attr_bg_color (const Fl_Widget *grp) const
- Fl_Color attr_color (Fl_Color col, const Fl_Widget *grp) const
- Fl_Color attr_fg_color (const Fl_Widget *grp) const
- uchar attrib (void) const
- Fl_Color bgcolor (void) const
- uchar charflags (void) const
- void clear (const CharStyle &style)
- Fl_Color fgcolor (void) const
- void fl_font_set (const CharStyle &style) const
- bool is_char (char c) const
- int length (void) const
- int max_utf8 () const
- Utf8Char & operator= (const Utf8Char &o)
- double pwidth (void) const
- int pwidth_int (void) const
- void show_char (void) const
- void show_char_info (void) const
- void text_ascii (char c, const CharStyle &style)
- void text_utf8 (const char *text, int len, const CharStyle &style)
- const char * text_utf8 (void) const
- Utf8Char (const Utf8Char &o)

The documentation for this class was generated from the following files:

- Fl_Terminal.H
- Fl_Terminal.cxx
35.1 Enumerations.H File Reference

This file contains type definitions and general enumerations.

```c
#include <FL/fl_config.h>
#include "Fl_Export.H"
#include "fl_types.h"
#include <FL/platform_types.h>
```

Macros

- `#define FL_IMAGE_WITH_ALPHA 0x40000000`

Version Numbers

FLTK defines some constants to help the programmer to find out, for which FLTK version a program is compiled.

The following constants are defined:

- `#define FL_ABI_VERSION FL_API_VERSION`
  The FLTK ABI (Application Binary Interface) version number as an int.
- `#define FL_API_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100 + FL_PATCH_VERSION)`
  The FLTK API version number as an int.
- `#define FL_MAJOR_VERSION 1`
  The major release version of this FLTK library.
- `#define FL_MINOR_VERSION 4`
  The minor release version for this library.
- `#define FL_PATCH_VERSION 0`
  The patch version for this library.
- `#define FL_VERSION`
  The FLTK version number as a double.

Names of Non-ASCII keys and mouse buttons

The following constants define the names of non-ASCII keys on the keyboard and of mouse buttons for FL←KEYBOARD and FL_SHORTCUT events.

See also

`Fl::event_key()` and `Fl::get_key(int)` (use ASCII letters for all other keys):

- `#define FL_Alt_L 0xffe9`
  The left alt key.
- `#define FL_Alt_R 0xffea`
  The right alt key.
- `#define FL_Back 0xEF26`
  Like back on a browser.
• #define FL_BackSpace 0xff08
  The backspace key.
• #define FL_Button 0xfee8
  A mouse button; use FL_Button + n for mouse button n.
• #define FL_Caps_Lock 0xffe5
  The caps lock key.
• #define FL_Control_L 0xffe3
  The lefthand control key.
• #define FL_Control_R 0xffe4
  The righthand control key.
• #define FL_Delete 0xffff
  The delete key.
• #define FL_Down 0xff54
  The down arrow key.
• #define FL_Eisu 0xff2f
  The Eisu key of JIS keyboards.
• #define FL_End 0xff57
  The end key.
• #define FL_Enter 0xff0d
  The enter key.
• #define FL_Escape 0xff1b
  The escape key.
• #define FL_F 0xffbd
  One of the function keys; use FL_F + n for function key n.
• #define FL_F_Last 0xffe0
  The last function key; use to range-check function keys.
• #define FL_Favorites 0xEF30
  Show favorite locations.
• #define FL_Forward 0xEF27
  Like forward on a browser.
• #define FL_Help 0xff68
  The 'help' key on Mac keyboards.
• #define FL_Home 0xff50
  The home key.
• #define FL_Home_Page 0xEF18
  Display user's home page.
• #define FL_Insert 0xff63
  The insert key.
• #define FL_Iso_Key 0xff0c
  The additional key of ISO keyboards.
• #define FL_JIS_Underscore 0xff31
  The underscore key of JIS keyboards.
• #define FL_Kana 0xff2e
  The Kana key of JIS keyboards.
• #define FL_KP 0xff80
  One of the keypad numbers; use FL_KP + n' for digit n.
• #define FL_KP_Enter 0xff8d
  The enter key on the keypad, same as FL_KP+'r'.
• #define FL_KP_Last 0xffbd
  The last keypad key; use to range-check keypad.
• #define FL_Left 0xff51
  The left arrow key.
• #define FL_Mail 0xEF19
  Invoke user's mail program.
• #define FL_Media_Next 0xEF17
  Next track.
• #define FL_Media_Play 0xEF14
  Start playing of audio.
• #define FL_Media_Prev 0xEF16

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• #define FL_Media_Stop 0xEF15
  Stop playing audio.
• #define FL_Menu 0xff67
  The menu key.
• #define FL_Meta_L 0xffe7
  The left meta/Windows key.
• #define FL_Meta_R 0xffe8
  The right meta/Windows key.
• #define FL_Num_Lock 0xff7f
  The num lock key.
• #define FL_Page_Down 0xff56
  The page-down key.
• #define FL_Page_Up 0xff55
  The page-up key.
• #define FL_Pause 0xff13
  The pause key.
• #define FL_Print 0xff61
  The print (or print-screen) key.
• #define FL_Refresh 0xEF29
  Refresh the page.
• #define FL_Right 0xff53
  The right arrow key.
• #define FL_Scroll_Lock 0xff14
  The scroll lock key.
• #define FL_Search 0xEF1B
  Search.
• #define FL_Shift_L 0xffe1
  The lefthand shift key.
• #define FL_Shift_R 0xffe2
  The righthand shift key.
• #define FL_Sleep 0xEF2F
  Put system to sleep.
• #define FL_Stop 0xEF28
  Stop current operation.
• #define FL_Tab 0xff09
  The tab key.
• #define FL_Up 0xff52
  The up arrow key.
• #define FL_Volume_Down 0xEF11
  Volume control down.
• #define FL_Volume_Mute 0xEF12
  Mute sound from the system.
• #define FL_Volume_Up 0xEF13
  Volume control up.
• #define FL_Yen 0xff30
  The Yen key of JIS keyboards.

Mouse Buttons
These constants define the button numbers for FL_PUSH and FL_RELEASE events.

See also

  Fl::event_button()
The right mouse button.

Event States
The following constants define bits in the Fl::event_state() value.

- `#define FL_ALT 0x00080000` One of the alt keys is down.
- `#define FL_BUTTON(n) (0x00800000 << (n))` Mouse button n (n > 0) is pushed.
- `#define FL_BUTTON1 0x01000000` Mouse button 1 is pushed.
- `#define FL_BUTTON2 0x02000000` Mouse button 2 is pushed.
- `#define FL_BUTTON3 0x04000000` Mouse button 3 is pushed.
- `#define FL_BUTTONS 0x7f000000` Any mouse button is pushed.
- `#define FL_CAPS_LOCK 0x00020000` The caps lock is on.
- `#define FL_CTRL 0x00040000` One of the ctrl keys is down.
- `#define FL_KEY_MASK 0x0000ffff` All keys are 16 bit for now.
- `#define FL_META 0x00400000` One of the meta/Windows keys is down.
- `#define FL_NUM_LOCK 0x00100000` The num lock is on.
- `#define FL_SCROLL_LOCK 0x00800000` The scroll lock is on.
- `#define FL_SHIFT 0x00010000` One of the shift keys is down.

Typedefs
- `typedef int Fl_Fontsize` Size of a font in pixels.

Enumerations
- `enum { FL_READ = 1 , FL_WRITE = 4 , FL_EXCEPT = 8 }` FD "when" conditions.
- `enum Fl_Arrow_Type { FL_ARROW_SINGLE = 0x01 , FL_ARROW_DOUBLE = 0x02 , FL_ARROW_CHOICE = 0x03 , FL_ARROW_RETURN = 0x04 }` Arrow types define the type of arrow drawing function.
- `enum Fl_Damage { FL_DAMAGE_CHILD = 0x01 , FL_DAMAGE_EXPOSE = 0x02 , FL_DAMAGE_SCROLL = 0x04 , FL_DAMAGE_OVERLAY = 0x08 , FL_DAMAGE_USER1 = 0x10 , FL_DAMAGE_USER2 = 0x20 , FL_DAMAGE_ALL = 0x80 }` Damage masks.
- `enum Fl_Event { FL_NO_EVENT = 0 , FL_PUSH = 1 , FL_RELEASE = 2 , FL_ENTER = 3 , FL_LEAVE = 4 , FL_DRAG = 5 , FL_FOCUS = 6 , FL_UNFOCUS = 7 , FL_KEYDOWN = 8 , FL_KEYBOARD = 9 , FL_CLOSE = 10 , FL_MOVE = 11 , FL_SHORTCUT = 12 , FL_DEACTIVATE = 13 , FL_ACTIVATE = 14 , FL_HIDE = 15 , FL_SHOW = 16 , FL_PASTE = 17 , FL_SELECTIONCLEAR = 18 , FL_MOUSEWHEEL = 19 , FL_DND_ENTER = 20 , FL_DND_DRAG = 21 , FL_DND_LEAVE = 22 , FL_DND_RELEASE = 23 , FL_SCREEN_CONFIGURATION_CHANGED = 24 , FL_FULLSCREEN = 25 , FL_ZOOM_GESTURE = 26 , FL_ZOOM_EVENT = 27 }`
Every time a user moves the mouse pointer, clicks a button, or presses a key, an event is generated and sent to your application.

- **enum Fl_Labeltype**
  
  ```
  FL_NORMAL_LABEL = 0, FL_NO_LABEL, FL_SHADOW_LABEL, FL_ENGRAVED_LABEL, 
  FL_EMBOSSED_LABEL, FL_MULTI_LABEL, FL_ICON_LABEL, FL_IMAGE_LABEL, 
  FL_FREE_LABELTYPE
  ```

  The labeltype() method sets the type of the label.

- **enum Fl_Mode**
  
  ```
  FL_RGB = 0, FL_INDEX = 1, FL_SINGLE = 0, FL_DOUBLE = 2, 
  FL_RGB8 = 64, FL_MULTISAMPLE = 128, FL_STENCIL = 32, 
  FL_OPENGL3 = 1024
  ```

  *visual types and Fl_Gl_Window::mode() (values match Glut)*

- **enum Fl_Orientation**
  
  ```
  FL_ORIENT_NONE = 0x00, FL_ORIENT_RIGHT = 0x00, FL_ORIENT_NE = 0x01, FL_ORIENT_UP = 
  0x02, 
  FL_ORIENT_NW = 0x03, FL_ORIENT_LEFT = 0x04, FL_ORIENT_SW = 0x05, FL_ORIENT_DOWN = 
  0x06, 
  FL_ORIENT_SE = 0x07
  ```

  *Fl_Orientation describes the orientation of a GUI element.*

When Conditions

- **enum Fl_When**
  
  ```
  FL_WHEN_NEVER = 0, FL_WHEN_CHANGED = 1, FL_WHEN_NOT_CHANGED = 2, FL_WHEN_RELEASE 
  = 4, 
  FL_WHEN_RELEASE_ALWAYS = 6, FL_WHEN_ENTER_KEY = 8, FL_WHEN_ENTER_KEY_ALWAYS 
  = 10, FL_WHEN_ENTER_KEY_CHANGED = 11, 
  FL_WHEN_CLOSED = 16
  ```

  These constants determine when a callback is performed.

Callback Reasons

- **enum Fl_Callback_Reason**
  
  ```
  FL_REASON_UNKNOWN = 0, FL_REASON_SELECTED, FL_REASON_DESELECTED, FL_REASON_RESELECTED 
  , 
  FL_REASON_OPENED, FL_REASON_CLOSED, FL_REASON_DRAGGED, FL_REASON_CANCELLED 
  , 
  FL_REASON_CHANGED, FL_REASON_GOT_FOCUS, FL_REASON_LOST_FOCUS, FL_REASON_RELEASED 
  , 
  FL_REASON_ENTER_KEY, FL_REASON_USER = 32
  ```

  These constants describe why a callback is performed.

Cursors

- **enum Fl_Cursor**
  
  ```
  FL_CURSOR_DEFAULT = 0, FL_CURSOR_ARROW = 35, FL_CURSOR_CROSS = 66, 
  FL_CURSOR_WAIT = 76, 
  FL_CURSOR_INSERT = 77, FL_CURSOR_HAND = 31, FL_CURSOR_HELP = 47, FL_CURSOR_MOVE 
  = 27, 
  FL_CURSOR_NS = 78, FL_CURSOR_WE = 79, FL_CURSOR_NWSE = 80, FL_CURSOR_NESW = 
  81, 
  FL_CURSOR_N = 70, FL_CURSOR_NE = 69, FL_CURSOR_E = 49, FL_CURSOR_SE = 8, 
  FL_CURSOR_S = 9, FL_CURSOR_SW = 7, FL_CURSOR_W = 36, FL_CURSOR_NW = 68, 
  FL_CURSOR_NONE = 255
  ```

  The following constants define the mouse cursors that are available in FLTK.
Variables

- **FL_Fontsize FL_NORMAL_SIZE**
  
  normal font size

Box Types

FLTK standard box types

This enum defines the standard box types included with FLTK.

**Note**

The documented enum **Fl_Boxtype** contains some values (names) with leading underscores, e.g. `__FL__SHADOW_BOX`. This is due to technical reasons - please use the same values (names) without the leading underscore in your code! Enum values with leading underscores are reserved for internal use and subject to change without notice!

FL_NO_BOX means nothing is drawn at all, so whatever is already on the screen remains. The FL_..._FRAME types only draw their edges, leaving the interior unchanged. The blue color in the image below is the area that is not drawn by the frame types.

![Figure 35.1 FLTK Standard Box Types](image)

**Figure 35.1 FLTK Standard Box Types**

**Note**

Not all box types are depicted in the figure above. See enum **Fl_Boxtype** below for the complete list of box types.

See also

- **Fl::get_system_colors()**

- **Fl_Boxtype fl_box (Fl_Boxtype b)**
  
  Get the filled version of a frame.
35.1 Enumerations.H File Reference

```c
enum Fl_Boxtype {
    FL_NO_BOX = 0, FL_FLAT_BOX, FL_UP_BOX, FL_DOWN_BOX,
    FL_UP_FRAME, FL_DOWN_FRAME, FL_THIN_UP_BOX, FL_THIN_DOWN_BOX,
    FL_THIN_UP_FRAME, FL_THIN_DOWN_FRAME, FL_ENGRAVED_BOX, FL_EMBOSSED_BOX,
    FL_ENGRAVED_FRAME, FL_EMBOSSED_FRAME, FL_BORDER_BOX, FL_SHADOW_BOX,
    FL_SHADOW_FRAME, FL_THIN_SHADOW_BOX, FL_ROUND_SHADOW_BOX,
    FL_THIN_ROUND_SHADOW_BOX, FL_RFLAT_BOX, FL_ROUND_UP_BOX, FL_ROUND_DOWN_BOX,
    FL_DIAMOND_UP_BOX, FL_DIAMOND_DOWN_BOX, FL_OVAL_BOX, FL_SHADOW_BOX,
    FL_OVAL_FRAME, FL_SHADOW_FRAME, FL_THIN_SHADOW_BOX,
    FL_OVAL_UP_BOX, FL_OVAL_DOWN_BOX, FL_OVAL_THIN_UP_BOX, FL_OVAL_THIN_DOWN_BOX,
    FL_OVAL_UP_FRAME, FL_OVAL_DOWN_FRAME, FL_OVAL_THIN_UP_FRAME, FL_OVAL_THIN_DOWN_FRAME,
    FL_OVAL_ROUND_UP_BOX, FL_OVAL_ROUND_DOWN_BOX, FL_OVAL_ROUND_UP_FRAME,
    FL_OVAL_ROUND_DOWN_FRAME, FL_OVAL_BUTTON_UP_BOX, FL_OVAL_BUTTON_DOWN_BOX,
    FL_FREE_BOXTYPE
};
```

FLTK standard box types.

- **#define FL_CIRCLE_BOX** FL_ROUND_DOWN_BOX
- **#define FL_DIAMOND_BOX** FL_DIAMOND_DOWN_BOX

```c
Fl_Boxtype fl_down (Fl_Boxtype b)
```

Get the "pressed" or "down" version of a box.

```c
Fl_Boxtype fl_frame (Fl_Boxtype b)
```

Get the unfilled, frame only version of a box.

- **#define FL_FRAME** FL_ENGRAVED_FRAME
- **#define FL_FRAME_BOX** FL_ENGRAVED_BOX

```c
Fl_Labeltype fl_define_FL_EMBOSSED_LABEL ()
```

Initializes the internal table entry for FL_EMBOSSED_LABEL and returns its internal value.

```c
Fl_Labeltype fl_define_FL_ENGRAVED_LABEL ()
```

Initializes the internal table entry for FL_ENGRAVED_LABEL and returns its internal value.

```c
Fl_Labeltype fl_define_FL_ICON_LABEL ()
```

Initializes the internal table entry for FL_ICON_LABEL and returns its internal value.

```c
Fl_Labeltype fl_define_FL_IMAGE_LABEL ()
```

Initializes the internal table entry for FL_IMAGE_LABEL and returns its internal value.

```c
Fl_Labeltype fl_define_FL_MULTI_LABEL ()
```

Initializes the internal table entry for FL_MULTI_LABEL and returns its internal value.

```c
Fl_Labeltype fl_define_FL_SHADOW_LABEL ()
```

Initializes the internal table entry for FL_SHADOW_LABEL and returns its internal value.

- **#define FL_EMBOSSED_LABEL** fl_define_FL_EMBOSSED_LABEL()

Draws a label with embossed text.

- **#define FL_ENGRAVED_LABEL** fl_define_FL_ENGRAVED_LABEL()

Draws a label with engraved text.

- **#define FL_ICON_LABEL** fl_define_FL_ICON_LABEL()

Draws an icon as the label.
• #define FL_IMAGE_LABEL fl_define_FL_IMAGE_LABEL()
  Draws an image (Fl_Image) as the label.
• #define FL_MULTI_LABEL fl_define_FL_MULTI_LABEL()
  Draws a label that can comprise several parts like text and images.
• #define FL_SHADOW_LABEL fl_define_FL_SHADOW_LABEL()
  Draws a label with shadows behind the text.
• #define FL_SYMBOL_LABEL FL_NORMAL_LABEL
  Sets the current label type and returns its corresponding Fl_Labeltype value.

Colors

The Fl_Color type holds an FLTK color value. Colors are either 8-bit indexes into a virtual colormap or 24-bit RGB color values. (See Colors for the default FLTK colormap)

Color indices occupy the lower 8 bits of the value, while RGB colors occupy the upper 24 bits, for a byte organization of RGBI.

\[
\text{Fl\_Color} \rightarrow \text{0xrrggbbii}
\]

| | | +---- index between 0 and 255
| | +----- blue color component (8 bit)
| +------- green component (8 bit)
+--------- red component (8 bit)

A color can have either an index or an rgb value. Colors with rgb set and an index >0 are reserved for special use.

• const Fl_Color FL_BACKGROUND2_COLOR = 7
  the default background color for text, list, and valuator widgets
• const Fl_Color FL_BACKGROUND_COLOR = 49
  Default background color.
• const Fl_Color FL_BLACK = 56
• const Fl_Color FL_BLUE = 216
• typedef unsigned int Fl_Color
  An FLTK color value; see also Colors

• Fl_Color fl_color_average (Fl_Color c1, Fl_Color c2, float weight)
  Returns the weighted average color between the two given colors.
• #define FL_COLOR_CUBE (Fl_Color)56
• Fl_Color fl_color_cube (int r, int g, int b)
  Returns a color out of the color cube.
• Fl_Color fl_contrast (Fl_Color fg, Fl_Color bg, Fl_Fontsize fs=0, int context=0)
  Returns a color that contrasts with the background color.
• typedef Fl_Color() Fl_Contrast_Function(Fl_Color, Fl_Color, Fl_Fontsize, int)
  Type of a custom fl_contrast() function.
• void fl_contrast_function (Fl_Contrast_Function ∗f)
  Register a custom contrast function.
• int fl_contrast_level ()
  Get the contrast level (sensitivity) of the fl_contrast() method.
• void fl_contrast_level (int level)
  Set the contrast level (sensitivity) of the fl_contrast() method.
• enum Fl_Contrast_Mode {
  FL_CONTRAST_NONE = 0 , FL_CONTRAST_LEGACY , FL_CONTRAST_CIELAB , FL_CONTRAST_CUSTOM ,
  FL_CONTRAST_LAST }

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35.1 Enumerations.H File Reference

Define the possible modes to calculate `fl_contrast()`.

- `int fl_contrast_mode ()`
  
  Return the current contrast algorithm (mode).

- `void fl_contrast_mode (int mode)`
  
  Set the contrast algorithm (mode).

- `const Fl_Color FL_CYAN = 223`
- `const Fl_Color FL_DARK1 = 47`
- `const Fl_Color FL_DARK2 = 45`
- `const Fl_Color FL_DARK3 = 39`
- `const Fl_Color FL_DARK_BLUE = 136`
- `const Fl_Color FL_DARK_CYAN = 140`
- `const Fl_Color FL_DARK_GREEN = 60`
- `const Fl_Color FL_DARK_MAGENTA = 152`
- `const Fl_Color FL_DARK_RED = 72`
- `const Fl_Color FL_DARK_YELLOW = 76`

- `Fl_Color fl_darker (Fl_Color c)`
  
  Returns a darker version of the specified color.

- `const Fl_Color FL_FOREGROUND_COLOR = 0`

  the default foreground color (0) used for labels and text

- `#define FL_FREE_COLOR (Fl_Color)16`

  Colors numbered between FL_FREE_COLOR and FL_FREE_COLOR + FL_NUM_FREE_COLOR - 1 are free for the user to be given any value using Fl::set_color().

- `#define FL_GRAY FL_BACKGROUND_COLOR`
- `const Fl_Color FL_GRAY0 = 32`
- `#define FL_GRAY_RAMP (Fl_Color)32`
  
  Returns a gray color value from black (i == 0) to white (i == FL_NUM_GRAY - 1).

- `const Fl_Color FL_GREEN = 63`

- `Fl_Color flInactive (Fl_Color c)`

  Returns the inactive, dimmed version of the given color.

- `const Fl_Color FL_INACTIVE_COLOR = 8`

  the inactive foreground color

- `const Fl_Color FL_LIGHT1 = 50`
- `const Fl_Color FL_LIGHT2 = 52`
- `const Fl_Color FL_LIGHT3 = 54`

- `Fl_Color fl_lighter (Fl_Color c)`

  Returns a lighter version of the specified color.

- `double fl_lightness (Fl_Color color)`

  Return the perceived lightness of a color.

- `double fl_luminance (Fl_Color color)`

  Return the raw / physical luminance of a color.

- `const Fl_Color FL_MAGENTA = 248`
- `#define FL_NUM_BLUE 5`
- `#define FL_NUM_FREE_COLOR 16`
- `#define FL_NUM_GRAY 24`
- `#define FL_NUM_GREEN 8`
- `#define FL_NUM_RED 5`
- `const Fl_Color FL_RED = 88`

- `Fl_Color fl_rgb_color (uchar g)`

  Returns the 24-bit color value closest to `g` (grayscale).

- `Fl_Color fl_rgb_color (uchar r, uchar g, uchar b)`

  Returns the 24-bit color value closest to `r, g, b`.

- `const Fl_Color FL_SELECTION_COLOR = 15`

  the default selection/highlight color

- `const Fl_Color FL_WHITE = 255`
- `const Fl_Color FL_YELLOW = 95`
Alignment Flags

Flags to control the label alignment. This controls how the label is displayed next to or inside the widget. The default value is FL_ALIGN_CENTER (0) for most widgets, which centers the label inside the widget.

All alignment flags use the common prefix "FL_ALIGN_". In the following descriptions this prefix is sometimes omitted for brevity.

Flags can be or'd to achieve a combination of alignments, but there are some "magic values" (e.g. combinations of TOP and BOTTOM and of LEFT and RIGHT) that have special meanings (see below). For instance:

FL_ALIGN_TOP_LEFT == (FL_ALIGN_TOP | FL_ALIGN_LEFT) != FL_ALIGN_LEFT_TOP.

Outside alignments (FL_ALIGN_INSIDE is not set):

<table>
<thead>
<tr>
<th>LEFT_TOP</th>
<th>TOP</th>
<th>TOP_RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT</td>
<td>CENTER</td>
<td>RIGHT</td>
</tr>
<tr>
<td>LEFT_BOTTOM</td>
<td></td>
<td>RIGHT_BOTTOM</td>
</tr>
</tbody>
</table>

Inside alignments (FL_ALIGN_INSIDE is set):

<table>
<thead>
<tr>
<th>TOP_LEFT</th>
<th>TOP</th>
<th>TOP_RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT</td>
<td>CENTER</td>
<td>RIGHT</td>
</tr>
<tr>
<td>BOTTOM_LEFT</td>
<td>BOTTOM</td>
<td>BOTTOM_RIGHT</td>
</tr>
</tbody>
</table>

Outside alignments (FL_ALIGN_INSIDE is not set):

<table>
<thead>
<tr>
<th>LEFT_TOP</th>
<th>TOP</th>
<th>TOP_RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT</td>
<td>CENTER</td>
<td>RIGHT</td>
</tr>
<tr>
<td>LEFT_BOTTOM</td>
<td></td>
<td>RIGHT_BOTTOM</td>
</tr>
</tbody>
</table>

See also

Fl_Align, FL_ALIGN_CENTER, etc.

Note

1. Bit positions not defined in the following constants of type Fl_Align are reserved for future extensions. Do not use.

2. The "magic values" (FL_ALIGN_)LEFT_TOP, RIGHT_TOP, LEFT_BOTTOM, and RIGHT_BOTTOM must not be used together with FL_ALIGN_INSIDE. Use TOP_LEFT, TOP_RIGHT, BOTTOM_LEFT, or BOTTOM_RIGHT instead.

3. Although bits can be or'd together there are some unused/illegal combinations, for instance:
   • setting both FL_ALIGN_TOP and FL_ALIGN_BOTTOM in combinations other than those given in the Fl_Align constants below (magic values)
   • setting both FL_ALIGN_LEFT and FL_ALIGN_RIGHT in combinations other than those given in the Fl_Align constants below (magic values)
   • using one of the "magic values" (2) together with FL_ALIGN_INSIDE

Using illegal bit combinations or undefined bits may yield unexpected behavior, and this behavior may be changed without notice in future FLTK versions.

• typedef unsigned Fl_Align

   FLTK type for alignment control.

• const Fl_Align FL_ALIGN_BOTTOM = 0x0002

   Align the label at the bottom of the widget.

• const Fl_Align FL_ALIGN_BOTTOM_LEFT = FL_ALIGN_BOTTOM | FL_ALIGN_LEFT

• const Fl_Align FL_ALIGN_BOTTOM_RIGHT = FL_ALIGN_BOTTOM | FL_ALIGN_RIGHT

• const Fl_Align FL_ALIGN_CENTER = 0x0000

   Align the label horizontally in the middle.

• const Fl_Align FL_ALIGN_CLIP = 0x0040

   All parts of the label that are larger than the widget will not be drawn.

• const Fl_Align FL_ALIGN_IMAGE_BACKDROP = 0x0200

   If the label contains an image, draw the image or deimage in the background.

• const Fl_Align FL_ALIGN_IMAGE_MASK = 0x0320

   Mask value to test for image alignment flags.
• const Fl_Align FL_ALIGN_IMAGE_NEXT_TO_TEXT = 0x0100
  If the label contains an image, draw the text to the right of the image.
• const Fl_Align FL_ALIGN_IMAGE_OVER_TEXT = 0x0000
  If the label contains an image, draw the text below the image.
• const Fl_Align FL_ALIGN_INSIDE = 0x0010
  Draw the label inside of the widget.
• const Fl_Align FL_ALIGN_LEFT = 0x0004
  Align the label at the left of the widget.
• const Fl_Align FL_ALIGN_LEFT_BOTTOM = 0x0000d
  Outside only, left of widget, bottom position, magic value: TOP | LEFT | RIGHT.
• const Fl_Align FL_ALIGN_LEFT_TOP = 0x0007
  Outside only, left of widget, top position, magic value: TOP | BOTTOM | LEFT.
• const Fl_Align FL_ALIGN_NOWRAP = 0x0000
  Nothing, same as FL_ALIGN_CENTER, for back compatibility.
• const Fl_Align FL_ALIGN_POSITION_MASK = 0x000f
  Mask value to test for TOP, BOTTOM, LEFT, and RIGHT flags.
• const Fl_Align FL_ALIGN_RIGHT = 0x0008
  Align the label to the right of the widget.
• const Fl_Align FL_ALIGN_RIGHT_BOTTOM = 0x000e
  Outside only, right of widget, bottom position, magic value: BOTTOM | LEFT | RIGHT.
• const Fl_Align FL_ALIGN_RIGHT_TOP = 0x000b
  Outside only, right of widget, top position, magic value: TOP | BOTTOM | RIGHT.
• const Fl_Align FL_ALIGN_TEXT_NEXT_TO_IMAGE = 0x0120
  If the label contains an image, draw the text to the left of the image.
• const Fl_Align FL_ALIGN_TEXT_OVER_IMAGE = 0x0020
  If the label contains an image, draw the text on top of the image.
• const Fl_Align FL_ALIGN_TOP = 0x0001
  Align the label at the top of the widget.
• const Fl_Align FL_ALIGN_TOP_LEFT = FL_ALIGN_TOP | FL_ALIGN_LEFT
• const Fl_Align FL_ALIGN_TOP_RIGHT = FL_ALIGN_TOP | FL_ALIGN_RIGHT
• const Fl_Align FL_ALIGN_WRAP = 0x0080
  Wrap text that does not fit the width of the widget.

Font Numbers

The following constants define the standard FLTK fonts:

• const Fl_Font FL_BOLD = 1
  add this to Helvetica, Courier, or Times
• const Fl_Font FL_BOLD_ITALIC = 3
  add this to Helvetica, Courier, or Times
• const Fl_Font FL_COURIER = 4
  Courier normal.
• const Fl_Font FL_COURIER_BOLD = 5
  Courier bold.
• const Fl_Font FL_COURIER_BOLD_ITALIC = 7
  Courier bold-italic.
• const Fl_Font FL_COURIER_ITALIC = 6
  Courier italic.
• typedef int Fl_Font
  A font number is an index into the internal font table.
• const Fl_Font FL_FREE_FONT = 16
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first one to allocate

- `const Fl_Font FL_HELVETICA = 0`
  Helvetica (or Arial) normal (0)

- `const Fl_Font FL_HELVETICA_BOLD = 1`
  Helvetica (or Arial) bold.

- `const Fl_Font FL_HELVETICA_BOLD_ITALIC = 3`
  Helvetica (or Arial) bold-oblique.

- `const Fl_Font FL_HELVETICA_ITALIC = 2`
  Helvetica (or Arial) oblique.

- `const Fl_Font FL_ITALIC = 2`
  add this to Helvetica, Courier, or Times

- `const Fl_Font FL_SCREEN = 13`
  Default monospaced screen font.

- `const Fl_Font FL_SCREEN_BOLD = 14`
  Default monospaced bold screen font.

- `const Fl_Font FL_SYMBOL = 12`
  Standard symbol font.

- `const Fl_Font FL_TIMES = 8`
  Times roman.

- `const Fl_Font FL_TIMES_BOLD = 9`
  Times roman bold.

- `const Fl_Font FL_TIMES_BOLD_ITALIC = 11`
  Times roman bold-italic.

- `const Fl_Font FL_TIMES_ITALIC = 10`
  Times roman italic.

- `const Fl_Font FL_ZAPF_DINGBATS = 15`
  Zapf-dingbats font.

### 35.1.1 Detailed Description

This file contains type definitions and general enumerations.

### 35.1.2 Macro Definition Documentation

#### 35.1.2.1 FL_ABI_VERSION

```c
#define FL_ABI_VERSION FL_API_VERSION
```

The FLTK ABI (Application Binary Interface) version number as an int. FL_ABI_VERSION is an int that describes the major, minor, and patch ABI version numbers in the same format as FL_API_VERSION.

The ABI version number FL_ABI_VERSION is usually the same as the API version FL_API_VERSION with the last two digits set to '00'. FLTK retains the ABI (Application Binary Interface) during patch releases of the same major and minor versions.

Examples:

<table>
<thead>
<tr>
<th>FLTK Version</th>
<th>FL_API_VERSION</th>
<th>FL_ABI_VERSION</th>
<th>FL_VERSION (deprecated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3.0</td>
<td>10300</td>
<td>10300</td>
<td>1.0300</td>
</tr>
<tr>
<td>1.3.4</td>
<td>10304</td>
<td>10300</td>
<td>1.0304</td>
</tr>
</tbody>
</table>

Version 1.2.3 is actually stored as 10203 to allow for more than 9 minor and patch releases.

The FL_MAJOR_VERSION, FL_MINOR_VERSION, and FL_PATCH_VERSION constants give the integral values for the major, minor, and patch releases respectively.

To enable new ABI-breaking features in patch releases you can configure FLTK to use a higher FL_ABI_VERSION.
35.1 Enumerations.H File Reference

See also

README.abi-version.txt

35.1.2.2 FL_API_VERSION

#define FL_API_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100 + FL_PATCH_VERSION)
The FLTK API version number as an int.
FL_API_VERSION is an int that describes the major, minor, and patch version numbers.
Version 1.2.3 is actually stored as 10203 to allow for more than 9 minor and patch releases.
The FL_MAJOR_VERSION, FL_MINOR_VERSION, and FL_PATCH_VERSION constants give the integral values for the major, minor, and patch releases respectively.

Note

FL_API_VERSION is intended to replace the deprecated double FL_VERSION.

See also

Fl::api_version()

35.1.2.3 FL_IMAGE_LABEL

#define FL_IMAGE_LABEL fl_define_FL_IMAGE_LABEL()
Draws an image (Fl_Image) as the label.
This is useful for one particular part of an Fl_Multi_Label. Use Fl_Widget::image() and/or Fl_Widget::deimage() for normal widgets with images as labels.

35.1.2.4 FL_MAJOR_VERSION

#define FL_MAJOR_VERSION 1
The major release version of this FLTK library.

See also

FL_VERSION

35.1.2.5 FL_MINOR_VERSION

#define FL_MINOR_VERSION 4
The minor release version for this library.
FLTK remains mostly source-code compatible between minor version changes.

35.1.2.6 FL_MULTI_LABEL

#define FL_MULTI_LABEL fl_define_FL_MULTI_LABEL()
Draws a label that can comprise several parts like text and images.

See also

Fl_Multi_Label

35.1.2.7 FL_PATCH_VERSION

#define FL_PATCH_VERSION 0
The patch version for this library.
FLTK remains binary compatible between patches.
35.1.2.8 FL_SYMBOL_LABEL

#define FL_SYMBOL_LABEL FL_NORMAL_LABEL
Sets the current label type and returns its corresponding Fl_Labeltype value.
FL_SYMBOL_LABEL is an alias for FL_NORMAL_LABEL.
'@' symbols can be drawn with normal labels as well.
This definition is for historical reasons only (forms compatibility). You should use FL_NORMAL_LABEL instead.

35.1.2.9 FL_VERSION

#define FL_VERSION
Value:
\[(double)FL_MAJOR_VERSION + \]
\[(double)FL_MINOR_VERSION \times 0.01 + \]
\[(double)FL_PATCH_VERSION \times 0.0001 \]
The FLTK version number as a double.
FL_VERSION is a double that describes the major, minor, and patch version numbers.
Version 1.2.3 is actually stored as 1.0203 to allow for more than 9 minor and patch releases.

Deprecated This double version number is retained for compatibility with existing program code. New code should use int FL_API_VERSION instead. FL_VERSION is deprecated because comparisons of floating point values may fail due to rounding errors. However, there are currently no plans to remove this deprecated constant.

FL_VERSION is equivalent to \[(double)FL_API_VERSION / 10000 \].

See also
Fl::version() (deprecated as well)
FL_API_VERSION
Fl::api_version()

35.1.3 Typedef Documentation

35.1.3.1 Fl_Contrast_Function

typedef Fl_Color() Fl_Contrast_Function(Fl_Color, Fl_Color, Fl_Fontsize, int)
Type of a custom fl_contrast() function.
Use this signature to define your own custom fl_contrast() function together with fl_contrast_mode(FL__CONTRAST_CUSTOM). Example:
Fl_Color my_contrast(Fl_Color fg, Fl_Color bg, Fl_Fontsize fs, int context) {
  // calculate contrast and ...
  return color;
}
// call this early in your main() program:
fl_contrast_function(my_contrast);
fl_contrast_mode(FL_CONTRAST_CUSTOM);

See also
fl_contrast(Fl_Color, Fl_Color, Fl_Fontsize, int)
fl_contrast_mode(int)

35.1.3.2 Fl_Fontsize

typedef int Fl_Fontsize
Size of a font in pixels.
This is the approximate height of a font in pixels.
35.1 Enumerations.H File Reference

35.1.4 Enumeration Type Documentation

35.1.4.1 anonymous enum

anonymous enum
FD "when" conditions.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_READ</td>
<td>Call the callback when there is data to be read.</td>
</tr>
<tr>
<td>FL_WRITE</td>
<td>Call the callback when data can be written without blocking.</td>
</tr>
<tr>
<td>FL_EXCEPT</td>
<td>Call the callback if an exception occurs on the file.</td>
</tr>
</tbody>
</table>

35.1.4.2 Fl_Arrow_Type

enum Fl_Arrow_Type
Arrow types define the type of arrow drawing function.
FLTK schemes can draw several graphical elements in their particular way. One of these elements is an arrow type that can be in different GUI elements like scrollbars, choice buttons, and FLTK's Fl_Return_Button.

Note
This enum is not yet stable (as of FLTK 1.4.0) and may be changed without notice as necessary.

Since
1.4.0

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_ARROW_SINGLE</td>
<td>Single arrow, e.g. in Fl_Scrollbar.</td>
</tr>
<tr>
<td>FL_ARROW_DOUBLE</td>
<td>Double arrow, e.g. in Fl_Counter.</td>
</tr>
<tr>
<td>FL_ARROW_CHOICE</td>
<td>Dropdown box, e.g. in Fl_Choice.</td>
</tr>
<tr>
<td>FL_ARROW_RETURN</td>
<td>Return arrow, e.g. in Fl_Return_Button.</td>
</tr>
</tbody>
</table>

35.1.4.3 Fl_Boxtype

enum Fl_Boxtype
FLTK standard box types.
This enum defines the standard box types included with FLTK.

Note
The documented enum Fl_Boxtype contains some values (names) with leading underscores, e.g. _FL_← _SHADOW_BOX_. This is due to technical reasons - please use the same values (names) without the leading underscore in your code! Enum values with leading underscores are reserved for internal use and subject to change without notice!

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_NO_BOX</td>
<td>nothing is drawn at all, this box is invisible</td>
</tr>
<tr>
<td>FL_FLAT_BOX</td>
<td>a flat box</td>
</tr>
</tbody>
</table>
### Enumerator

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_UP_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_DOWN_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_UP_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_DOWN_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_THIN_UP_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_THIN_DOWN_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_THIN_UP_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_THIN_DOWN_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_ENGRAVED_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_ENGRAVED_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_EMBOSSED_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_EMBOSSED_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_BORDER_BOX</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_SHADOW_BOX</td>
<td>see figure Standard Box Types, use FL_SHADOW_BOX</td>
</tr>
<tr>
<td>FL_BORDER_FRAME</td>
<td>see figure Standard Box Types</td>
</tr>
<tr>
<td>FL_SHADOW_FRAME</td>
<td>see figure Standard Box Types, use FL_SHADOW_FRAME</td>
</tr>
<tr>
<td>FL_ROUNDED_BOX</td>
<td>see figure Standard Box Types, use FL_ROUNDED_BOX</td>
</tr>
<tr>
<td>FL_ROUNDED_FRAME</td>
<td>see figure Standard Box Types, use FL_ROUNDED_FRAME</td>
</tr>
<tr>
<td>FL_RFLAT_BOX</td>
<td>see figure Standard Box Types, use FL_RFLAT_BOX</td>
</tr>
<tr>
<td>FL_ROUND_DOWN_BOX</td>
<td>see figure Standard Box Types, use FL_ROUND_DOWN_BOX</td>
</tr>
<tr>
<td>FL_DIAMOND_UP_BOX</td>
<td>see figure Standard Box Types, use FL_DIAMOND_UP_BOX</td>
</tr>
<tr>
<td>FL_DIAMOND_DOWN_BOX</td>
<td>see figure Standard Box Types, use FL_DIAMOND_DOWN_BOX</td>
</tr>
<tr>
<td>FL_OVAL_BOX</td>
<td>see figure Standard Box Types, use FL_OVAL_BOX</td>
</tr>
<tr>
<td>FL_OSHADOW_BOX</td>
<td>see figure Standard Box Types, use FL_OSHADOW_BOX</td>
</tr>
<tr>
<td>FL_OVAL_FRAME</td>
<td>see figure Standard Box Types, use FL_OVAL_FRAME</td>
</tr>
<tr>
<td>FL_OFLAT_BOX</td>
<td>see figure Standard Box Types, use FL_OFLAT_BOX</td>
</tr>
<tr>
<td>FL_PLASTIC_UP_BOX</td>
<td>plastic version of FL_UP_BOX, use FL_PLASTIC_UP_BOX</td>
</tr>
<tr>
<td>FL_PLASTIC_DOWN_BOX</td>
<td>plastic version of FL_DOWN_BOX, use FL_PLASTIC_DOWN_BOX</td>
</tr>
<tr>
<td>FL_PLASTIC_UP_FRAME</td>
<td>plastic version of FL_UP_FRAME, use FL_PLASTIC_UP_FRAME</td>
</tr>
<tr>
<td>FL_PLASTIC_DOWN_FRAME</td>
<td>plastic version of FL_DOWN_FRAME, use</td>
</tr>
<tr>
<td>FL_PLASTIC_THIN_UP_BOX</td>
<td>plastic version of FL_THIN_UP_BOX, use FL_PLASTIC_THIN_UP_BOX</td>
</tr>
<tr>
<td>FL_PLASTIC_THIN_DOWN_BOX</td>
<td>plastic version of FL_THIN_DOWN_BOX, use</td>
</tr>
<tr>
<td>FL_PLASTIC_ROUND_UP_BOX</td>
<td>plastic version of FL_ROUND_UP_BOX, use</td>
</tr>
<tr>
<td>FL_PLASTIC_ROUND_DOWN_BOX</td>
<td>plastic version of FL_ROUND_DOWN_BOX, use</td>
</tr>
<tr>
<td>FL_GTK_UP_BOX</td>
<td>gtk+ version of FL_UP_BOX, use FL_GTK_UP_BOX</td>
</tr>
<tr>
<td>FL_GTK_DOWN_BOX</td>
<td>gtk+ version of FL_DOWN_BOX, use FL_GTK_DOWN_BOX</td>
</tr>
<tr>
<td>FL_GTK_UP_FRAME</td>
<td>gtk+ version of FL_UP_FRAME, use FL_GTK_UP_FRAME</td>
</tr>
<tr>
<td>FL_GTK_DOWN_FRAME</td>
<td>gtk+ version of FL_DOWN_FRAME, use FL_GTK_DOWN_FRAME</td>
</tr>
<tr>
<td>FL_GTK_THIN_UP_BOX</td>
<td>gtk+ version of FL_THIN_UP_BOX, use FL_GTK_THIN_UP_BOX</td>
</tr>
<tr>
<td>FL_GTK_THIN_DOWN_BOX</td>
<td>gtk+ version of FL_THIN_DOWN_BOX, use FL_GTK_THIN_DOWN_BOX</td>
</tr>
</tbody>
</table>

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### 35.1 Enumerations.H File Reference

#### 35.1.4.4 Fl_Callback_Reason

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>_FL_GTK_THIN_UP_FRAME</td>
<td>gtk+ version of FL_THIN_UP_FRAME, use FL_GTK_THIN_UP_FRAME</td>
</tr>
<tr>
<td>_FL_GTK_THIN_DOWN_FRAME</td>
<td>gtk+ version of FL_THIN_DOWN_FRAME, use FL_GTK_THIN_DOWN_FRAME</td>
</tr>
<tr>
<td>_FL_GTK_ROUND_UP_BOX</td>
<td>gtk+ version of FL_ROUND_UP_BOX, use FL_GTK_ROUND_UP_BOX</td>
</tr>
<tr>
<td>_FL_GTK_ROUND_DOWN_BOX</td>
<td>gtk+ version of FL_ROUND_DOWN_BOX, use FL_GTK_ROUND_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_GLEAM_UP_BOX</td>
<td>gleam version of FL_UP_BOX, use FL_GLEAM_UP_BOX</td>
</tr>
<tr>
<td>_FL_GLEAM_DOWN_BOX</td>
<td>gleam version of FL_DOWN_BOX, use FL_GLEAM_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_GLEAM_UP_FRAME</td>
<td>gleam version of FL_UP_FRAME, use FL_GLEAM_UP_FRAME</td>
</tr>
<tr>
<td>_FL_GLEAM_DOWN_FRAME</td>
<td>gleam version of FL_DOWN_FRAME, use FL_GLEAM_DOWN_FRAME</td>
</tr>
<tr>
<td>_FL_GLEAM_THIN_UP_BOX</td>
<td>gleam version of FL_THIN_UP_BOX, use FL_GLEAM_THIN_UP_BOX</td>
</tr>
<tr>
<td>_FL_GLEAM_THIN_DOWN_BOX</td>
<td>gleam version of FL_THIN_DOWN_BOX, use FL_GLEAM_THIN_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_GLEAM_ROUND_UP_BOX</td>
<td>gleam version of FL_ROUND_UP_BOX, use FL_GLEAM_ROUND_UP_BOX</td>
</tr>
<tr>
<td>_FL_GLEAM_ROUND_DOWN_BOX</td>
<td>gleam version of FL_DOWN_BOX, use FL_GLEAM_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_OXY_UP_BOX</td>
<td>oxy version of FL_UP_BOX, use FL_OXY_UP_BOX</td>
</tr>
<tr>
<td>_FL_OXY_DOWN_BOX</td>
<td>oxy version of FL_DOWN_BOX, use FL_OXY_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_OXY_UP_FRAME</td>
<td>oxy version of FL_UP_FRAME, use FL_OXY_UP_FRAME</td>
</tr>
<tr>
<td>_FL_OXY_DOWN_FRAME</td>
<td>oxy version of FL_DOWN_FRAME, use FL_OXY_DOWN_FRAME</td>
</tr>
<tr>
<td>_FL_OXY_THIN_UP_BOX</td>
<td>oxy version of FL_THIN_UP_BOX, use FL_OXY_THIN_UP_BOX</td>
</tr>
<tr>
<td>_FL_OXY_THIN_DOWN_BOX</td>
<td>oxy version of FL_THIN_DOWN_BOX, use FL_OXY_THIN_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_OXY_THIN_UP_FRAME</td>
<td>oxy version of FL_THIN_UP_FRAME, use FL_OXY_THIN_UP_FRAME</td>
</tr>
<tr>
<td>_FL_OXY_THIN_DOWN_FRAME</td>
<td>oxy version of FL_THIN_DOWN_FRAME, use FL_OXY_THIN_DOWN_FRAME</td>
</tr>
<tr>
<td>_FL_OXY_ROUND_UP_BOX</td>
<td>oxy version of FL_ROUND_UP_BOX, use FL_OXY_ROUND_UP_BOX</td>
</tr>
<tr>
<td>_FL_OXY_ROUND_DOWN_BOX</td>
<td>oxy version of FL_ROUND_DOWN_BOX, use FL_OXY_ROUND_DOWN_BOX</td>
</tr>
<tr>
<td>_FL_OXY_BUTTON_UP_BOX</td>
<td>oxy version of FL_THIN_UP_BOX, use FL_OXY_BUTTON_UP_BOX</td>
</tr>
<tr>
<td>_FL_OXY_BUTTON_DOWN_BOX</td>
<td>oxy version of FL_DOWN_BOX, use FL_OXY_BUTTON_DOWN_BOX</td>
</tr>
<tr>
<td>FL_FREE_BOXTYPE</td>
<td>the first free box type for creation of new box types</td>
</tr>
</tbody>
</table>

---

35.1.4.4 Fl_Callback_Reason

**enum Fl_Callback_Reason**

These constants describe why a callback is performed.

See also

Fl::callback_reason(), Fl_Widget::when(), Fl_When

---

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Fl_Restoration_Mode

```cpp
enum Fl_Restoration_Mode
{
    FL_REASON_UNKNOWN, // unknown or unset reason
    FL_REASON_SELECTED, // an item was selected
    FL_REASON_DESELECTED, // an item was de-selected
    FL_REASON_RESELECTED, // an item was re-selected (double-clicked).
    FL_REASON_OPENED, // an item was opened
    FL_REASON_CLOSED, // an item was closed
    FL_REASON_DRAGGED, // an item was dragged into a new place
    FL_REASON_CANCELLED, // a dialog was cancelled
    FL_REASON_CHANGED, // the value of the widget was modified
    FL_REASON_GOT_FOCUS, // a widget received focus
    FL_REASON_LOST_FOCUS, // a widget lost focus
    FL_REASON_RELEASED, // the mouse button was released
    FL_REASON_ENTER_KEY, // user finished input pressing Enter
    FL_REASON_USER, // user defined callback reasons
};
```

### 35.1.4.5 Fl_Contrast_Mode

```cpp
enum Fl_Contrast_Mode
{
    FL_CONTRAST_NONE, // always return foreground color
    FL_CONTRAST_LEGACY, // legacy (FLTK 1.3.x) contrast function
    FL_CONTRAST_CIELAB, // new (FLTK 1.4.0) default function
    FL_CONTRAST_CUSTOM, // optional custom contrast function
    FL_CONTRAST_LAST, // internal use only (invalid contrast mode)
};
```

### 35.1.4.6 Fl_Cursor

```cpp
enum Fl_Cursor
{
    FL_CURSOR_DEFAULT, // the default cursor, usually an arrow:
    FL_CURSOR_ARROW, // an arrow pointer:
    FL_CURSOR_CROSS, // crosshair:
    FL_CURSOR_WAIT, // busy indicator (for instance hourglass):
    FL_CURSOR_INSERT, // I-beam:
    FL_CURSOR_HAND, // pointing hand:
    FL_CURSOR_HELP, // question mark pointer:
    FL_CURSOR_MOVE, // 4-pointed arrow or hand:
    FL_CURSOR_NS, // up/down resize:
    FL_CURSOR_WE, // left/right resize:
    FL_CURSOR_NWSE, // diagonal resize:
};
```
35.1 Enumerations.H File Reference

### 35.1.4.7 Fl_Damage

```c
enum Fl_Damage
```

#### Damage masks.

- **FL_DAMAGE_CHILD**: A child needs to be redrawn.
- **FL_DAMAGE_EXPOSE**: The window was exposed.
- **FL_DAMAGE_SCROLL**: The Fl_Scroll widget was scrolled. Used by other widgets for other widget specific damages.
- **FL_DAMAGE_OVERLAY**: The overlay planes need to be redrawn.
- **FL_DAMAGE_USER1**: First user-defined damage bit.
- **FL_DAMAGE_USER2**: Second user-defined damage bit.
- **FL_DAMAGE_ALL**: Everything needs to be redrawn.

### 35.1.4.8 Fl_Event

```c
enum Fl_Event
```

#### Every time a user moves the mouse pointer, clicks a button, or presses a key, an event is generated and sent to your application.

Events can also come from other programs like the window manager.

Events are identified by the integer argument passed to the Fl_Widget::handle() virtual method. Other information about the most recent event is stored in static locations and acquired by calling the Fl::event_*() methods. This static information remains valid until the next event is read from the window system, so it is ok to look at it outside of the handle() method.

Event numbers can be converted to their actual names using the fl_eventnames[] array defined in `<FL/names.h>`.

See also

- Fl::event_text(), Fl::event_key(), class Fl::

```c

#### Enumerator

| FL_NO_EVENT | No event. |
```
### Enumerator

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_PUSH</td>
<td>A mouse button has gone down with the mouse pointing at this widget. You can find out what button by calling Fl::event_button(). You find out the mouse position by calling Fl::event_x() and Fl::event_y(). A widget indicates that it &quot;wants&quot; the mouse click by returning non-zero from its Fl_Widget::handle() method. It will then become the Fl::pushed() widget and will get FL_DRAG and the matching FL_RELEASE events. If Fl_Widget::handle() returns zero then FLTK will try sending the FL_PUSH to another widget.</td>
</tr>
<tr>
<td>FL_RELEASE</td>
<td>A mouse button has been released. You can find out what button by calling Fl::event_button(). In order to receive the FL_RELEASE event, the widget must return non-zero when handling FL_PUSH.</td>
</tr>
<tr>
<td>FL_ENTER</td>
<td>The mouse has been moved to point at this widget. This can be used for highlighting feedback. If a widget wants to highlight or otherwise track the mouse, it indicates this by returning non-zero from its handle() method. It then becomes the Fl::belowmouse() widget and will receive FL_MOVE and FL_LEAVE events.</td>
</tr>
<tr>
<td>FL_LEAVE</td>
<td>The mouse has moved out of the widget. In order to receive the FL_LEAVE event, the widget must return non-zero when handling FL_ENTER.</td>
</tr>
<tr>
<td>FL_DRAG</td>
<td>The mouse has moved with a button held down. The current button state is in Fl::event_state(). The mouse position is in Fl::event_x() and Fl::event_y(). In order to receive FL_DRAG events, the widget must return non-zero when handling FL_PUSH.</td>
</tr>
<tr>
<td>FL_FOCUS</td>
<td>This indicates an attempt to give a widget the keyboard focus. If a widget wants the focus, it should change itself to display the fact that it has the focus, and return non-zero from its handle() method. It then becomes the Fl::focus() widget and gets FL_KEYDOWN, FL_KEYUP, and FL_UNFOCUS events. The focus will change either because the window manager changed which window gets the focus, or because the user tried to navigate using tab, arrows, or other keys. You can check Fl::event_key() to figure out why it moved. For navigation it will be the key pressed and for interaction with the window manager it will be zero.</td>
</tr>
<tr>
<td>FL_UNFOCUS</td>
<td>This event is sent to the previous Fl::focus() widget when another widget gets the focus or the window loses focus.</td>
</tr>
<tr>
<td>Enumerator</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>FL_KEYDOWN</td>
<td>A key was pressed (FL_KEYDOWN) or released (FL_KEYUP). FL_KEYBOARD is a synonym for FL_KEYDOWN. The key can be found in Fl::event_key(). The text that the key should insert can be found with Fl::event_text() and its length is in Fl::event_length(). If you use the key handle() should return 1. If you return zero then FLTK assumes you ignored the key and will then attempt to send it to a parent widget. If none of them want it, it will change the event into a FL_SHORTCUT event. To receive FL_KEYBOARD events you must also respond to the FL_FOCUS and FL_UNFOCUS events. If you are writing a text-editing widget you may also want to call the Fl::compose() function to translate individual keystrokes into non-ASCII characters. FL_KEYUP events are sent to the widget that currently has focus. This is not necessarily the same widget that received the corresponding FL_KEYDOWN event because focus may have changed between events.</td>
</tr>
<tr>
<td>FL_KEYBOARD</td>
<td>Equivalent to FL_KEYDOWN. See also FL_KEYDOWN.</td>
</tr>
<tr>
<td>FL_KEYUP</td>
<td>Key release event. See also FL_KEYDOWN.</td>
</tr>
<tr>
<td>FL_CLOSE</td>
<td>The user clicked the close button of a window. This event is used internally only to trigger the callback of Fl::Window derived classes. The default callback closes the window calling Fl::Window::hide().</td>
</tr>
<tr>
<td>FL_MOVE</td>
<td>The mouse has moved without any mouse buttons held down. This event is sent to the Fl::belowmouse() widget. In order to receive FL_MOVE events, the widget must return non-zero when handling FL_ENTER.</td>
</tr>
<tr>
<td>FL_SHORTCUT</td>
<td>If the Fl::focus() widget is zero or ignores an FL_KEYBOARD event then FLTK tries sending this event to every widget it can, until one of them returns non-zero. FL_SHORTCUT is first sent to the Fl::belowmouse() widget, then its parents and siblings, and eventually to every widget in the window, trying to find an object that returns non-zero. FLTK tries really hard to not to ignore any keystrokes! You can also make &quot;global&quot; shortcuts by using Fl::add_handler(). A global shortcut will work no matter what windows are displayed or which one has the focus.</td>
</tr>
<tr>
<td>FL_DEACTIVATE</td>
<td>This widget is no longer active, due to Fl_Widget::deactivate() being called on it or one of its parents. Fl_Widget::active() may still be true after this, the widget is only active if Fl_Widget::active() is true on it and all its parents (use Fl_Widget::active_r() to check this).</td>
</tr>
<tr>
<td>FL_ACTIVATE</td>
<td>This widget is now active, due to Fl_Widget::activate() being called on it or one of its parents.</td>
</tr>
</tbody>
</table>
### Enumerator

| FL_HIDE | This widget is no longer visible, due to Fl_Widget::hide() being called on it or one of its parents, or due to a parent window being minimized. Fl_Widget::visible() may still be true after this, but the widget is visible only if visible() is true for it and all its parents (use Fl_Widget::visible_r() to check this). |
| FL_SHOW | This widget is visible again, due to Fl_Widget::show() being called on it or one of its parents, or due to a parent window being restored. Child Fl_Windows respond to this by actually creating the window if not done already, so if you subclass a window, be sure to pass FL_SHOW to the base class Fl_Widget::handle() method! |
| FL_PASTE | You should get this event some time after you call Fl::paste(). The contents of Fl::event_text() is the text to insert and the number of characters is in Fl::event_length(). |
| FL_SELECTIONCLEAR | The Fl::selection_owner() will get this event before the selection is moved to another widget. This indicates that some other widget or program has claimed the selection. Motif programs used this to clear the selection indication. Most modern programs ignore this. |
| FL_MOUSEWHEEL | The user has moved the mouse wheel. The Fl::event_dx() and Fl::event_dy() methods can be used to find the amount to scroll horizontally and vertically. |
| FL_DND_ENTER | The mouse has been moved to point at this widget. A widget that is interested in receiving drag'n'drop data must return 1 to receive FL_DND_DRAG, FL_DND_LEAVE and FL_DND_RELEASE events. |
| FL_DND_DRAG | The mouse has been moved inside a widget while dragging data. A widget that is interested in receiving drag'n'drop data should indicate the possible drop position. |
| FL_DND_LEAVE | The mouse has moved out of the widget. |
| FL_DND.Release | The user has released the mouse button dropping data into the widget. If the widget returns 1, it will receive the data in the immediately following FL_PASTE event. |
| FL_SCREEN_CONFIGURATION_CHANGED | The screen configuration (number, positions) was changed. Use Fl::add_handler() to be notified of this event. |
| FL_FULLSCREEN | The fullscreen state of the window has changed. This event is sent to the window's handle method. |
| FL_ZOOM_GESTURE | The user has made a zoom/pinch/magnification gesture (Mac OS platform only). The Fl::event_dy() method can be used to find magnification amount, Fl::event_x() and Fl::event_y() are set as well. This event is sent to the window's handle method. |
| FL_ZOOM_EVENT | A zoom event (ctrl/+/-/0/ or cmd/+/-/0/) was processed. Use Fl::add_handler() to be notified of this event. |

#### 35.1.4.9 Fl_Labeltype

**enum Fl_Labeltype**

The labeltype() method sets the type of the label.
Note

The documented enum Fl_Labeltype contains some values (names) with leading underscores, e.g. `_FL_IMAGE_LABEL`. This is due to technical reasons - please use the same values (names) without the leading underscore in your code! Enum values with leading underscores are reserved for internal use and subject to change without notice!

The following standard label types are included:

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>FL_NORMAL_LABEL</code></td>
<td>draws the text (0)</td>
</tr>
<tr>
<td><code>FL_NO_LABEL</code></td>
<td>does nothing</td>
</tr>
<tr>
<td><code>_FL_SHADOW_LABEL</code></td>
<td>draws a drop shadow under the text</td>
</tr>
<tr>
<td><code>_FL_ENGRAVED_LABEL</code></td>
<td>draws edges as though the text is engraved</td>
</tr>
<tr>
<td><code>_FL_EMBOSSED_LABEL</code></td>
<td>draws edges as though the text is raised</td>
</tr>
<tr>
<td><code>_FL_MULTI_LABEL</code></td>
<td>draws a composite label</td>
</tr>
<tr>
<td><code>Fl_Multi_Label</code></td>
<td>See also</td>
</tr>
<tr>
<td><code>_FL_ICON_LABEL</code></td>
<td>draws the icon associated with the text</td>
</tr>
<tr>
<td><code>_FL_IMAGE_LABEL</code></td>
<td>the label displays an &quot;icon&quot; based on a Fl_Image</td>
</tr>
<tr>
<td><code>FL_FREE_LABELTYPE</code></td>
<td>first free labeltype to use for creating own labeltypes</td>
</tr>
</tbody>
</table>

35.1.4.10 Fl_Orientation

enum Fl_Orientation

Fl_Orientation describes the orientation of a GUI element. FLTK schemes can draw several graphical elements, for instance arrows, pointing at different directions. This enum defines the direction to use for drawing a particular GUI element. The definition of this enum was chosen such that the enum value can be multiplied by 45 to get a rotation angle in degrees starting at the horizontal axis (0 = right, 1 = NE, 2 = up, ...) that can be used with fl_rotate(). Note: angle is counter-clockwise in degrees.

The 'unspecified' value `FL_ORIENT_NONE` shall be used for elements that would usually not be rotated, like the return arrow of the Fl_Return_Button. It can still be used as an angle though since it is the same value as `FL_ORIENT_RIGHT` (0 degrees).

Note

This enum is not yet stable (as of FLTK 1.4.0) and may be changed without notice as necessary.

Since

1.4.0

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>FL_ORIENT_NONE</code></td>
<td>GUI element direction is unspecified.</td>
</tr>
<tr>
<td><code>FL_ORIENT_RIGHT</code></td>
<td>GUI element pointing right (0°)</td>
</tr>
<tr>
<td><code>FL_ORIENT_NE</code></td>
<td>GUI element pointing NE (45°)</td>
</tr>
<tr>
<td><code>FL_ORIENT_UP</code></td>
<td>GUI element pointing up (90°)</td>
</tr>
<tr>
<td><code>FL_ORIENT_NW</code></td>
<td>GUI element pointing NW (135°)</td>
</tr>
<tr>
<td><code>FL_ORIENT_LEFT</code></td>
<td>GUI element pointing left (180°)</td>
</tr>
<tr>
<td><code>FL_ORIENT_SW</code></td>
<td>GUI element pointing SW (225°)</td>
</tr>
</tbody>
</table>
35.1.4.11  Fl_When

enum Fl_When
These constants determine when a callback is performed.
Fl_When is a bit field. Some values are merely shortcuts for common bit combinations. New flags may be added in
the future, so it's important to mask the required bit when reading via when().

Note
Some widgets may not fully support FL_WHEN_... flags.

See also
Fl_Widget::when(), Fl::callback_reason(), Fl_Callback_Reason, Fl_Widget::do_callback()

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_WHEN_NEVER</td>
<td>Never call the callback.</td>
</tr>
<tr>
<td>FL_WHEN_CHANGED</td>
<td>Do the callback only when the widget value changes.</td>
</tr>
<tr>
<td>FL_WHEN_NOT_CHANGED</td>
<td>Do the callback whenever the user interacts with the widget.</td>
</tr>
<tr>
<td>FL_WHEN_RELEASE</td>
<td>Do the callback when the button or key is released and the value changes.</td>
</tr>
<tr>
<td>FL_WHEN_RELEASE_ALWAYS</td>
<td>Do the callback when the button or key is released, even if the value doesn't change.</td>
</tr>
<tr>
<td>FL_WHEN_ENTER_KEY</td>
<td>Do the callback when the user presses the ENTER key and the value changes.</td>
</tr>
<tr>
<td>FL_WHEN_ENTER_KEY_ALWAYS</td>
<td>Do the callback when the user presses the ENTER key, even if the value doesn't change.</td>
</tr>
<tr>
<td>FL_WHEN_ENTER_KEY_CHANGED</td>
<td>Do callbacks whether the value changed or not, and when the ENTER key is pressed.</td>
</tr>
<tr>
<td>FL_WHEN_CLOSED</td>
<td>Do the callback when a child of Fl_Tabs is closed.</td>
</tr>
</tbody>
</table>

35.1.5  Function Documentation

35.1.5.1  fl_box()

Fl_Boxtype fl_box ( Fl_Boxtype b ) [inline]
Get the filled version of a frame.
If no filled version of a given frame exists, the behavior of this function is undefined and some random box or frame is returned.

35.1.5.2  fl_color_cube()

Fl_Color fl_color_cube ( int r,
35.1 Enumerations.H File Reference

```c
int g,
int b ); [inline]
```

Returns a color out of the color cube.

- `r` must be in the range 0 to FL_NUM_RED (5) minus 1,
- `g` must be in the range 0 to FL_NUM_GREEN (8) minus 1,
- `b` must be in the range 0 to FL_NUM_BLUE (5) minus 1.

To get the closest color to a 8-bit set of R,G,B values use:

```c
fl_color_cube(R * (FL_NUM_RED - 1) / 255,
             G * (FL_NUM_GREEN - 1) / 255,
             B * (FL_NUM_BLUE - 1) / 255);
```

35.1.5.3 fl_define_FL_EMBOSSED_LABEL()

```c
FLLabeltype fl_define_FL_EMBOSSED_LABEL ( )
```

Initializes the internal table entry for FL_EMBOSSED_LABEL and returns its internal value.
Internal use only.

35.1.5.4 fl_define_FL_ENGRAVED_LABEL()

```c
FLLabeltype fl_define_FL_ENGRAVED_LABEL ( )
```

Initializes the internal table entry for FL_ENGRAVED_LABEL and returns its internal value.
Internal use only.

35.1.5.5 fl_define_FL_ICON_LABEL()

```c
FLLabeltype fl_define_FL_ICON_LABEL ( )
```

Initializes the internal table entry for FL_ICON_LABEL and returns its internal value.
Internal use only.

35.1.5.6 fl_define_FL_IMAGE_LABEL()

```c
FLLabeltype fl_define_FL_IMAGE_LABEL ( )
```

Initializes the internal table entry for FL_IMAGE_LABEL and returns its internal value.
Internal use only.

35.1.5.7 fl_define_FL_MULTI_LABEL()

```c
FLLabeltype fl_define_FL_MULTI_LABEL ( )
```

Initializes the internal table entry for FL_MULTI_LABEL and returns its internal value.
Internal use only.

35.1.5.8 fl_define_FL_SHADOW_LABEL()

```c
FLLabeltype fl_define_FL_SHADOW_LABEL ( )
```

Initializes the internal table entry for FL_SHADOW_LABEL and returns its internal value.
Internal use only.

35.1.5.9 fl_down()

```c
FlBoxtype fl_down ( FlBoxtype b ) [inline]
```

Get the "pressed" or "down" version of a box.

If no "down" version of a given box exists, the behavior of this function is undefined and some random box or frame is returned.

35.1.5.10 fl_frame()

```c
FlBoxtype fl_frame ( FlBoxtype b ) [inline]
```

Get the unfilled, frame only version of a box.
If no frame version of a given box exists, the behavior of this function is undefined and some random box or frame is returned.

35.1.5.11  **fl_gray_ramp()**

```c
Fl_Color fl_gray_ramp ( int i ) [inline]
```

Returns a gray color value from black (i == 0) to white (i == FL_NUM_GRAY - 1). FL_NUM_GRAY is defined to be 24 in the current FLTK release. To get the closest FLTK gray value to an 8-bit grayscale color I use:

```
fl_gray_ramp(I * (FL_NUM_GRAY - 1) / 255)
```

### 35.1.6  Variable Documentation

#### 35.1.6.1  **FL_ALIGN_LEFT**

```c
const Fl_Align FL_ALIGN_LEFT = 0x0004
```

Align the label at the left of the widget.
Inside labels appear left-justified starting at the left side of the widget, outside labels are right-justified and drawn to the left of the widget.

#### 35.1.6.2  **FL_ALIGN_TOP**

```c
const Fl_Align FL_ALIGN_TOP = 0x0001
```

Align the label at the top of the widget.
Inside labels appear below the top, outside labels are drawn on top of the widget.

#### 35.1.6.3  **FL_NORMAL_SIZE**

```c
Fl_Fontsize FL_NORMAL_SIZE [extern]
```

normal font size

### 35.2  Enumerations.H

Go to the documentation of this file.

```c
1 //
2 // Enumerations for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 #ifndef Fl_Enumerations_H
17 #define Fl_Enumerations_H
18 #include <FL/fl_config.h>
19 # include "Fl_Export.H"
20
21 */
22 #ifdef Fl_Enumerations_H
23 #define Fl_Enumerations_H
24 */
25******************************************************************************
26 * FL_ABI_VERSION is defined by configure or CMake since FLTK 1.3.4.
27 * It is written to FL/fl_config.h and #included here.
28******************************************************************************
29 * For more informations on FL_ABI_VERSION see README.abi-version.txt.
30******************************************************************************
31 */
32
33 #include <FL/fl_config.h>
34
35 # include "Fl_Export.H"
36 # include "fl_types.h"
37 # include <FL/platform_types.h> // for FL_COMMAND and FL_CONTROL
52 #define FL_MAJOR_VERSION 1
59 #define FL_MINOR_VERSION 4
66 #define FL_PATCH_VERSION 0
89 #define FL_VERSION ( (double)FL_MAJOR_VERSION + \n90 (double)FL_MINOR_VERSION * 0.01 + \n91 (double)FL_PATCH_VERSION * 0.0001 )
111 #define FL_API_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100 + FL_PATCH_VERSION)
144 #define FL_ABI_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100)
147 #endif
164 #if FL_ABI_VERSION < FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100
165 # undef FL_ABI_VERSION
166 # define FL_ABI_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100)
177 #endif
198 enum Fl_Event { // events
199     FL_NO_EVENT = 0,
211     FL_PUSH = 1,
219     FL_RELEASE = 2,
228     FL_ENTER = 3,
229     FL_LEAVE = 4,
243     FL_DRAG = 5,
258     FL_FOCUS = 6,
263     FL_UNFOCUS = 7,
285     FL_KEYDOWN = 8,
290     FL_KEYBOARD = 8,
291     FL_KEYUP = 9,
302     FL_CLOSE = 10,
310     FL_MOVE = 11,
324     FL_SHORTCUT = 12,
enum Fl_When { // Fl_Widget::when():
    FL_WHEN_NEVER = 0,
    FL_WHEN_CHANGED = 1,
    FL_WHEN_NOT_CHANGED = 2,
    FL_WHEN_RELEASE = 4,
    FL_WHEN_RELEASE_ALWAYS = 6,
    FL_WHEN_ENTER_KEY = 8,
    FL_WHEN_ENTER_KEY_ALWAYS = 10,
    FL_WHEN_ENTER_KEY_CHANGED = 11,
    FL_WHEN_CLOSED = 16
}; // group: When Conditions

enum Fl_Callback_Reason { // Callback Reasons
    FL_REASON_UNKNOWN=0,
    FL_REASON_SELECTED,
    FL_REASON_DESELECTED,
    FL_REASON_RESELECTED,
    FL_REASON_OPENED,
    FL_REASON_CLOSED,
    FL_REASON_DRAGGED,
    FL_REASON_CANCELLED,
    FL_REASON_CHANGED,
    FL_REASON_GOT_FOCUS,
    FL_REASON_LOST_FOCUS,
    FL_REASON_RELEASED,
    FL_REASON_USER = 32
};

// FIXME: These codes collide with valid Unicode keys
#define FL_Button 0xfee8
#define FL_BackSpace 0xff08
#define FL_Tab 0xff09
#define FL_Iso_Key 0xff0c
#define FL_Enter 0xff0d
#define FL_Pause 0xff13
#define FL_Scroll_Lock 0xff14
#define FL_Escape 0xff1b
#define FL_Kana 0xff2e
#define FL_Eisu 0xff2f
#define FL_Yen 0xff30
#define FL_JIS_Underscore 0xff31
#define FL_Home 0xff50
#define FL_Left 0xff51
#define FL_Up 0xff52
#define FL_Right 0xff53
#define FL_Down 0xff54
#define FL_Page_Up 0xff55
#define FL_Page_Down 0xff56
#define FL_End 0xff57
#define FL_Print 0xff61
#define FL_Insert 0xff63
#define FL_Eisu 0xff67
#define FL_Help 0xff68
#define FL_NUM_LOCK 0xff7f
#define FL_KP 0xff80
#define FL_KP_Enter 0xff8d
#define FL_KP_Last 0xffbd
#define FL_F 0xffbd
#define FL_F_Last 0xffe0
#define FL_Shift_L 0xffe1
#define FL_Shift_R 0xffe2
#define FL_Control_L 0xffe3
#define FL_Control_R 0xffe4
#define FL_Caps_Lock 0xffe5

// DEV NOTE: Keep this list in sync with FL/names.h

// FL_SELECTIONCLEAR = 18,
// FL_MOUSEWHEEL = 19,
// FL_DND_ENTER = 20,
// FL_DND_DRAG = 21,
// FL_DND_LEAVE = 22,
// FL_DND_RELEASE = 23,
// FL_SCREEN_CONFIGURATION_CHANGED = 24,
// FL_FULLSCREEN = 25,
// FL_ZOOM_GESTURE = 26,
// FL_ZOOM_EVENT = 27

// group: When Conditions

// FLWHEN_NEVER
// FLWHEN_CHANGED
// FLWHEN_NOT_CHANGED
// FLWHEN_RELEASE
// FLWHEN_RELEASE_ALWAYS
// FLWHEN_ENTER_KEY
// FLWHEN_ENTER_KEY_ALWAYS
// FLWHEN_ENTER_KEY_CHANGED
// FLWHEN_CLOSED

// group: Callback Reasons

// FL_REASON_USER

// FIXME: These codes collide with valid Unicode keys

// Doxygen-generated content
35.2 Enumerations.H

#define FL_Meta_L 0xffe7
#define FL_Meta_R 0xffe8
#define FL_Alt_L 0xffe9
#define FL_Alt_R 0xffea
#define FL_Delete 0xffff

// These use the Private Use Area (PUA) of the Basic Multilingual Plane
// Guaranteed not to conflict with a proper Unicode character.

// These primarily map to the XFree86 keysym range
#define FL_Volume_Down 0xEF11
#define FL_Volume_Mute 0xEF12
#define FL_Volume_Up 0xEF13
#define FL_Media_Play 0xEF14
#define FL_Media_Stop 0xEF15
#define FL_Media_Prev 0xEF16
#define FL_Media_Next 0xEF17
#define FL_Home_Page 0xEF18
#define FL_Mail 0xEF19
#define FL_Search 0xEF1A
#define FL_Back 0xEF1B
#define FL_Forward 0xEF1C
#define FL_Stop 0xEF1D
#define FL_Refresh 0xEF1E
#define FL_Sleep 0xEF1F
#define FL_Favorites 0xEF20

// group: Non-ASCII key names
#define FL_LEFT_MOUSE 1
#define FL_MIDDLE_MOUSE 2
#define FL_RIGHT_MOUSE 3

// group: Mouse Buttons
#define FL_SHIFT 0x00010000
#define FL_CAPS_LOCK 0x00020000
#define FL_CTRL 0x00040000
#define FL_ALT 0x00080000
#define FL_NUM_LOCK 0x00100000
#define FL_META 0x00400000
#define FL_SCROLL_LOCK 0x00800000
#define FL_BUTTON1 0x01000000
#define FL_BUTTON2 0x02000000
#define FL_BUTTON3 0x04000000
#define FL_BUTTONS 0x7f000000
#define FL_BUTTON(n) (0x00800000«(n))

#define FL_KEY_MASK 0x0000ffff

// FIXME: it would be nice to have the modifiers in the upper 8 bit so that
// a unicode key (24bit) can be sent as an unsigned with the modifiers.

#define FL_SHIFT 0x00010000
#define FL_CAPS_LOCK 0x00020000
#define FL_CTRL 0x00040000
#define FL_ALT 0x00080000
#define FL_NUM_LOCK 0x00100000
#define FL_META 0x00400000
#define FL_SCROLL_LOCK 0x00800000
#define FL_BUTTON1 0x01000000
#define FL_BUTTON2 0x02000000
#define FL_BUTTON3 0x04000000
#define FL_BUTTONS 0x7f000000
#define FL_BUTTON(n) (0x00800000«(n))

#define FL_KEY_MASK 0x0000ffff

// FIXME: Unicode needs 24 bits!

enum Fl_Boxtype { // boxtypes (if you change these you must also change fl_boxtype.cxx):
    FL_NO_BOX = 0,
    FL_FLAT_BOX,
    FL_UP_BOX,
    FL_DOWN_BOX,
    FL_UP_FRAME,
    FL_DOWN_FRAME,
    FL_THIN_UP_BOX,
    FL_THIN_DOWN_BOX,
    FL_THIN_UP_FRAME,
    FL_THIN_DOWN_FRAME,
    FL_ENGRAVED_BOX,
    FL_EMBOSSED_BOX,
    FL_ENGRAVED_FRAME,
    FL_EMBOSSED_FRAME,
    FL_BORDER_BOX,
    _FL_SHADOW_BOX,
    FL_BORDER_FRAME,
    _FL_SHADOW_FRAME,
    _FL_ROUNDED_BOX,
    _FL_RSHADOW_BOX,
    _FL_ROUNDED_FRAME,
    _FL_RFLAT_BOX,
    _FL_ROUND_UP_BOX,
    _FL_ROUND_DOWN_BOX,
    _FL_DIAMOND_UP_BOX,
    _FL_DIAMOND_DOWN_BOX,
defined FL_OVAL_BOX,
655  FL_OSHADOW_BOX,
656  FL_OVAL_FRAME,
657  FL_OFLAT_BOX,
658  FL_PLASTIC_UP_BOX,
659  FL_PLASTIC_DOWN_BOX,
660  FL_PLASTIC_UP_FRAME,
661  FL_PLASTIC_DOWN_FRAME,
662  FL_PLASTIC_THIN_UP_BOX,
663  FL_PLASTIC_THIN_DOWN_BOX,
664  FL_PLASTIC_ROUND_UP_BOX,
665  FL_PLASTIC_ROUND_DOWN_BOX,
666  FL_GTK_UP_BOX,
667  FL_GTK_DOWN_BOX,
668  FL_GTK_UP_FRAME,
669  FL_GTK_DOWN_FRAME,
670  FL_GTK_THIN_UP_BOX,
671  FL_GTK_THIN_DOWN_BOX,
672  FL_GTK_THIN_UP_FRAME,
673  FL_GTK_THIN_DOWN_FRAME,
674  FL_GTK_ROUND_UP_BOX,
675  FL_GTK_ROUND_DOWN_BOX,
676  FL_GLEAM_UP_BOX,
677  FL_GLEAM_DOWN_BOX,
678  FL_GLEAM_UP_FRAME,
679  FL_GLEAM_DOWN_FRAME,
680  FL_GLEAM_THIN_UP_BOX,
681  FL_GLEAM_THIN_DOWN_BOX,
682  FL_GLEAM_ROUND_UP_BOX,
683  FL_GLEAM_ROUND_DOWN_BOX,
684  FL_GLEAM_UP_BOX,
685  FL_OXY_UP_BOX,
686  FL_OXY_DOWN_BOX,
687  FL_OXY_UP_FRAME,
688  FL_OXY_DOWN_FRAME,
689  FL_OXY_THIN_UP_BOX,
690  FL_OXY_THIN_DOWN_BOX,
691  FL_OXY_THIN_UP_FRAME,
692  FL_OXY_THIN_DOWN_FRAME,
693  FL_OXY_UP_BOX,
694  FL_OXY_DOWN_BOX,
695  FL_FREE_BOXTYPE
696 
697 #ifndef FL_DOXYGEN
698
699 extern FL_EXPORT Fl_Boxtype fl_define_FL_ROUND_UP_BOX();
700 #define FL_ROUND_UP_BOX fl_define_FL_ROUND_UP_BOX()
701 #define FL_ROUND_DOWN_BOX (Fl_Boxtype)(fl_define_FL_ROUND_UP_BOX()+1)
702 extern FL_EXPORT Fl_Boxtype fl_define_FL_SHADOW_BOX();
703 #define FL_SHADOW_BOX fl_define_FL_SHADOW_BOX()
704 #define FL_SHADOW_FRAME (Fl_Boxtype)(fl_define_FL_SHADOW_BOX()+2)
705 extern FL_EXPORT Fl_Boxtype fl_define_FL_ROUNDED_BOX();
706 #define FL_ROUNDED_BOX fl_define_FL_ROUNDED_BOX()
707 #define FL_ROUNDED_FRAME (Fl_Boxtype)(fl_define_FL_ROUNDED_BOX()+2)
708 extern FL_EXPORT Fl_Boxtype fl_define_FL_RFLAT_BOX();
709 #define FL_RFLAT_BOX fl_define_FL_RFLAT_BOX()
710 extern FL_EXPORT Fl_Boxtype fl_define_FL_RSHADOW_BOX();
711 #define FL_RSHADOW_BOX fl_define_FL_RSHADOW_BOX()
712 extern FL_EXPORT Fl_Boxtype fl_define_FL_DIAMOND_BOX();
713 #define FL_DIAMOND_UP_BOX fl_define_FL_DIAMOND_BOX()
714 #define FL_DIAMOND_DOWN_BOX (Fl_Boxtype)(fl_define_FL_DIAMOND_BOX()+1)
715 extern FL_EXPORT Fl_Boxtype fl_define_FL_OVAL_BOX();
716 #define FL_OVAL_BOX fl_define_FL_OVAL_BOX()
717 #define FL_OVAL_FRAME (Fl_Boxtype)(fl_define_FL_OVAL_BOX()+1)
718 extern FL_EXPORT Fl_Boxtype fl_define_FL_OSHADOW_BOX();
719 #define FL_OSHADOW_BOX fl_define_FL_OSHADOW_BOX()
720 extern FL_EXPORT Fl_Boxtype fl_define_FL_OFLAT_BOX();
721 #define FL_OFLAT_BOX (Fl_Boxtype)(fl_define_FL_OSHADOW_BOX()+1)
722 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_UP_BOX();
723 #define FL_PLASTIC_UP_BOX fl_define_FL_PLASTIC_UP_BOX()
724 #define FL_PLASTIC_UP_FRAME (Fl_Boxtype)(fl_define_FL_PLASTIC_UP_BOX()+1)
725 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_DOWN_BOX();
726 #define FL_PLASTIC_DOWN_BOX (Fl_Boxtype)(fl_define_FL_PLASTIC_UP_BOX()+2)
727 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_UP_FRAME();
728 #define FL_PLASTIC_UP_FRAME (Fl_Boxtype)(fl_define_FL_PLASTIC_UP_BOX()+3)
729 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_DOWN_FRAME();
730 #define FL_PLASTIC_DOWN_FRAME (Fl_Boxtype)(fl_define_FL_PLASTIC_UP_BOX()+4)
731 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_THIN_UP_BOX();
732 #define FL_PLASTIC_THIN_UP_BOX (Fl_Boxtype)(fl_define_FL_PLASTIC_UP_BOX()+5)
733 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_ROUND_UP_BOX();
734 #define FL_PLASTIC_ROUND_UP_BOX (Fl_Boxtype)(fl_define_FL_PLASTIC_UP_BOX()+6)
735 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_UP_BOX();
736 #define FL_GLASS_UP_BOX fl_define_FL_GLASS_UP_BOX()
737 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_DOWN_BOX();
738 #define FL_GLASS_DOWN_BOX (Fl_Boxtype)(fl_define_FL_GLASS_UP_BOX()+1)
739 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_UP_FRAME();
740 #define FL_GLASS_UP_FRAME (Fl_Boxtype)(fl_define_FL_GLASS_UP_BOX()+2)
741 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_DOWN_FRAME();
742 #define FL_GLASS_DOWN_FRAME (Fl_Boxtype)(fl_define_FL_GLASS_UP_BOX()+3)
743 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_THIN_UP_BOX();
744 #define FL_GLASS_THIN_UP_BOX (Fl_Boxtype)(fl_define_FL_GLASS_UP_BOX()+4)
745 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_THIN_DOWN_BOX();
746 #define FL_GLASS_THIN_DOWN_BOX (Fl_Boxtype)(fl_define_FL_GLASS_UP_BOX()+5)
747 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLASS_THIN_UP_FRAME();
748 #define FL_GLASS_THIN_UP_FRAME (Fl_Boxtype)(fl_define_FL_GLASS_UP_BOX()+6)
749
#define FL_GTK_THIN_DOWN_FRAME (Fl_Boxtype)(fl_define_FL_GTK_UP_BOX()+7)
#define FL_GTK_ROUND_UP_BOX (Fl_Boxtype)(fl_define_FL_GTK_UP_BOX()+8)
#define FL_GTK_ROUND_DOWN_BOX (Fl_Boxtype)(fl_define_FL_GTK_UP_BOX()+9)

extern FL_EXPORT Fl_Boxtype fl_define_FL_GLEAM_UP_BOX();
#define FL_GLEAM_UP_BOX fl_define_FL_GLEAM_UP_BOX()
#define FL_GLEAM_DOWN_BOX (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+1)
#define FL_GLEAM_UP_FRAME (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+2)
#define FL_GLEAM_DOWN_FRAME (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+3)
#define FL_GLEAM_THIN_DOWN_BOX (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+4)
#define FL_GLEAM_THIN_UP_BOX (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+5)
#define FL_GLEAM_ROUND_UP_BOX (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+6)
#define FL_GLEAM_ROUND_DOWN_BOX (Fl_Boxtype)(fl_define_FL_GLEAM_UP_BOX()+7)

extern FL_EXPORT Fl_Boxtype fl_define_FL_OXY_UP_BOX();
#define FL_OXY_UP_BOX fl_define_FL_OXY_UP_BOX()
#define FL_OXY_DOWN_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+1)
#define FL_OXY_UP_FRAME (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+2)
#define FL_OXY_DOWN_FRAME (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+3)
#define FL_OXY_THIN_DOWN_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+4)
#define FL_OXY_THIN_UP_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+5)
#define FL_OXY_THIN_UP_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+6)
#define FL_OXY_THIN_DOWN_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+7)
#define FL_OXY_THIN_UP_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+8)
#define FL_OXY_THIN_DOWN_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+9)
#define FL_OXY_BUTTON_UP_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+10)
#define FL_OXY_BUTTON_DOWN_BOX (Fl_Boxtype)(fl_define_FL_OXY_UP_BOX()+11)

#endif // ! FL_DOXYGEN

// conversions of box types to other box types:

inline Fl_Boxtype fl_box(Fl_Boxtype b) {
    return (Fl_Boxtype)((b<FL_UP_BOX||b%4>1)?b:(b-2));
}

inline Fl_Boxtype fl_down(Fl_Boxtype b) {
    return (Fl_Boxtype)((b<FL_UP_BOX)?b:(b|1));
}

inline Fl_Boxtype fl_frame(Fl_Boxtype b) {
    return (Fl_Boxtype)((b%4<2)?b:(b+2));
}

// back-compatibility box types:
#define FL_FRAME FL_ENGRAVED_FRAME
#define FL_FRAME_BOX FL_ENGRAVED_BOX
#define FL_CIRCLE_BOX_FL_ROUND_DOWN_BOX
#define FL_DIAMOND_BOX_FL_DIAMOND_DOWN_BOX
#endif // group: Box Types

enum Fl_Labeltype { // labeltypes:
    FL_NORMAL_LABEL = 0,
    FL_NO_LABEL,
    FL_SHADOW_LABEL,
    FL_ENGRAVED_LABEL,
    FL_EMBOSSED_LABEL,
    FL_MULTI_LABEL,
    FL_ICON_LABEL,
    FL_IMAGE_LABEL,
    FL_FREE_LABELTYPE
};

#define FL_SYMBOL_LABEL FL_NORMAL_LABEL

extern Fl_Labeltype FL_EXPORT fl_define_FL_SHADOW_LABEL();
#define FL_SHADOW_LABEL fl_define_FL_SHADOW_LABEL()

extern Fl_Labeltype FL_EXPORT fl_define_FL_ENGRAVED_LABEL();
#define FL_ENGRAVED_LABEL fl_define_FL_ENGRAVED_LABEL()

extern Fl_Labeltype FL_EXPORT fl_define_FL_EMBOSSED_LABEL();
#define FL_EMBOSSED_LABEL fl_define_FL_EMBOSSED_LABEL()

extern Fl_Labeltype FL_EXPORT fl_define_FL_MULTI_LABEL();
#define FL_MULTI_LABEL fl_define_FL_MULTI_LABEL()

extern Fl_Labeltype FL_EXPORT fl_define_FL_ICON_LABEL();
#define FL_ICON_LABEL fl_define_FL_ICON_LABEL()

extern Fl_Labeltype FL_EXPORT fl_define_FL_IMAGE_LABEL();
#define FL_IMAGE_LABEL fl_define_FL_IMAGE_LABEL()

typedef unsigned Fl_Align;

const Fl_Align FL_ALIGN_CENTER = 0x0000;
const Fl_Align FL_ALIGN_TOP = 0x0001;
const Fl_Align FL_ALIGN_BOTTOM = 0x0002;
const Fl_Align FL_ALIGN_LEFT = 0x0010;
const Fl_Align FL_ALIGN_RIGHT = 0x0020;
const Fl_Align FL_ALIGN_INSIDE = 0x0040;
const Fl_Align FL_ALIGN_OUTSIDE = 0x0080;
const Fl_Align FL_ALIGN_FILL = 0x0040;
const Fl_Align FL_ALIGN_WRAP = 0x0020;
const Fl_Align FL_ALIGN_JUSTIFY = 0x0030;
const Fl_Align FL_ALIGN_INSET = 0x0010;
const Fl_Align FL_ALIGN_CENTERED = 0x0050;
const Fl_Align FL_ALIGN_CENTER = 0x0050;
const Fl_Align FL_ALIGN_RIGHT = 0x0040;
const Fl_Align FL_ALIGN_LEFT = 0x0020;
const Fl_Align FL_ALIGN_INSIDE = 0x0030;
const Fl_Align FL_ALIGN_OUTSIDE = 0x0040;
const Fl_Align FL_ALIGN_FILL = 0x0050;
const Fl_Align FL_ALIGN_WRAP = 0x0060;
const Fl_Align FL_ALIGN_LEFT = 0x0004;
const Fl_Align FL_ALIGN_RIGHT = 0x0008;
const Fl_Align FL_ALIGN_INSIDE = 0x0010;
const Fl_Align FL_ALIGN_TEXT_OVER_IMAGE = 0x0020;
const Fl_Align FL_ALIGN_IMAGE_OVER_TEXT = 0x0000;
const Fl_Align FL_ALIGN_CLIP = 0x0040;
const Fl_Align FL_ALIGN_WRAP = 0x0080;
const Fl_Align FL_ALIGN_IMAGE_NEXT_TO_TEXT = 0x0100;
const Fl_Align FL_ALIGN_TEXT_NEXT_TO_IMAGE = 0x0120;
const Fl_Align FL_ALIGN_IMAGE_BACKDROP = 0x0200;
const Fl_Align FL_ALIGN_TOP_LEFT = FL_ALIGN_TOP | FL_ALIGN_LEFT;
const Fl_Align FL_ALIGN_TOP_RIGHT = FL_ALIGN_TOP | FL_ALIGN_RIGHT;
const Fl_Align FL_ALIGN_BOTTOM_LEFT = FL_ALIGN_BOTTOM | FL_ALIGN_LEFT;
const Fl_Align FL_ALIGN_BOTTOM_RIGHT = FL_ALIGN_BOTTOM | FL_ALIGN_RIGHT;
const Fl_Align FL_ALIGN_LEFT_TOP = 0x0007;
const Fl_Align FL_ALIGN_RIGHT_TOP = 0x000b;
const Fl_Align FL_ALIGN_LEFT_BOTTOM = 0x000d;
const Fl_Align FL_ALIGN_RIGHT_BOTTOM = 0x000e;
const Fl_Align FL_ALIGN_NOWRAP = 0x0000;
const Fl_Align FL_ALIGN_POSITION_MASK = 0x000f;
const Fl_Align FL_ALIGN_IMAGE_MASK = 0x0320;

typedef int Fl_Font;
const Fl_Font FL_HELVETICA = 0;
const Fl_Font FL_HELVETICA_BOLD = 1;
const Fl_Font FL_HELVETICA_ITALIC = 2;
const Fl_Font FL_HELVETICA_BOLD_ITALIC = 3;
const Fl_Font FL_COURIER = 4;
const Fl_Font FL_COURIER_BOLD = 5;
const Fl_Font FL_COURIER_ITALIC = 6;
const Fl_Font FL_COURIER_BOLD_ITALIC = 7;
const Fl_Font FL_TIMES = 8;
const Fl_Font FL_TIMES_BOLD = 9;
const Fl_Font FL_TIMES_ITALIC = 10;
const Fl_Font FL_TIMES_BOLD_ITALIC = 11;
const Fl_Font FL_SYMBOL = 12;
const Fl_Font FL_SCREEN = 13;
const Fl_Font FL_SCREEN_BOLD = 14;
const Fl_Font FL_ZAPF_DINGBATS = 15;
const Fl_Font FL_FREE_FONT = 16;
const Fl_Font FL_BOLD = 1;
const Fl_Font FL_ITALIC = 2;
const Fl_Font FL_BOLD_ITALIC = 3;

typedef int Fl_Fontsize;
extern FL_EXPORT Fl_Fontsize FL_NORMAL_SIZE;

typedef unsigned int Fl_Color;
const Fl_Color FL_FOREGROUND_COLOR = 0;
const Fl_Color FL_BACKGROUND2_COLOR = 7;
const Fl_Color FL_INACTIVE_COLOR = 8;
const Fl_Color FL_SELECTION_COLOR = 15;
const Fl_Color FL_GRAY0 = 32; // 'A'
const Fl_Color FL_DARK3 = 39; // 'G'
const Fl_Color FL_DARK2 = 45; // 'M'
const Fl_Color FL_DARK1 = 47; // 'P'
const Fl_Color FL_BACKGROUND_COLOR = 49; // 'R' default background color
const Fl_Color FL_LIGHT1 = 50; // 'S'
const Fl_Color FL_LIGHT2 = 52; // 'U'
const Fl_Color FL_LIGHT3 = 54; // 'W'
const Fl_Color FL_LIGHT4 = 56; // 'X'
const Fl_Color FL_LIGHT5 = 58; // 'Y'
const Fl_Color FL_LIGHT6 = 60; // 'Z'

// boxtypes generally limit themselves to these colors so
// the whole ramp is not allocated:
FLTK provides a 5x8x5 color cube that is used with colormap visuals

const Fl_Color FL_BLACK = 56;
const Fl_Color FL_RED = 88;
const Fl_Color FL_GREEN = 63;
const Fl_Color FL_YELLOW = 95;
const Fl_Color FL_BLUE = 216;
const Fl_Color FL_MAGENTA = 248;
const Fl_Color FL_CYAN = 223;
const Fl_Color FL_DARK_RED = 72;
const Fl_Color FL_DARK_GREEN = 60;
const Fl_Color FL_DARK_YELLOW = 76;
const Fl_Color FL_DARK_BLUE = 136;
const Fl_Color FL_DARK_MAGENTA = 152;
const Fl_Color FL_DARK_CYAN = 140;
const Fl_Color FL_WHITE = 255;

#define FL_FREE_COLOR (Fl_Color)16
#define FL_NUM_FREE_COLOR 16
#define FL_GRAY_RAMP (Fl_Color)32
#define FL_NUM_GRAY 24
#define FL_GRAY FL_BACKGROUND_COLOR
#define FL_COLOR_CUBE (Fl_Color)56
#define FL_NUM_RED 5
#define FL_NUM_GREEN 8
#define FL_NUM_BLUE 5

FL_EXPORT Fl_Color fl_inactive(Fl_Color c);

typedef Fl_Color (Fl_Contrast_Function)(Fl_Color, Fl_Color, Fl_Fontsize, int);

FL_EXPORT void fl_contrast_function(Fl_Contrast_Function *f);

enum Fl_Contrast_Mode {
  FL_CONTRAST_NONE = 0,
  FL_CONTRAST_LEGACY,
  FL_CONTRAST_CIELAB,
  FL_CONTRAST_CUSTOM,
  FL_CONTRAST_LAST
};

// The following functions are defined and documented in src/fl_contrast.cxx
FL_EXPORT void fl_contrast_level(int level);
FL_EXPORT int fl_contrast_level();
FL_EXPORT void fl_contrast_mode(int mode);
FL_EXPORT int fl_contrast_mode();

FL_EXPORT Fl_Color fl_contrast(Fl_Color fg, Fl_Color bg, Fl_Fontsize fs = 0, int context = 0);

FL_EXPORT double fl_lightness(Fl_Color color);
FL_EXPORT double fl_luminance(Fl_Color color);

// Other color functions are defined and documented in src/fl_color.cxx
FL_EXPORT Fl_Color fl_color_average(Fl_Color c1, Fl_Color c2, float weight);

inline Fl_Color fl_lighter(Fl_Color c) { return fl_color_average(c, FL_WHITE, .67f); }

inline Fl_Color fl_darker(Fl_Color c) { return fl_color_average(c, FL_BLACK, .67f); }

inline Fl_Color fl_rgb_color(uchar r, uchar g, uchar b) {
  if (!r && !g && !b) return FL_BLACK;
  else return (Fl_Color)(((((r « 8) | g) « 8) | b) « 8);
}

inline Fl_Color fl_rgb_color(uchar g) {
  if (!g) return FL_BLACK;
  else return (Fl_Color)(((((g « 8) | g) « 8) | g) « 8);
}

inline Fl_Color fl_gray_ramp(int i) {return (Fl_Color)(i+FL_GRAY_RAMP);}

inline Fl_Color fl_color_cube(int r, int g, int b) {
  return (Fl_Color)((b *FL_NUM_RED + r) * FL_NUM_GREEN + g + FL_COLOR_CUBE);}

// group: Colors

/* FIXME: We should renumber these, but that will break the ABI */
enum Fl_Cursor {
  FL_CURSOR_DEFAULT = 0, // U+2196
  FL_CURSOR_ARROW = 35, // U+2196
  FL_CURSOR_CROSS = 66, // U+FF0B
  FL_CURSOR_WAIT = 76, // U+231A, U+231B
  FL_CURSOR_INSERT = 77, // U+2336
  FL_CURSOR_HAND = 31, // U+261C

  FL_CURSOR_LAST
};
1268 FL_CURSOR_HELP = 47,
1269 FL_CURSOR_MOVE = 27, // U+2725, U+270B
1270
1271 // Resize indicators */
1272 FL_CURSOR_NS = 78, // U+21D5
1273 FL_CURSOR_WE = 79, // U+21D4
1274 FL_CURSOR_NSWE = 80, // U+2921
1275 FL_CURSOR_NESW = 81, // U+2922
1276 FL_CURSOR_N = 70, // U+2912
1277 FL_CURSOR_NE = 69, // U+2197
1278 FL_CURSOR_E = 49, // U+21E5
1279 FL_CURSOR_SE = 8, // U+21F2
1280 FL_CURSOR_S = 9, // U+2913
1281 FL_CURSOR_SW = 7, // U+2199
1282 FL_CURSOR_W = 36, // U+21E4
1283 FL_CURSOR_U = 68, // U+21F1
1284
1285 FL_CURSOR_NONE = 255
1286 }; // group: Cursors

1290 enum { // values for "when" passed to Fl::add_fd()
1291 FL_READ = 1,
1292 FL_WRITE = 4,
1293 FL_EXCEPT = 8
1294 }

1297 enum Fl_Mode {
1298 FL_RGB = 0,
1299 FL_INDEX = 1,
1300 FL_SINGLE = 0,
1301 FL_DOUBLE = 2,
1302 FL_ACCUM = 4,
1303 FL_ALPHA = 8,
1304 FL_DEPTH = 16,
1305 FL_STENCIL = 32,
1306 FL_RGB8 = 64,
1307 FL_MULTISAMPLE = 128,
1308 FL_STEREO = 256,
1309 FL_FAKE_SINGLE = 512, // Fake single buffered windows using double-buffer
1310 FL_OPENGL3 = 1024
1311 }

1328 // FLTK 1.0.x compatibility definitions (FLTK_1_0_COMPAT) dropped in 1.4.0
1332 enum Fl_Arrow_Type {
1333 FL_ARROW_SINGLE = 0x01,
1334 FL_ARROW_DOUBLE = 0x02,
1335 FL_ARROW_CHOICE = 0x03,
1336 FL_ARROW_RETURN = 0x04
1337 }

35.3  filename.H File Reference

File names and URI utility functions.
#include "Fl_Export.H"
#include <FL/platform_types.h>

## Macros
- \#define FL_PATH_MAX 2048
  
  *all path buffers should use this length*

## Typedefs
- typedef int() Fl_File_Sort_F(struct dirent **, struct dirent **)
  
  *File sorting function.*

## Functions
- void fl_decode_uri (char *uri)
  
  *Decodes a URL-encoded string.*
- int fl_filename_absolute (char *to, int tolen, const char *from)
  
  *Makes a filename absolute from a relative filename to the current working directory.*
- int fl_filename_absolute (char *to, int tolen, const char *from, const char *cwd)
  
  *Concatenate the absolute path base with from to form the new absolute path in to.*
- int fl_filename_expand (char *to, int tolen, const char *from)
  
  *Expands a filename containing shell variables and tilde (~).*
- const char * fl_filename_ext (const char *buf)
  
  *Gets the extension of a filename.*
- void fl_filename_free_list (struct dirent **∗∗∗l, int n)
  
  *Free the list of filenames that is generated by fl_filename_list().*
- int fl_filename_isdir (const char *name)
  
  *Determines if a file exists and is a directory from its filename.*
- int fl_filename_list (const char *d, struct dirent **∗∗∗l, Fl_File_Sort_F ∗s=fl_numericsort)
  
  *Portable and const-correct wrapper for the scandir() function.*
- int fl_filename_match (const char *name, const char *pattern)
  
  *Checks if a string s matches a pattern p.*
- const char * fl_filename_name (const char *filename)
  
  *Gets the file name from a path.*
- int fl_filename_relative (char *to, int tolen, const char *from)
  
  *Makes a filename relative to the current working directory.*
- int fl_filename_relative (char *to, int tolen, const char *from, const char *cwd)
  
  *Makes a filename relative to any other directory.*
- char * fl_filename_setext (char *to, int tolen, const char *ext)
  
  *Replaces the extension in buf of max.*
- int fl_open_uri (const char *uri, char *msg, int msglen)
  
  *Opens the specified Uniform Resource Identifier (URI).*

### 35.3.1 Detailed Description

File names and URI utility functions.

---

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Go to the documentation of this file.

1. Filename header file for the Fast Light Tool Kit (FLTK).
2. Copyright 1998-2023 by Bill Spitzak and others.
3. This library is free software. Distribution and use rights are outlined in
4. the file "COPYING" which should have been included with this file. If this
5. file is missing or damaged, see the license at:
7. Please see the following page on how to report bugs and issues:

Note to devs:
Under Windows, we include filename.H from numericsort.c; this should probably change.
This implies that we need C-style comments and '#ifdef __cplusplus ...

#define FL_FILENAME_H
#include "Fl_Export.H"
#include <FL/platform_types.h>

#ifdef __cplusplus
// The following include is not (yet) used in FLTK 1.4
// In FLTK 1.5 or 4.0 using std::string would be default.
#include <string>
#endif /* __cplusplus */

#define FL_PATH_MAX 2048
FL_EXPORT const char *fl_filename_name(const char * filename);
FL_EXPORT const char *fl_filename_ext(const char *buf);
FL_EXPORT char *fl_filename_setext(char *to, int tolen, const char *ext);
FL_EXPORT int fl_filename_expand(char *to, int tolen, const char *from);
FL_EXPORT int fl_filename_absolute(char *to, int tolen, const char *from);
FL_EXPORT int fl_filename_relative(char *to, int tolen, const char *from);
FL_EXPORT int fl_filename_match(const char *name, const char *pattern);
FL_EXPORT int fl_filename_isdir(const char *name);

#ifdef __cplusplus
FL_EXPORT int fl_filename_absolute(char *to, int tolen, const char *from, const char *cwd);
FL_EXPORT int fl_filename_relative(char *to, int tolen, const char *from, const char *cwd);
#endif /* __cplusplus */

#include <string>
inline char *fl_filename_setext(char *to, const char *ext) { return fl_filename_setext(to, FL_PATH_MAX,
ext); }
inline int fl_filename_expand(char *to, const char *from) { return fl_filename_expand(to, FL_PATH_MAX,
from); }
inline int fl_filename_absolute(char *to, const char *from) { return fl_filename_absolute(to,
FL_PATH_MAX, from); }
inline int fl_filename_relative(char *to, const char *from) { return fl_filename_relative(to,
FL_PATH_MAX, from); }

Generated by Doxygen
35.5 Fl.H File Reference

**Fl static class.**

```
#include <FL/fl_config.h>
#include <FL/Fl_Export.H>
#include <FL/platform_types.h>
#include <FL/fl_casts.H>
#include "fl_utf8.h"
#include "Enumerations.H"
#include <string.h>
```

**Classes**

- **class Fl**
  
  *The Fl is the FLTK global (static) class containing state information and global methods for the current application.*

- **class Fl_Widget_Tracker**
  
  *This class should be used to control safe widget deletion.*

**Macros**

- **#define Fl_Object Fl_Widget**
  
  *for back compatibility - use Fl_Widget!*

**Typedefs**

- typedef void(* Fl_Abort_Handler)(const char *format, ...)

---

Generated by Doxygen
Signature of `set_abort` functions passed as parameters.
- `typedef int(* Fl_Args_Handler)(int argc, char***argv, int &i)`
  Signature of `args` functions passed as parameters.
- `typedef void(* Fl_Acctlose_Handler)(Fl_Window *window, void *data)`
  Signature of `set_acctlose` functions passed as parameters.
- `typedef void(* Fl_Awake_Handler)(void *data)`
  Signature of some wakeup callback functions passed as parameters.
- `typedef void(Fl_Box_Draw_F)(int x, int y, int w, int h, Fl_Color color)`
  Signature of some box drawing functions passed as parameters.
- `typedef void(* Fl_Clipboard_Notify_Handler)(int source, void *data)`
  Signature of `add_clipboard_notify` functions passed as parameters.
- `typedef int(* Fl_Event_Dispatch)(int event, Fl_Window *w)`
  Signature of `event_dispatch` functions passed as parameters.
- `typedef int(* Fl_Event_Handler)(int event)`
  Signature of `add_handler` functions passed as parameters.
- `typedef void(* Fl_FD_Handler)(FL_SOCKET fd, void *data)`
  Signature of `add_fd` functions passed as parameters.
- `typedef void(* Fl_Idle_Handler)(void *data)`
  Signature of `add_idle` callback functions passed as parameters.
- `typedef void(Fl_Label_Draw_F)(const Fl_Label *label, int x, int y, int w, int h, Fl_Align align)`
  Signature of some label drawing functions passed as parameters.
- `typedef void(Fl_Label_Measure_F)(const Fl_Label *label, int &width, int &height)`
  Signature of some label measurement functions passed as parameters.
- `typedef void(* Fl_Old_Idle_Handler)()`
  Signature of `set_idle` callback functions passed as parameters.
- `typedef int(* Fl_System_Handler)(void *event, void *data)`
  Signature of `add_system_handler` functions passed as parameters.
- `typedef void(* Fl_Timeout_Handler)(void *data)`
  Signature of timeout callback functions passed as parameters.

Variables

- `const char * fl_local_alt`  
  String pointer used in shortcuts, you can change it to another language
- `const char * fl_local_ctrl`  
  String pointer used in shortcuts, you can change it to another language
- `const char * fl_local_meta`  
  String pointer used in shortcuts, you can change it to another language
- `const char * fl_local_shift`  
  String pointer used in shortcuts, you can change it to another language

35.5.1 Detailed Description

`Fl` static class.
// Main header file for the Fast Light Tool Kit (FLTK).
// Copyright 1998-2023 by Bill Spitzak and others.
// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

#ifndef Fl_H
#define Fl_H

#include <FL/fl_config.h> // build configuration
#include <FL/Fl_Export.H>
#include <FL/platform_types.h> // for FL_SOCKET
#include <FL/fl_casts.H> // experimental

#ifdef FLTK_HAVE_CAIRO
#include <FL/Fl_Cairo.H>
#endif

#include "fl_utf8.h"
#include "Enumerations.H"
#ifndef Fl_Object
#define Fl_Object Fl_Widget
#endif

#ifdef check
#undef check
#endif

#ifdef BSD
#undef BSD
#endif

#include <string.h> // FIXME: Fl::is_scheme(): strcmp needs string.h

class Fl_Widget;
class Fl_Window;
class Fl_Image;
struct Fl_Label;
class Fl_Screen_Driver;
class Fl_System_Driver;

// Pointers you can use to change FLTK to another language.
// Note: Similar pointers are defined in FL/fl_ask.H and src/fl_ask.cxx

extern FL_EXPORT const char* fl_local_alt;
extern FL_EXPORT const char* fl_local_ctrl;
extern FL_EXPORT const char* fl_local_meta;
extern FL_EXPORT const char* fl_local_shift;

typedef void (Fl_Label_Draw_F)(const Fl_Label *label, int x, int y, int w, int h, Fl_Align align);
typedef void (Fl_Label_Measure_F)(const Fl_Label *label, int &width, int &height);
typedef void (Fl_Box_Draw_F)(int x, int y, int w, int h, Fl_Color color);
typedef (*Fl_Timeout_Handler)(void *data);
typedef (*Fl_Awake_Handler)(void *data);
typedef (*Fl_Idle_Handler)(void *data);
typedef void (*Fl_Old_Idle_Handler)();
typedef (*Fl_FD_Handler)(FL_SOCKET fd, void *data);
typedef int (*Fl_Event_Handler)(int event);
typedef int (*Fl_System_Handler)(void *event, void *data);
typedef void (*Fl_Abort_Handler)(const char *format,...);
typedef void (*Fl_Atclose_Handler)(Fl_Window *window, void *data);

Generated by Doxygen
typedef int (*Fl_Args_Handler)(int argc, char **argv, int &i);

typedef int (*Fl_Event_Dispatch)(int event, Fl_Window *w);

typedef void (*Fl_Clipboard_Notify_Handler)(int source, void *data);

/* group callback_functions */

class FL_EXPORT Fl {
friend class Fl_System_Driver;

Fl() {} // no constructor!

private:

static int use_high_res_GL);
static int draw_GL_text_with_textures;
static int box_shadow_width;
static int box_border_radius_max;
static int selection_to_clipboard;

public:

static Fl_Screen_Driver *screen_driver();
static Fl_System_Driver *system_driver();

#ifdef __APPLE__ // deprecated in 1.4 - only for compatibility with 1.3
static void reset_marked_text();
static void insertion_point_location(int x, int y, int height);
#endif


static int box_shadow_width() { return box_shadow_width_; }
static void box_shadow_width(int W) { box_shadow_width_ = W < 1 ? 1 : W; }

static int box_border_radius_max() { return box_border_radius_max_; }
static void box_border_radius_max(int R) { box_border_radius_max_ = R < 5 ? 5 : R; }

public: // should be private!

#ifdef FL_DOXYGEN
static int e_number;
static int e_x;
static int e_y;
static int e_x_root;
static int e_y_root;
static int e_dx;
static int e_dy;
static int e_state;
static int e_clicks;
static int e_is_click;
static int e_keysym;
static char * e_text;
static int e_length;
static void *e_clipboard_data;
static const char *e_clipboard_type;

static Fl_Callback_Reason callback_reason_;  
static Fl_Widget *belowmouse_;  
static Fl_Widget *pushed_;  
static Fl_Widget *focus_;  
static Fl_Window *selection_owner_;  
static Fl_Window *modal_;  
static Fl_Window *grab_;  
static int compose_state; // used for dead keys (Windows) or marked text (MacOS)
#endif

public:

static void damage(int d) {damage_ = d;}

int damage_{int d} (damage_ = d;)

public;

typedef enum {

OPTION_ARROW_FOCUS = 0,

// When switched on, FLTK will use the file chooser dialog that comes
// with your operating system whenever possible. When switched off, FLTK
// will present its own file chooser.

// todo implement me

OPTION_NATIVE_FILECHOOSER,

// When Filechooser Preview is enabled, the FLTK or native file chooser
// will show a preview of a selected file (if possible) before the user
// decides to choose the file.

// todo implement me

OPTION_FILECHOOSER_PREVIEW,

OPTION_VISIBLE_FOCUS,

OPTION_DND_TEXT,

OPTION_SHOW_TOOLTIP,

OPTION_FNFC_USES_GTK,

Generated by Doxygen
35.6 FL.H

```cpp
OPTION_PRINTER_USES_GTK,
OPTION_SHOW_SCALING,
OPTION_FNFC_USES_ZENITY,
// don't change this, leave it always as the last element
OPTION_LAST
} Fl_Option;

private:
static unsigned char options_[OPTION_LAST];
static unsigned char options_read_;
static int program_should_quit_; // non-zero means the program was asked to cleanly terminate
public:
/*
Return a global setting for all FLTK applications, possibly overridden
by a setting specifically for this application.
*/
static bool option(Fl_Option opt);

/*
Override an option while the application is running.
*/
static void option(Fl_Option opt, bool val);

static void (*idle)();

#ifndef FL_DOXYGEN
private:
static Fl_Awake_Handler *awake_ring_;
static void **awake_data_;  
static int awake_ring_size_; 
static int awake_ring_head_;  
static int awake_ring_tail_;  
public:
static const char * scheme_;  
static Fl_Image * scheme_bg_; 
static int e_original_keysym; // late addition 
static int scrollbar_size_; // STR #2927 
static int menu_linespacing_; // STR #2927
#endif

static int add_awake_handler_(Fl_Awake_Handler, void *); 
static int get_awake_handler_(Fl_Awake_Handler&, void *&);
public:

// API version number 
static double version(); 
static int api_version();

// ABI version number 
static int abi_version();

static inline int abi_check(const int val = FL_ABI_VERSION) {
  return val == abi_version();
}

// argument parsers:
static int arg(int argc, char **argv, int& i); 
static int args(int argc, char **argv, int& i, Fl_Args_Handler cb = 0);
static void args(int argc, char **argv);

static const char * const help;

// things called by initialization: 
static void display(const char *);
static int visual(int);
static int gl_visual(int, int *alist=0); // platform dependent 
static void own_colormap();
static void get_system_colors();
static void foreground(uchar, uchar, uchar);
static void background(uchar, uchar, uchar);
static void background2(uchar, uchar, uchar);

// schemes:
static int scheme(const char *name);
static const char* scheme(); { return scheme_; }
static int is_scheme(const char *name) { return strcmp(name,scheme_); }
static int reload_scheme(); // defined in 'src/Fl_get_system_colors.cxx'
static int scrollbar_size();
static void scrollbar_size(int W);
```

Generated by Doxygen
static int menu_linespacing();
static void menu_linespacing(int H);

// execution:
static int wait();
static double wait(double time);
static int check();
static int ready();
static int run();
static int program_should_quit() {return program_should_quit_;
static void program_should_quit(int should_i) { program_should_quit_ = should_i; }
static void hide_all_windows();

static Fl_Widget* readqueue();

// cross-platform timer support
static void add_timeout(double t, Fl_Timeout_Handler cb, void* data = 0);
static void repeat_timeout(double t, Fl_Timeout_Handler cb, void* data = 0);
static int has_timeout(Fl_Timeout_Handler cb, void* data = 0);
static void remove_timeout(Fl_Timeout_Handler cb, void* data = 0);
static void add_check(Fl_Timeout_Handler, void* = 0);
static int has_check(Fl_Timeout_Handler, void* = 0);
static void remove_check(Fl_Timeout_Handler, void* = 0);
static Fl_Timestamp now(double offset = 0);
static double seconds_since(Fl_Timestamp& then);
static double seconds_between(Fl_Timestamp& back, Fl_Timestamp& further_back);
static long ticks_since(Fl_Timestamp& then);
static long ticks_between(Fl_Timestamp& back, Fl_Timestamp& further_back);

// private
static void run_idle();
static void run_checks();
static void add_fd(int fd, int when, Fl_FD_Handler cb, void* data = 0); // platform dependent
static void remove_fd(int fd, void* data = 0); // platform dependent
static void add_fd(int fd, int when, Fl_FD_Handler cb, void* data = 0); // platform dependent
static void remove_fd(int); // platform dependent
static void add_idle(Fl_Idle_Handler cb, void* data = 0);
static int has_idle(Fl_Idle_Handler cb, void* data = 0);
static void remove_idle(Fl_Idle_Handler cb, void* data = 0);
static int damage() {return damage_;
static void redraw();
static void flush();

static void ( *warning)(const char*, ...);
static void ( *error)(const char*, ...);
static void ( *fatal)(const char*, ...);
static Fl_Window * first_window();
static void first_window(Fl_Window *);
static Fl_Window * next_window(const Fl_Window*);

static Fl_Window * modal() {return modal_;
static Fl_Window * grab() {return grab_;
static void grab(Fl_Window *); // platform dependent

// event information:
static int event() {return e_number;
static int event_x() {return e_x;
static int event_y() {return e_y;
static int event_x_root() {return e_x_root;
static int event_y_root() {return e_y_root;
static int event_dx() {return e_dx;
static int event_dy() {return e_dy;
static void get_mouse(int &x, int &y);
static int event_clicks() {return e_clicks;
static int event_is_click() {return e_is_click;
static int event_button() {return e_keysym-FL_Button;

static int compose(int &del);

Generated by Doxygen
static void compose_reset();  
static int event_inside(int, int, int, int);  
static int event_inside(const Fl_Widget *);  
static int test_shortcut(Fl_Shortcut);  

static void enable_im();  
static void disable_im();  

// event destinations:  
static int handle(int, Fl_Window *);  
static int handle_(int, Fl_Window *);  
static Fl_Widget * belowmouse() {return belowmouse_;}  
static void belowmouse(Fl_Widget *);  
static Fl_Widget * pushed() {return pushed_;}  
static void pushed(Fl_Widget *);  
static Fl_Widget * focus() {return focus_;}  
static void focus(Fl_Widget *);  
static void add_handler(Fl_Event_Handler h);  
static void remove_handler(Fl_Event_Handler h);  
static void add_system_handler(Fl_System_Handler h, void *data);  
static void remove_system_handler(Fl_System_Handler h);  
static void event_dispatch(Fl_Event_Dispatch d);  
static Fl_Event_Dispatch event_dispatch();  
static Fl_Callback_Reason callback_reason();

// cut/paste:  
static void copy(const char *stuff, int len, int destination = 0,  
const char *type = Fl::clipboard_plain_text);  

static void selection_to_clipboard(int mode) {  
selection_to_clipboard_ = mode ? 1 : 0;  
}

static void selection_to_clipboard() { return selection_to_clipboard_; }  
static int selection_to_clipboard() { return selection_to_clipboard_; }  
static void selection_owner(Fl_Widget *);  
static void selection(Fl_Widget &owner, const char *, int len);  
static void paste(Fl_Widget &receiver);  
static int x(); // via screen driver  
static int y(); // via screen driver  
static int w(); // via screen driver  
static int h(); // via screen driver  
static void screen_xywh(int &X, int &Y, int &W, int &H); // via screen driver  
static void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my); // via screen driver  
static void screen_xywh(int &X, int &Y, int &W, int &H, int n); // via screen driver  
static void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh); // via screen driver  

// multi-head support:  
static int screen_count(); // via screen driver  
static void screen_work_area(int &X, int &Y, int &W, int &H); // via screen driver  
static void screen_work_area(int &X, int &Y, int &W, int &H, int mx, int my); // via screen driver  
static void screen_work_area(int &X, int &Y, int &W, int &H, int n); // via screen driver  
static void screen_work_area(int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh); // via screen driver  
static float screen_scale(int n); // via screen driver  
static void screen_scale(int n, float factor); // via screen driver  
static int screen_scaling_supported();  
static void keyboard_screen_scaling(int value);  

// color map:  
static void set_color(Fl_Color, uchar, uchar, uchar);  
static void set_color(Fl_Color, uchar, uchar, uchar, uchar);  
static void set_color(Fl_Color i, unsigned c); // platform dependent  
static unsigned get_color(Fl_Color i);  
static void get_color(Fl_Color i, uchar &red, uchar &green, uchar &blue);  
static void get_color(Fl_Color i, uchar &red, uchar &green, uchar &blue, uchar &alpha);  
static void free_color(Fl_Color i, int overlay = 0); // platform dependent  
static int screen_num(int x, int y, int w, int h); // via screen driver

// fonts:  
static const char * get_font(Fl_Font);  
static const char * get_font_name(Fl_Font, int * attributes = 0);  
static int get_font_sizes(Fl_Font, int * sizep);  
static void set_font(Fl_Font, int &size);  
static void set_font(Fl_Font, Fl_Font);
static Fl_Font set_fonts(const char * = 0); // platform dependent

// Hack to re-order the 'Drawing functions' group>

static void set_labeltype(Fl_Labeltype, Fl_Label_Draw_F*, Fl_Label_Measure_F*);
static void set_labeltype(Fl_Labeltype, Fl_Labeltype from); // is it defined ?

// boxtypes:
static Fl_Box_Draw_F* get_boxtype(Fl_Boxtype);
static void set_boxtype(Fl_Boxtype, Fl_Box_Draw_F*, uchar, uchar, uchar, uchar);
static void set_boxtype(Fl_Boxtype, Fl_Boxtype from);
static int box_dx(Fl_Boxtype);
static int box_dy(Fl_Boxtype);
static int box_dw(Fl_Boxtype);
static int box_dh(Fl_Boxtype);
static int draw_box_active();
static Fl_Color box_color(Fl_Color);
static void set_box_color(Fl_Color);

// back compatibility:
static void set_abort(Fl_Abort_Handler f) {fatal = f;}
static void ( *atclose)(Fl_Window*, void*);
static void default_atclose(Fl_Window*, void*);
static void set_atclose(Fl_Atclose_Handler f) {atclose = f;}
static int event_shift() {return e_state&FL_SHIFT;}
static int event_ctrl() {return e_state&FL_CTRL;}
static int event_command() {return e_state&FL_COMMAND;}
static int event_alt() {return e_state&FL_ALT;}
static int event_buttons() {return e_state&0x7f000000;}
static int event_button1() {return e_state&FL_BUTTON1;}
static int event_button2() {return e_state&FL_BUTTON2;}
static int event_button3() {return e_state&FL_BUTTON3;}
static void set_idle(Fl_Old_Idle_Handler cb) {idle = cb;}
static void grab(Fl_Window& win) {grab(&win);}
static void release() {grab(0);}

// Visible focus methods...
static void visible_focus(int v) { option(OPTION_VISIBLE_FOCUS, (v!=0)); }
static int visible_focus() { return option(OPTION_VISIBLE_FOCUS); }

// Drag-n-drop text operation methods...
static void dnd_text_ops(int v) { option(OPTION_DND_TEXT, (v!=0)); }
static int dnd_text_ops() { return option(OPTION_DND_TEXT); }

// Multithreading support:
static int lock();
static void unlock();
static void awake(Fl_Window* win); // platform dependent
static void delete_widget(Fl_Widget* w);
static void do_widget_deletion();
static void watch_widget_pointer(Fl_Widget* w);
static void release_widget_pointer(Fl_Widget* w);
static void clear_widget_pointer(Fl_Widget const* w);
static void use_high_res_GL(int val) { use_high_res_GL_ = val; }
static int use_high_res_GL() { return use_high_res_GL_; }
static void draw_GL_text_with_textures(int val) { draw_GL_text_with_textures_ = val; }
static int draw_GL_text_with_textures() { return draw_GL_text_with_textures_; }
static int system(const char* command);

#ifdef FLTK_HAVE_CAIRO
public:
static cairo_t* cairo_make_current(Fl_Window* w);
static void cairo_autolink_context(bool alink) {
cairo_state_.autolink(alink);
}
static bool cairo_autolink_context() {
return cairo_state_.autolink();
}
static cairo_t* cairo_cc() {
return cairo_state_.cc();
}

cairo_t* cairo_cc(cairo_t* c, bool own=false) {
35.7 Fl_Adjuster.H

1 //
2 // Adjuster widget header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 /* \file
17 Fl_Adjuster widget. */
18 #ifndef Fl_Adjuster_H
19 #define Fl_Adjuster_H
20 #ifndef Fl_Valuator_H
21 #include "Fl_Valuator.H"
22 #endif
23 #ifndef Fl_Adjuster_H
24 #define Fl_Adjuster_H
25 #endif
26 #include "Fl_Valuator.H"
27 #endif
28
class FL_EXPORT Fl_Adjuster : public Fl_Valuator {
  int drag;
  int ix;
  int soft_;
protected:
  void draw() FL_OVERRIDE;
  int handle(int) FL_OVERRIDE;
  void value_damage() FL_OVERRIDE;
public:
  Fl_Adjuster(int X,int Y,int W,int H,const char *l=0);
  void soft(int s) {soft_ = s;}
  int soft() const {return soft_;}
};

Generated by Doxygen
# Fl_Anim_GIF Image.H

The Fl_Anim_GIF class is a header file for the Fast Light Tool Kit (FLTK).

```c
#ifndef Fl_Anim_GIF_Image_H
#define Fl_Anim_GIF_Image_H

#include <FL/Fl_GIF_Image.H>

class FL_EXPORT Fl_Anim_GIF_Image : public Fl_GIF_Image {
  class FrameInfo; // internal helper class

public:
  // constructors and destructor
  Fl_Anim_GIF_Image(const char *filename, Fl_Widget *canvas = 0, unsigned short flags = 0);
  Fl_Anim_GIF_Image(const char *imagename, const unsigned char *data, const size_t length, Fl_Widget *canvas = 0, unsigned short flags = 0);
  Fl_Anim_GIF_Image();
  ~Fl_Anim_GIF_Image() FL_OVERRIDE;

  // file handling
  bool load(const char *name, const unsigned char *imgdata=NULL, size_t imglength=0);
  bool valid() const;

  // getters and setters
  void frame_uncache(bool uncache);
  bool frame_uncache() const;
  double delay(int frame_) const;
  void delay(int frame, double delay);
  void canvas(Fl_Widget *canvas, unsigned short flags = 0);
  Fl_Widget *canvas() const;
  int canvas_w() const;
  int canvas_h() const;
  bool is_animated() const;
  const char *name() const;
  void speed(double speed);
  double speed() const;

  // animation
  int frames() const;
  void frame(int frame);
  int frame() const;
  Fl_Image *image() const;
  Fl_Image *image(int frame) const;
  bool start();
  bool stop();
  bool next();

  bool playing() const { return valid() && Fl::has_timeout(cb_animate, (void *)this); }

  // image data
  bool playing();
  Fl_Anim_GIF_Image& resize(int w, int h);
  Fl_Anim_GIF_Image& resize(double scale);
  int frame_x(int frame) const;
  int frame_y(int frame) const;
  int frame_w(int frame) const;
};
#endif
``
```cpp
int frame_h(int frame) const;

// -- overridden methods
void color_average(Fl_Color c, float i) FL_OVERRIDE;
Fl_Image *copy(int W, int H) const FL_OVERRIDE;
void desaturate() FL_OVERRIDE;
void draw(int x, int y, int w, int h, int cx = 0, int cy = 0) FL_OVERRIDE;
void uncache() FL_OVERRIDE;

// -- debugging and logging
int debug() const;

// -- static methods
int frame_count(const char *name, const unsigned char *imgdata = NULL, size_t imglength = 0);

static bool loop;
static double min_delay;

protected:

bool next_frame();
void clear_frames();
void set_frame(int frame);

static void cb_animate(void *d);
void scale_frame();
void set_frame();
on_frame_data(Fl_GIF_Image::GIF_FRAME &f) FL_OVERRIDE;
on_extension_data(Fl_GIF_Image::GIF_Frame &f) FL_OVERRIDE;

private:

char *name_;
unsigned short flags_; Fl_Widget *canvas_; bool uncache_; bool valid_; int frame_; double speed_; FrameInfo *fi_;

#endif // Fl_Anim_Gif_Image_H
```

---

### 35.9 fl_ask.H File Reference

API for common dialogs.

```cpp
#include <FL/Enumerations.H>
#include <FL/fl_attr.h>
```

#### Enumerations

- `enum Fl_Beep {
  FL_BEEP_DEFAULT = 0, FL_BEEP_MESSAGE, FL_BEEP_ERROR, FL_BEEP_QUESTION,
  FL_BEEP_PASSWORD, FL_BEEP_NOTIFICATION
}

Defines the different system beeps available.

#### Functions

- `void fl_alert(const char *,...) __fl_attr((__format__(__printf__

- `void int fl_ask(const char *,...) __fl_attr((__format__(__printf__

- `void fl_beep (int type=FL_BEEP_DEFAULT)

  Emits a system beep.

- `int fl_choice (const char *q, const char *b0, const char *b1, const char *b2,...) __fl_attr(__format__(__printf__

- `int const char const char int fl_choice_n (const char *q, const char *b0, const char *b1, const char *b2,...) __fl_attr(__format__(__printf__

- `int const char + fl_input (const char *label, const char +deflt=0,...) __fl_attr(__format__(__printf__

```
• int const char const char int const char * fl_input (int maxchar, const char *label, const char *deflt=0,...) __fl_attr((__format__)(__printf__)
• void fl_message (const char *,...) __fl_attr((__format__)(__printf__)
• void fl_message_font (Fl_Font f, Fl_Fontsize s)
• void fl_message_hotspot (int enable)
  Sets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer.
• int fl_message_hotspot (void)
  Gets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer.
• int const char const char int const char const char Fl_Widget * fl_message_icon ()
  Gets the Fl_Box icon container of the current default dialog used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().
• void fl_message_icon_label (const char *str)
  Sets the icon label of the dialog window used in many common dialogs.
• void fl_message_position (const int x, const int y, const int center=0)
  Sets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().
• void fl_message_position (Fl_Widget &widget)
• void fl_message_position (Fl_Widget *widget)
  Sets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().
• int fl_message_position (int *x=0, int *y=0)
  Gets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().
• void fl_message_title (const char *title)
  Sets the title of the dialog window used in many common dialogs.
• void fl_message_title_default (const char *title)
  Sets the default title of the dialog window used in many common dialogs.
• int const char const char * fl_password (const char *label, const char *deflt=0,...) __fl_attr((__format__)(__printf__)
• int const char const char int const char const char * fl_password (int maxchar, const char *label, const char *deflt=0,...) __fl_attr((__format__)(__printf__)

### Variables

- void void int __deprecated__
- const char * fl_cancel
  string pointer used in common dialogs, you can change it to another language
- const char * fl_close
  string pointer used in common dialogs, you can change it to another language
- Fl_Font fl_message_font_
- Fl_Fontsize fl_message_size_
- const char * fl_no
  string pointer used in common dialogs, you can change it to another language
- const char * fl_ok
  string pointer used in common dialogs, you can change it to another language
- const char * fl_yes
  string pointer used in common dialogs, you can change it to another language

### 35.9.1 Detailed Description

API for common dialogs.
35.9.2 Enumeration Type Documentation

35.9.2.1 Fl_Beep

```c
enum Fl_Beep
```
Defines the different system beeps available. Some systems may play different sounds or use different sound volume depending on the Fl_Beep value. The implementation is platform dependent.

See also

`fl_beep(int)`

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_BEEP_DEFAULT</td>
<td>Default beep.</td>
</tr>
<tr>
<td>FL_BEEP_MESSAGE</td>
<td>Message beep.</td>
</tr>
<tr>
<td>FL_BEEP_ERROR</td>
<td>Error beep.</td>
</tr>
<tr>
<td>FL_BEEP_QUESTION</td>
<td>Question beep.</td>
</tr>
<tr>
<td>FL_BEEP_PASSWORD</td>
<td>Password beep.</td>
</tr>
<tr>
<td>FL_BEEP_NOTIFICATION</td>
<td>Notification beep.</td>
</tr>
</tbody>
</table>

35.9.3 Function Documentation

35.9.3.1 fl_message_position()

```c
void fl_message_position ( 
    Fl_Widget & widget ) [inline]
```
See also

`fl_message_position(Fl_Widget *widget)`. 

35.10 fl_ask.H

Go to the documentation of this file.

```c
#include <FL/Enumerations.H>
#include <FL/fl_attr.h>

#if (FLTK_USE_STD)
#include <string>
#endif

Generated by Doxygen
class Fl_Widget;

enum Fl_Beep {
    FL_BEEP_DEFAULT = 0,
    FL_BEEP_MESSAGE,
    FL_BEEP_ERROR,
    FL_BEEP_QUESTION,
    FL_BEEP_PASSWORD,
    FL_BEEP_NOTIFICATION
};

void fl_beep(int type = FL_BEEP_DEFAULT);

void fl_message(const char *, ...) __fl_attr((__format__(__printf__, 1, 2)));

void fl_alert(const char *, ...) __fl_attr((__format__(__printf__, 1, 2)));

int fl_ask(const char *, ...) __fl_attr((__format__(__printf__, 1, 2), __deprecated__));

int fl_choice(const char *q, const char *b0, const char *b1, const char *b2, ...)
    __fl_attr((__format__(__printf__, 1, 5)));

int fl_choice_n(const char *q, const char *b0, const char *b1, const char *b2, ...)
    __fl_attr((__format__(__printf__, 1, 3)));

const char *fl_input(const char *label, const char *deflt = 0, ...)
    __fl_attr((__format__(__printf__, 1, 3)));

const char *fl_password(const char *label, const char *deflt = 0, ...)
    __fl_attr((__format__(__printf__, 1, 3)));

int fl_choice_n(const char *q, const char *b0, const char *b1, const char *b2, ...)
    __fl_attr((__format__(__printf__, 1, 3)));

int fl_choice_n(const char *q, const char *b0, const char *b1, const char *b2, ...)
    __fl_attr((__format__(__printf__, 1, 3)));

void fl_message_icon();

extern Fl_Font fl_message_font_;
extern Fl_Fontsize fl_message_size_;

inline void fl_message_font(Fl_Font f, Fl_Fontsize s) {
    fl_message_font_ = f;
    fl_message_size_ = s;
}

void fl_message_hotspot(int enable);

int fl_message_hotspot(void);

void fl_message_position(const int x, const int y, const int center = 0);

void fl_message_position(Fl_Widget *widget);

int fl_message_position(int *x = 0, int *y = 0);

inline void fl_message_position(Fl_Widget *widget) {
    fl_message_position(widget);
}

void fl_message_title(const char *title);

void fl_message_title_default(const char *title);

 Generated by Doxygen
This file defines compiler-specific macros.

### Macros

- **__fl_attr(x)**
  
  This section lists macros for Doxygen documentation only.

- **FL_DEPRECATED(msg, func)**
  
  Enclosing a function or method in `FL_DEPRECATED` marks it as no longer recommended.

- **FL OVERRIDE**
  
  This macro makes it safe to use the C++11 keyword `override` with older compilers.

#### 35.11.1 Detailed Description

This file defines compiler-specific macros.

#### 35.11.2 Macro Definition Documentation

##### 35.11.2.1 __fl_attr

```c
#define __fl_attr(x)
```

This section lists macros for Doxygen documentation only.

The next section will define the actual macros based on the compile used and based on the capabilities of the version of that compiler. To be used in prototypes with a variable list of arguments. This macro helps detection of mismatches between format string and argument list at compilation time.

Usage example: `FL/fl_ask.H`

##### 35.11.2.2 FL_DEPRECATED

```c
#define FL_DEPRECATED(msg, func)
```

Value:

```c
/** deprecated msg */
```

Enclosing a function or method in `FL_DEPRECATED` marks it as no longer recommended.

This macro syntax can not be used if the return type contains a comma, which is not the case in FLTK.

```
FL_DEPRECATED("Outdated, don’t use", int position()) { return position_; }
```

## 35.12 fl_attr.h

Go to the documentation of this file.
This library is free software. Distribution and use rights are outlined in the file "COPYING" which should have been included with this file. If this file is missing or damaged, see the license at:

https://www.fltk.org/COPYING.php

Please see the following page on how to report bugs and issues:

https://www.fltk.org/bugs.php

#ifndef _FL_fl_attr_h_
#define _FL_fl_attr_h_

#ifdef FL_DOXYGEN
#define __fl_attr(x)
#else /* FL_DOXYGEN */
#ifdef __cplusplus
/* Declare macros specific to Visual Studio.

Visual Studio defines __cplusplus = '199711L' in all its versions which is not helpful for us here. For VS version number encoding see: https://learn.microsoft.com/en-us/cpp/preprocessor/predefined-macros

This document specifies that the macro __MSVC_LANG is defined since "Visual Studio 2015 Update 3" as 201402L (default) and undefined in earlier versions. It can be used to determine the C++ standard as specified by the /std:c++ compiler option:

- /std:c++14 201402L (also if /std:c++ is not used)
- /std:c++17 201703L
- /std:c++20 202002L
- /std:c++latest a "higher, unspecified value" (docs of VS 2022)

As of this writing (02/2023) __MSVC_LANG is not yet used in this file but it is documented for future use.

Declare macros specific to Visual Studio.

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- /std:c++17 201703L
- /std:c++20 202002L
- /std:c++latest a "higher, unspecified value" (docs of VS 2022)

As of this writing (02/2023) __MSVC_LANG is not yet used in this file but it is documented for future use.

Declare macros specific to the C++ standard used.

Macros may have been declared already in previous sections.

#include <cplus++>
#endif

#if (__cplusplus >= 202002L) // C++20
#endif

#define FL_OVERRIDE override

#define FL_DEPRECATED(msg, func) __declspec(deprecated(msg)) func

#endif // Visual Studio

#elif defined(_MSC_VER)
#endif // Visual Studio 2015 (14.0)

#elif defined(_MSC_VER) == 1400 // Visual Studio 2005 (8.0)
#endif // Visual Studio 2005 (8.0)

#elif defined(_MSC_VER) == 1310 // Visual Studio .NET 2003 (7.1)
#endif // Visual Studio .NET 2003 (7.1)

#endif // Visual Studio

#endif // __fl_attr_h__}
if (__cplusplus >= 201402L) // C++14
 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) [](deprecated(msg)] func
 endif
 endif // C++14

 ifndef FL_OVERRIDE
 define FL_OVERRIDE override
 endif
 endif // C++11

 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) func
 endif
 ifndef // C++89
 endif
 endif // __cplusplus

 ifndef __clang__
 define FL_CLANG_VERSION (__clang_major__ * 10000 + __clang_minor__ * 100 + __clang_patchlevel__)
 endif // nothing yet --

 ifndef // __clang__
 endif
 ifndef __GNUC__
 define FL_GCC_VERSION (__GNUC__ * 10000 + __GNUC_MINOR__ * 100 + __GNUC_PATCHLEVEL__)
 ifndef __fl_attr
 define __fl_attr(x) __attribute__((x))
 endif
 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) func __attribute__((deprecated(msg)))
 endif // gcc 4.5.0
 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) func __attribute__((deprecated))
 endif // gcc 3.1.0
 endif // __GNUC__
 endif // __GNUC__
 ifndef // __fl_attr
 define __fl_attr(x)
 ifndef FL_OVERRIDE
 define FL_OVERRIDE
 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) func
 endif
 ifndef // FL_DOXYGEN */
 endif /* FL_DOXYGEN */
 endif /* !_FL_fl_attr_h_ */

 /* Declare macros specific to clang
 Macros may have been declared already in previous sections.
 
 Declare macros specific to gcc.
 Macros may have been declared already in previous sections.
 */
 ifndef __fl_attr
 define __fl_attr(x)
 ifndef FL_OVERRIDE
 define FL_OVERRIDE
 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) func
 endif
 ifndef // FL_DOXYGEN */
 endif /* FL_DOXYGEN */
 printf("%s\n", __fl_attr("Claim") + __fl_attr("Claim") *** __fl_attr("Claim") + __fl_attr("Claim") *** __fl_attr("Claim") + __fl_attr("Claim") *** __fl_attr("Claim")
 /* a macro was not defined in any of the sections above, set it to no-op here.
 */
 ifndef __fl_attr
 define __fl_attr(x)
 ifndef FL_OVERRIDE
 define FL_OVERRIDE
 ifndef FL_DEPRECATED
 define FL_DEPRECATED(msg, func) func
 endif
 ifndef // FL_DOXYGEN */
 endif /* FL_DOXYGEN */
Fl_Bitmap widget.

Fl_Bitmap(const uchar *bits, int W, int H) : Fl_Image(W,H,0), array(bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char**)&array, 1);}

Fl_Bitmap(const char *bits, int W, int H) : Fl_Image(W,H,0), array((const uchar *)bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char**)&array, 1);}

Fl_Bitmap(const uchar *bits, int bits_length, int W, int H);

Fl_Bitmap(const char *bits, int bits_length, int W, int H);

Fl_Bitmap();

Fl_BMP_Image.H

Fl_BMP_Image widget.

Fl_BMP_Image(const uchar *bits, int W, int H) :

Fl_BMP_Image(W,H,0), array(bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char**)&array, 1);}

Fl_BMP_Image(const char *bits, int W, int H) :

Fl_BMP_Image(W,H,0), array((const uchar *)bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char**)&array, 1);}

Fl_BMP_Image(const uchar *bits, int bits_length, int W, int H);

Fl_BMP_Image(const char *bits, int bits_length, int W, int H);

virtual ~Fl_BMP_Image();

Fl_BMP_Image();

Fl_RGB_Image widget.

Fl_RGB_Image(const uchar *bits, int W, int H) :

Fl_RGB_Image(W,H,0), array(bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char**)&array, 1);}

Fl_RGB_Image(const char *bits, int W, int H) :

Fl_RGB_Image(W,H,0), array((const uchar *)bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char**)&array, 1);}

Fl_RGB_Image(const uchar *bits, int bits_length, int W, int H);

Fl_RGB_Image(const char *bits, int bits_length, int W, int H);

virtual ~Fl_RGB_Image();

Fl_RGB_Image();

35.14 Fl_BMP_Image.H
public:

Fl BMP Image(const char * filename);
Fl BMP Image(const char * imagename, const unsigned char *data, const long length = -1);

protected:

void load_bmp_(class Fl Image Reader &rdr, int ico_height = 0, int ico_width = 0);

#endif

35.15 Fl_Box.H File Reference

**Fl_Box** widget.

#include "Fl_Widget.H"

**Classes**

- class Fl_Box

  This widget simply draws its box, and possibly its label.

35.15.1 Detailed Description

**Fl_Box** widget.

35.16 Fl_Box.H

Go to the documentation of this file.

35.17 Fl_Browser.H

1 //
2 // Browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //  https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //  https://www.fltk.org/bugs.php
15 //
16 #ifndef Fl_Browser_H
17 #define Fl_Browser_H
18 #endif
19
20 class FL_EXPORT Fl_Browser : public Fl_Widget {
21 protected:
22 void draw() FL_OVERRIDE;
23 public:
24 Fl_Browser(int X, int Y, int W, int H);
25 Fl_Browser(Fl_Browsertype b, int X, int Y, int W, int H);
26 int handle(int) FL_OVERRIDE;
27 #endif

35.17 Fl_Browser.H

Generated by Doxygen
Fl_Browser widget

Forms-compatible browser. Probably useful for other lists of textual data. Notice that the line numbers start from 1, and 0 means "no line".

ifndef Fl_Browser_H
#define Fl_Browser_H

#include "FL_Browser_.H"
#include "Fl_Image.H"

struct FL_BLINE;

class FL_EXPORT Fl_Browser : public Fl_Browser_ {
  FL_BLINE *first; // the array of lines
  FL_BLINE *last;
  FL_BLINE *cache;
  int cacheline; // line number of cache
  int lines; // Number of lines
  int full_height_; // full height of the widget
  const int * column_widths_; // alternative to @-sign
  char format_char_; // alternative to tab
  char column_char_; // alternative to tab

protected:

  // required routines for Fl_Browser_ subclass:
  void * item_first() const FL_OVERRIDE;
  void * item_next(void* item) const FL_OVERRIDE;
  void * item_prev(void* item) const FL_OVERRIDE;
  void * item_last() const FL_OVERRIDE;
  int item_selected(void * item) const FL_OVERRIDE;
  void item_select(void * item, int val) FL_OVERRIDE;
  int item_height(void * item) const FL_OVERRIDE;
  int item_width(void * item) const FL_OVERRIDE;
  void item_draw(void * item, int X, int Y, int W, int H) const FL_OVERRIDE;
  int full_height() const FL_OVERRIDE;
  int incr_height() const FL_OVERRIDE;
  const char *item_text(void *item) const FL_OVERRIDE;

  void remove(int line);
  void add(const char * newtext, void* d = 0);
  void insert(int line, const char * newtext, void* d = 0);
  void move(int to, int from);
  int load(const char * filename);
  void swap(int a, int b);
  void clear();

public:

  int topline() const ;

eenum Fl_Line_Position { TOP, BOTTOM, MIDDLE };

  int size() const { return lines; }  
  size(int W, int H) { Fl_Widget::size(W, H); }  
  Fl_Fontsize textsize() const { return Fl_Browser_::textsize(); }  

  / * Sets the default text size for the lines in the browser to newSize. Defined and documented in Fl_Browser.cxx */
  void textsize(Fl_Fontsize newSize);

  int topline() const ;

  enum Fl_Line_Position { TOP, BOTTOM, MIDDLE };

  //
void lineposition(int line, FL_Line_Position pos);
void topline(int line);  \{ lineposition(line, TOP);  \}
void bottomline(int line); \{ lineposition(line, BOTTOM); \}
void middelline(int line); \{ lineposition(line, MIDDLE); \}
int select(int line, int val=1);
int selected(int line) const;
void show(int line);
void show(); FL_OVERRIDE \{ Fl_Widget::show(); \}
void hide(int line);
void hide(); FL_OVERRIDE \{ Fl_Widget::hide(); \}
int visible(int line) const;
int value() const;
int select(int line, int val=1);
int selected(int line) const;
void show(int line);
void show(); FL_OVERRIDE \{ Fl_Widget::show(); \}
void hide(int line);
void hide(); FL_OVERRIDE \{ Fl_Widget::hide(); \}
int visible(int line) const;
int value() const;

Fl_Browser(int X, int Y, int W, int H, const char *L = 0);
~Fl_Browser() \{ clear(); \}
char format_char() const \{ return format_char_; \}
void format_char(char c) \{ format_char_ = c; \}
char column_char() const \{ return column_char_; \}
void column_char(char c) \{ column_char_ = c; \}
int displayed(int line) const \{ return Fl_Browser_::displayed(find_line(line)); \}
void make_visible(int line) \{ if (line < 1) Fl_Browser_::display(find_line(1));
else if (line > lines) Fl_Browser_::display(find_line(lines));
else Fl_Browser_::display(find_line(line)); \}
void icon(int line, Fl_Image * icon);
Fl_Image * icon(int line) const;
void remove_icon(int line);
void replace(int a, const char * b) \{ text(a, b); \}
void display(int line, int val=1);
}

---

Fl_Browser_ widget.
// Yes, I know this should be a template...

1 //
2 // Common browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2016 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 //
17 /* file
18 Fl_Browser_ widget. */
19
20 // Yes, I know this should be a template...
21
22 #ifndef Fl_Browser_\_H
23 #define Fl_Browser_\_H
24
25 #ifndef Fl_Group_\_H
26 #endif
27 #endif
28 #include "Fl_Group_\_H"
29
30 #ifndef FlScrollbar_\_H
31 #define FlScrollbar_\_H
32
33 #ifndef Fl_Flip_\_H
34 #define Fl_Flip_\_H
35
36 #define FL_NORMAL_BROWSER 0
37 #define FL_SELECT_BROWSER 1
38 #define FL_HOLD_BROWSER 2
39 #define FL_MULTI_BROWSER 3
40
41 #endif
42 #endif
43
44 #endif
45
46 //
47 // End of Fl_Browser_\_H file.
#define FL_SORT_ASCENDING 0
#define FL_SORT_DESCENDING 1
#define FL_SORT_CASEINSENSITIVE 0x2

class FL_EXPORT Fl_Browser_ : public Fl_Group {
    int position_; // where user wants it scrolled to
    int real_position_; // the current vertical scrolling position
    int hposition_; // where user wants it panned to
    int real_hposition_; // the current horizontal scrolling position
    int offset_; // how far down top_ item the real_position is
    int max_width; // widest object seen so far
    uchar has_scrollbar_;// which scrollbars are enabled
    Fl_Font textfont_; //
    Fl_Fontsize textsize_; //
    Fl_Color textcolor_; //
    void * top_; // which item scrolling position is in
    void * selection_; // which is selected (except for FL_MULTI_BROWSER)
    void * redraw1,+redraw2; // minimal update pointers
    void * max_width_item; // which item has max_width_
    int scrollbar_size_; // size of scrollbar trough
    int linespacing_; //
    void update_top();
    protected:
    virtual void *item_first() const = 0;
    virtual void *item_next(void *item) const = 0;
    virtual void *item_prev(void *item) const = 0;
    virtual void *item_last() const { return 0L; }
    virtual int item_height(void *item) const = 0;
    virtual int item_width(void *item) const = 0;
    virtual int item_quick_height(void *item) const;
    virtual void item_draw(void *item,int X,int Y,int W,int H) const = 0;
    virtual const char *item_text(void *item)const { (void)item; return 0L; }
    virtual void item_swap(void *a,void *b) { (void)a; (void)b; }
    virtual void *item_at(int index)const { (void)index; return 0L; }
    virtual int full_width() const; // current width of all items
    virtual int full_height() const; // current height of all items
    virtual int incr_height() const; // average height of an item
    // These only need to be done by subclass if you want a multi-browser:
    virtual void item_select(void *item,int val=1);
    virtual void item_selected(void *item) const;
    // things the subclass may want to call:
    void *top()const { return top_; }
    void *selection()const { return selection_; }
    void new_list(); // completely clobber all data, as though list replaced
    void deleting(void *item); // get rid of any pointers to item
    void replacing(void *a,void *b); // change a pointers to b
    void inserting(void *a,void *b); // insert b near a
    int displayed(void *item)const; // true if this item is visible
    void redraw_lines(); // redraw all of them
    void bbox(int &X,int &Y,int &W,int &H) const;
    int handle(int event) FL_OVERRIDE;
    void resize(int X,int Y,int W,int H) FL_OVERRIDE;
    int vposition()const { return position_; }
    int position(int x, int y) { Fl_Group::position(x, y); }
    int hposition(){const { return hposition_; }
    void vposition(int pos); // scroll to here
    void position(int); // pan to here
    void display(void *item); // scroll so this item is shown
};
enum { // values for has_scrollbar()
    HORIZONTAL = 1,
    VERTICAL = 2,
    BOTH = 3,
    ALWAYS_ON = 4,
    HORIZONTAL_ALWAYS = 5,
    VERTICAL_ALWAYS = 6,
    BOTH_ALWAYS = 7
};
uchar has_scrollbar() const { return has_scrollbar_; }
void has_scrollbar(uchar mode) { has_scrollbar_ = mode; }

Fl_Font textfont() const { return textfont_; }
void textfont(Fl_Font font) { textfont_ = font; }

Fl_Fontsize textsize() const { return textsize_; }
void textsize(Fl_Fontsize newSize) { textsize_ = newSize; }

Fl_Color textcolor() const { return textcolor_; }
void textcolor(Fl_Color col) { textcolor_ = col; }

int scrollbar_size() const {
    return scrollbar_size_;
}
void scrollbar_size(int newSize) {
    scrollbar_size_ = newSize;
}

int scrollbar_width() const {
    return (Fl::scrollbar_size());
}
void scrollbar_width(int width) {
    Fl::scrollbar_size(width);
    scrollbar_size_ = 0;
}

void scrollbar_right() {
    scrollbar.align(FL_ALIGN_RIGHT);
}
void scrollbar_left() {
    scrollbar.align(FL_ALIGN_LEFT);
}
void sort(int flags=0);

void linespacing(int pixels) {
    linespacing_ = pixels;
}

int linespacing() const {
    return linespacing_;
}

#ifdef

Fl_Shortcut fl_old_shortcut(const char*);
Fl_Widget_Tracker;

class Fl_Button : public Fl_Widget {
    // Button widget .

    #ifndef Fl_Button_H
    #define Fl_Button_H
    #ifndef Fl_Widget_H
    #include "Fl_Widget.H"
    #endif
    #endif

    #define FL_NORMAL_BUTTON 0
    #define FL_TOGGLE_BUTTON 1
    #define FL_RADIO_BUTTON (FL_RESERVED_TYPE+2)
    #define FL_HIDDEN_BUTTON 3

    extern Fl_EXPORT Fl_Shortcut fl_old_shortcut(char*);

    #endif
#endif

Generated by Doxygen
# Fl_Cairo.H File Reference

Cairo is currently supported for the following platforms: Windows, macOS, Unix/Linux (X11 + Wayland).

```plaintext
#include <FL/Fl.H>
#include <cairo.h>
```

## Classes

- class **Fl_Cairo_State**
  
  Contains all the necessary info on the current cairo context.

## 35.20.1 Detailed Description

Cairo is currently supported for the following platforms: Windows, macOS, Unix/Linux (X11 + Wayland).

**Note**

In FLTK 1.3.x this header file (**Fl_Cairo.H**) included the platform specific Cairo headers. This is no longer true since 1.4.0.

This header file is platform agnostic. If you need platform specific Cairo headers you need to #include them in your source file.
To use FLTK's builtin Cairo support you need to \#include `<FL/Fl.H>` \textbf{before} you include any other FLTK header which is officially required anyway. Since FLTK 1.4.0 the preprocessor constants `FLTK_HAVE_CAIRO` and/or `FLTK_HAVE_CAIROEXT` are defined in `<FL/Fl.H>` by including `<FL/fl_config.h>`.

### Fl_Cairo.H

Go to the documentation of this file.

```
1 //
2 // Main Cairo support header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 ifndef FL_CAIRO_H
17 #define FL_CAIRO_H
18
19 #ifdef FLTK_HAVE_CAIRO
20
21 #include <cairo.h>
22
23 class FL_EXPORT Fl_Cairo_State {
24 public:
25     Fl_Cairo_State();
26     cairo_t *cc() const;
27     bool autolink() const;
28     void cc(cairo_t *c, bool own = true);
29     void autolink(bool b);
30     void window(void *w);
31     void gc(void *c);
32
33 private:
34     cairo_t *cc_; // contains the unique autoupdated cairo context
35     bool autolink_; // indicates whether we must delete the cc, useful for internal cleanup
36     bool own_cc_;  // false by default, prevents the automatic cairo mapping on fltk windows
37     void *window_; // for custom cairo implementations.
38     void *gc_;     // for keeping track internally of last win+gc treated
39 }
40 #endif // FLTK_HAVE_CAIRO
41 #endif // FL_CAIRO_H
```

### Fl_Cairo_Window.H File Reference

\textbf{Fl_Cairo_Window}, an FLTK window incorporating a Cairo draw callback.

```
#ifndef FL_CAIRO_H
#define FL_CAIRO_H

#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>

class Fl_EXPORT Fl_Cairo_State {
    public:
        Fl_Cairo_State();
        cairo_t *cc() const;
        bool autolink() const;
        void cc(cairo_t *c, bool own = true);
        void autolink(bool b);
        void window(void *w);
        void gc(void *c);

    private:
        cairo_t *cc_; // contains the unique autoupdated cairo context
        bool autolink_; // indicates whether we must delete the cc, useful for internal cleanup
        bool own_cc_;  // false by default, prevents the automatic cairo mapping on fltk windows
        void *window_; // for custom cairo implementations.
        void *gc_;     // for keeping track internally of last win+gc treated

    #endif // FLTK_HAVE_CAIRO
#endif // FL_CAIRO_H
```
Classes

- class **Fl_Cairo_Window**
  
  *This defines an FLTK window with Cairo support.*

### 35.22.1 Detailed Description

**Fl_Cairo_Window**, an FLTK window incorporating a Cairo draw callback.

### 35.23 Fl_Cairo_Window.H

Go to the documentation of this file.

```cpp
#define FL_CAIRO_WINDOW_H

#include <FL/fl_config.h>

#define FLTK_HAVE_CAIRO

class FL_EXPORT Fl_Cairo_Window : public Fl_Double_Window {

public:

  Fl_Cairo_Window(int W, int H, const char *L = 0)
  : Fl_Double_Window(W, H, L), draw_cb_(0) {}

  Fl_Cairo_Window(int X, int Y, int W, int H, const char *L = 0)
  : Fl_Double_Window(X, Y, W, H, L), draw_cb_(0) {}

  void set_draw_cb(cairo_draw_cb cb) { draw_cb_ = cb; }

private:

  cairo_draw_cb draw_cb_; };

#endif // FL_CAIRO_WINDOW_H
```

### 35.24 fl_callback_macros.H File Reference

This file provides macros for easy function and method callbacks with multiple type safe arguments.
#include <stdlib.h>

**Macros**

- **#define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2)**
  
  Declare a C function callback with custom parameters.

- **#define FL_INLINE_CALLBACK_2(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA)**
  
  Creates code to declare a callback function in line with instantiating a widget.

- **#define FL_METHOD_CALLBACK_1(WIDGET, CLASS, SELF, METH, TYPE0, VALUE0)**
  
  Declare a non-static class method callback with custom parameters.

### 35.24.1 Detailed Description

This file provides macros for easy function and method callbacks with multiple type safe arguments.

### 35.24.2 Macro Definition Documentation

#### 35.24.2.1 FL_FUNCTION_CALLBACK_3

```c
#define FL_FUNCTION_CALLBACK_3(
    WIDGET,
    FUNC,
    TYPE0,
    VALUE0,
    TYPE1,
    VALUE1,
    TYPE2,
    VALUE2 )
```

Declare a C function callback with custom parameters.

You can declare a plain C function callback or a static method callback with custom parameters using this macro. It simplifies the process of calling arbitrary functions with up to five custom parameters. The macro generates code that ensures type safety and expands FLTK's standard callbacks, which are limited to a single `void*` or `long` argument.

To use the macro, you provide the widget that will handle the callback as the first argument. The second argument can be either a regular function or a static method in any class. Following these arguments, you can include up to five pairs, where each pair consists of a type and a value. For example, `int, 3` specifies an integer parameter with a value of 3. If you need to pass two arguments, you can use two pairs, like this: `int, 3, int, 4`. The last digit of the macro name must be the same as the number of pairs (0..5).

Whenever the code generated by the macro is called, the custom parameters are duplicated and marked for automatic deallocation using `delete` when the callback widget is destroyed.

```c
#include <FL/fl_callback_macros.H>
...
Fl_Button *btn1 = new Fl_Button(10, 10, 100, 20, "Beep");
FL_FUNCTION_CALLBACK_0(btn1, fl_beep);
...
Fl_Button *btn2 = new Fl_Button(10, 40, 100, 20, "Hello");
FL_FUNCTION_CALLBACK_5(btn2,
    const char *, text, "Hello\n%d %d %d %d",
    int, a, 1, int, b, 2, int, c, 3, int, d, 4);
```

You can find a small demonstration program showcasing the usage of `FL_*_CALLBACK_*` in the examples/callbacks.cxx file.

---

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Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIDGET</td>
<td>the widget that will call the callback</td>
</tr>
<tr>
<td>FUNC</td>
<td>a C/C++ function or a static class method</td>
</tr>
<tr>
<td>TYPE0,VALUE0,TYPE1,VALUE1,TYPE2,VALUE2</td>
<td>a list of zero to five type/value pairs, all separated by commas</td>
</tr>
</tbody>
</table>

See also

- FL_METHOD_CALLBACK_1, FL_INLINE_CALLBACK_2

### 35.24.2.2 FL_INLINE_CALLBACK_2

```c
#define FL_INLINE_CALLBACK_2(
    WIDGET, TYPE0, NAME0, VALUE0,
    TYPE1, NAME1, VALUE1,
    LAMBDA)
```

Creates code to declare a callback function in line with instantiating a widget.

You can use this macro to create a function as a callback, allowing you to define the callback function right where the widget and callback are declared, similar to a Lambda function.

The first argument of the macro specifies the widget that will handle the callback. Next, you can include up to five triplets, where each triplet consists of a type, a parameter name, and a value. For example, `int, x, 3` specifies an integer parameter with a value of 3. If you need to pass two arguments, you can use two triplets, such as `int, x, 3, int, y, 4`. The last digit of the macro name must be the same as the number of triplets (0..5).

The last argument is the actual function body itself.

The function body is limited to a syntax that the macro preprocessor can handle. It should include the leading '{' and trailing '}' and may contain local variable declarations, use global variables and functions, and use also the variables listed and initialized in the argument triples of the macro. Very large function bodies should be avoided because they may exceed the admissible size of a macro argument.

Whenever the code generated by the macro is called, the custom parameters are duplicated and marked for automatic deallocation using `delete` when the callback widget is destroyed.

```c
#include <FL/fl_callback_macros.h>
...
FL_Button *btn = new FL_Button(10, 10, 100, 20, "Test");
FL_INLINE_CALLBACK_2(btn, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA);
[fl_message("Greetings from the $s button", name);
  ];
```

You can find a small demonstration program showcasing the usage of `FL_*_CALLBACK_*` in the examples/callbacks.cxx file.

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIDGET</td>
<td>the widget that will call the callback</td>
</tr>
<tr>
<td>TYPE0</td>
<td>the type of the first parameter in the function call</td>
</tr>
<tr>
<td>NAME0</td>
<td>an arbitrary variable name that can be used as a parameter in the function body</td>
</tr>
<tr>
<td>VALUE0</td>
<td>a constant value or a variable; the value of the variable is copied when the callback is created</td>
</tr>
<tr>
<td>TYPE1,NAME1,VALUE1</td>
<td>as above; there are six macros that support 0 to 5 parameters</td>
</tr>
<tr>
<td>LAMBDA</td>
<td>the function body within the limits of the C macro preprocessor</td>
</tr>
</tbody>
</table>
35.24.2.3 FL_METHOD_CALLBACK_1

#define FL_METHOD_CALLBACK_1(
    WIDGET,
    CLASS,
    SELF,
    METH,
    TYPE0,
    VALUE0 )

Declare a non-static class method callback with custom parameters.
Y ou can declare a callback for a non-static class method with custom parameters using this macro. It provides a
convenient way to call arbitrary methods in any class, overcoming FLTK’s limitation of passing only a single void∗
or long argument. Furthermore, it ensures type safety.
The first argument of the macro specifies the widget that will handle the callback. The second argument indicates
the class type to be called. The third argument must be a pointer to an instance of that class. The fourth argument
is the name of the method within the class. That method must be public and should not be static.
F ollowing these arguments, you can include up to five pairs, where each pair consists of a type and a value. For
example, int, 3 specifies an integer parameter with a value of 3. If you need to pass two arguments, you can
use two pairs, like this: int, 3, int, 4. The last digit of the macro name must be the same as the number of
pairs (0..5).
Whenever the code generated by the macro is called, the custom parameters are duplicated and marked for auto-
matic deallocation using delete when the callback widget is destroyed.
#include <FL/fl_callback_macros.H>
...
Fl_Button *btn = new Fl_Button(10, 10, 100, 20, "Test");
FL_METHOD_CALLBACK_1(btn, Fl_Button, btn, color, Fl_Color, FL_GREEN);
You can find a small demonstration program showcasing the usage of FL_∗_CALLBACK_∗ in the
examples/callbacks.cxx file.

Parameters

| WIDGET | the widget that will call the callback |
| CLASS  | the class type                           |
| SELF   | a pointer to an instance of the class    |
| METH   | a C++ class method that must be public and not static |
| TYPE0, VALUE0 | a list of zero to five type/value pairs, all separated by commas |

See also

FL_FUNCTION_CALLBACK_3, FL_INLINE_CALLBACK_2

35.25 fl_callback_macros.H

Go to the documentation of this file.
```c
#ifndef _FL_FL_CALLBACK_MACROS_H_
#define _FL_FL_CALLBACK_MACROS_H_

#include <stdlib.h>

#ifdef FL_DOXYGEN

#define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2)
#define FL_FUNCTION_CALLBACK_4(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3)
#define FL_FUNCTION_CALLBACK_5(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3, TYPE4, VALUE4)

#define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2)
do {
    class Fl_Callback_User_Data_92 : public Fl_Callback_User_Data {
    public:
        const char * p0_; int p1_;
    static void cb(Fl_Widget *w, void *user_data) {
        Fl_Callback_User_Data_92 *d = (Fl_Callback_User_Data_92*)user_data;
        hello_2_args_cb(d->p0_, d->p1_);
    }
    Fl_Callback_User_Data_92(const char * p0, int p1)
    : p0_(p0), p1_(p1) { }
    }
    WIDGET->callback(Fl_Callback_User_Data_92::cb, new Fl_Callback_User_Data_92(VALUE0, VALUE1, VALUE2), true);
} while(0)

#define FL_FUNCTION_CALLBACK_4(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3)
do {
    class Fl_Callback_User_Data_92 : public Fl_Callback_User_Data {
    public:
        const char * p0_; int p1_; int p2_;
    static void cb(Fl_Widget *w, void *user_data) {
        Fl_Callback_User_Data_92 *d = (Fl_Callback_User_Data_92*)user_data;
        hello_2_args_cb(d->p0_, d->p1_, d->p2_);
    }
    Fl_Callback_User_Data_92(const char * p0, int p1, int p2)
    : p0_(p0), p1_(p1), p2_(p2) { }
    }
    WIDGET->callback(Fl_Callback_User_Data_92::cb, new Fl_Callback_User_Data_92(VALUE0, VALUE1, VALUE2, true), true);
} while(0)

#define FL_FUNCTION_CALLBACK_5(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3, TYPE4, VALUE4)
do {
    class Fl_Callback_User_Data_92 : public Fl_Callback_User_Data {
    public:
        const char * p0_; int p1_; int p2_; int p3_; TYPE4 p4_;
    static void cb(Fl_Widget *w, void *user_data) {
        Fl_Callback_User_Data_92 *d = (Fl_Callback_User_Data_92*)user_data;
        hello_2_args_cb(d->p0_, d->p1_, d->p2_, d->p3_, d->p4_);
    }
    Fl_Callback_User_Data_92(const char * p0, int p1, int p2, int p3, TYPE4 p4)
    : p0_(p0), p1_(p1), p2_(p2), p3_(p3), p4_(p4) { }
    }
    WIDGET->callback(Fl_Callback_User_Data_92::cb, new Fl_Callback_User_Data_92(VALUE0, VALUE1, VALUE2, VALUE3, VALUE4), true);
} while(0)
#endif

#endif // FL_DOXYGEN

#define FL_METHOD_CALLBACK_1(WIDGET, CLASS, SELF, METH, TYPE0, VALUE0)
#define FL_INLINE_CALLBACK_2(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA)

/*
These two macros make it possible to call macros with names that are created
by concatenating the name in x and (in this context) the number in y.
*/
#define _FL_CBD_CONCAT_IMPL(x, y) x##y
#define _FL_CBD_CONCAT(x, y) _FL_CBD_CONCAT_IMPL(x, y)

/*
Create a unique name for the derived class based on the current source code
line number.
*/
#define _FL_CBD_CLASS_NAME _FL_CBD_CONCAT(Fl_Callback_User_Data_,__LINE__)

/*
These macros create boilerplate code for callbacks to functions and
static class methods with up to five arguments.
*/

This macro invocation for example
**
FL_FUNCTION_CALLBACK_2( func_cb_btn_2, hello_2_args_cb,
const char *, text, "FLTK",
int, number, 2 );
**

will generate the following code:

```
class Fl_Callback_User_Data_92 : public Fl_Callback_User_Data {
public:
    const char * p0_; int p1_;
    static void cb(Fl_Widget *w, void *user_data) {
        Fl_Callback_User_Data_92 *d = (Fl_Callback_User_Data_92*)user_data;
        hello_2_args_cb(d->p0_, d->p1_);
    }
    Fl_Callback_User_Data_92(const char * p0, int p1)
    : p0_(p0), p1_(p1) { }
}
WIDGET->callback(Fl_Callback_User_Data_92::cb, new Fl_Callback_User_Data_92("FLTK", 2),
true);
```

Clicking the Fl_Button 'func_cb_btn_2' will call 'hello_2_args_cb("FLTK", 2)'.
Deleting the button will also delete the data that was created in our
boilerplate code.

*/
```
```
#define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2) 
  do { \ 
    class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \ 
      public: \ 
        TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; \ 
        static void cb(Fl_Widget *w, void *user_data) { \ 
          _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \ 
          FUNC(d->p0_, d->p1_, d->p2_, d->p3_); \ 
        } \ 
      _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3) \ 
        : p0_(p0), p1_(p1), p2_(p2), p3_(p3) { }; \ 
    } \ 
  } while(0) \ 
  \ 
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3), true); \ 
} \ 

#define FL_FUNCTION_CALLBACK_2(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1) 
  do { \ 
    class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \ 
      public: \ 
        TYPE0 p0_; TYPE1 p1_; \ 
        static void cb(Fl_Widget *w, void *user_data) { \ 
          _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \ 
          FUNC(d->p0_, d->p1_); \ 
        } \ 
      _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1) \ 
        : p0_(p0), p1_(p1) { }; \ 
    } \ 
  } while(0) \ 
  \ 
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1), true); \ 
} \ 

#define FL_FUNCTION_CALLBACK_1(WIDGET, FUNC, TYPE0, VALUE0) 
  do { \ 
    class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \ 
      public: \ 
        TYPE0 p0_; \ 
        static void cb(Fl_Widget *w, void *user_data) { \ 
          _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \ 
          FUNC(d->p0_); \ 
        } \ 
      _FL_CBD_CLASS_NAME(TYPE0 p0) \ 
        : p0_(p0) { }; \ 
    } \ 
  } while(0) \ 
  \ 
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0), true); \ 
} \ 

#define FL_FUNCTION_CALLBACK_0(WIDGET, FUNC) 
  do { \ 
    class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \ 
      public: \ 
        static void cb(Fl_Widget *w, void *user_data) { \ 
          FUNC(); \ 
        } \ 
      _FL_CBD_CLASS_NAME() { }; \ 
    } \ 
  } while(0) \ 
  \ 
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(), true); \ 
} \ 

These macros create boilerplate code for callbacks to class methods
with up to five arguments.

This macro invocation for example
"FL_METHOD_CALLBACK_4(btn, MyWindow, win, resize, int, test_x+10, int, test_y+10, int, 320, int, 480);"
will generate the following code:

Generated by Doxygen
Clicking the Fl_Button 'btn' will call

```
win->resize(test_x+10, test_y+10, 320, 400);
```

Deleting the button will also delete the data that was created in our
boilerplate code.

---

```cpp
#define FL_METHOD_CALLBACK_5(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3, TYPE4, VALUE4)
\}
do { \
class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
public: \

CLASS *self_; 
TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; TYPE4 p4_; 
static void void cb(Fl_Widget *w, void *user_data) { \

_FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; 

d->self_->METHOD(d->p0_, d->p1_, d->p2_, d->p3_, d->p4_); 

}; 

_WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1, VALUE2, VALUE3, VALUE4), true); 

} while(0)
```

```cpp
#define FL_METHOD_CALLBACK_4(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3) 
\}
do { \
class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
public: \

CLASS *self_; 
TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; 
static void void cb(Fl_Widget *w, void *user_data) { \

_FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; 

d->self_->METHOD(d->p0_, d->p1_, d->p2_, d->p3_); 

}; 

_WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1, VALUE2, VALUE3, VALUE4), true); 

} while(0)
```

```cpp
#define FL_METHOD_CALLBACK_3(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2) 
\}
do { \
class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
public: \

CLASS *self_; 
TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; 
static void void cb(Fl_Widget *w, void *user_data) { 

_FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; 

d->self_->METHOD(d->p0_, d->p1_, d->p2_); 

}; 

_WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1, VALUE2, VALUE3), true); 

} while(0)
```

```cpp
#define FL_METHOD_CALLBACK_2(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1) 
\}
do { \
class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
public: \

CLASS *self_; 
TYPE0 p0_; TYPE1 p1_; 
static void void cb(Fl_Widget *w, void *user_data) { 

_FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; 

d->self_->METHOD(d->p0_, d->p1_); 

}; 

_WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1), true); 

} while(0)
```
415 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \\
416 d->self_->METHOD(d->p0_, d->p1_); \\
417 };
418 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0, TYPE1 p1) \\
419 : self_(self), p0_(p0), p1_(p1) {} \\
420 );
421 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1), true); \\
422 } while(0);
423
424 #define FL_METHOD_CALLBACK_1(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0) \\
425 do { \\
426 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \\
427 public: \\
428 CLASS *self_; \\
429 TYPE0 p0_; \\
430 static void cb(Fl_Widget *w, void *user_data) { \\
431 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \\
432 d->self_->METHOD(d->p0_); \\
433 };
434 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0) \\
435 : self_(self), p0_(p0) {} \\
436 };
437 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0), true); \\
438 } while(0);
439
440 #define FL_METHOD_CALLBACK_0(WIDGET, CLASS, SELF, METHOD) \\
441 do { \\
442 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \\
443 public: \\
444 CLASS *self_; \\
445 static void cb(Fl_Widget *w, void *user_data) { \\
446 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \\
447 d->self_->METHOD(); \\
448 };
449 _FL_CBD_CLASS_NAME(CLASS *self) \\
450 : self_(self) {} \\
451 };
452 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF), true); \\
453 } while(0);
454
455 /*
456 These macros create boilerplate code for callback functions inlined into
457 the widget creation code (similar to lambda functions in C++11 and up)
458 with up to five arguments.
459
460 This macro invocation for example
461 "'
462 FL_INLINE_CALLBACK_2( // callback has two parameters
463 btn, // attach callback to this button
464 const char *, text, "FLTK", // first parameter (type, name, value)
465 int, number, 2, // second parameter
466 { // function body
467 fl_message("We received the message %s with %d!", text, number); 
468 };
469 )
470 );
471 will generate the following code:
472 "'
473 do { \\
474 class Fl_Callback_User_Data_133 : public Fl_Callback_User_Data { \\
475 public: \\
476 const char * p0_; // store first parameter here \\
477 int p1_; // store second parameter here \\
478 // lambda style function \\
479 static void fn(const char * text, int number) { \\
480 fl_message("We received the message %s with %d!", text, number); 
481 };
482 // FLTK style callback \\
483 static void cb(Fl_Widget *w, void *user_data) { \\
484 Fl_Callback_User_Data_133 *d = (Fl_Callback_User_Data_133*)user_data; \\
485 (d->p0_, d->p1_); \\
486 };
487 // class constructor \\
488 Fl_Callback_User_Data_133(const char * p0, int p1) \\
489 : p0_(p0), // copy parameter 0 \\
490 p1_(p1) // copy parameter 1 \\
491 ( ) // constructor body \\
492 );
493 // connect our class to the widget callback \\
494 btn->callback(Fl_Callback_User_Data_133::cb, \\
495 new Fl_Callback_User_Data_133("FLTK", 2), \\
496 true); \\
497 } while(0); // user code adds semicolon
498 "'
499 Clicking the Fl_Button 'btn' will call
500 'fl_message("We received the message %s with %d!", "FLTK", 2);'.

Generated by Doxygen
Deleting the button will also delete the data that was created in our boilerplate code.

```
#define FL_INLINE_CALLBACK_5(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, TYPE2, NAME2, VALUE2, TYPE3, NAME3, VALUE3, TYPE4, NAME4, VALUE4, LAMBDA) \
  do { \
  class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
  public: \
  TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; TYPE4 p4_; \
  static void fn(TYPE0 NAME0, TYPE1 NAME1, TYPE2 NAME2, TYPE3 NAME3, TYPE4 NAME4) \
  LAMBDA; \
  static void cb(Fl_Widget *w, void *user_data) { \
  _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
  _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_, d->p2_, d->p3_, d->p4_); 
  } ; \
  } ; \
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3, VALUE4), true); 
  } while(0) 

#define FL_INLINE_CALLBACK_4(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, TYPE2, NAME2, VALUE2, TYPE3, NAME3, VALUE3, LAMBDA) \
  do { \
  class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
  public: \
  TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; \
  static void fn(TYPE0 NAME0, TYPE1 NAME1, TYPE2 NAME2, TYPE3 NAME3) \
  LAMBDA; \
  static void cb(Fl_Widget *w, void *user_data) { \
  _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
  _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_, d->p2_, d->p3_); 
  } ; \
  } ; \
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3), true); 
  } while(0) 

#define FL_INLINE_CALLBACK_3(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, TYPE2, NAME2, VALUE2, LAMBDA) \
  do { \
  class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
  public: \
  TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; \
  static void fn(TYPE0 NAME0, TYPE1 NAME1) \
  LAMBDA; \
  static void cb(Fl_Widget *w, void *user_data) { \
  _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
  _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_); 
  } ; \
  } ; \
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2), true); 
  } while(0) 

#define FL_INLINE_CALLBACK_2(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA) \
  do { \
  class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
  public: \
  TYPE0 p0_; TYPE1 p1_; \
  static void fn(TYPE0 NAME0, TYPE1 NAME1) \
  LAMBDA; \
  static void cb(Fl_Widget *w, void *user_data) { \
  _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
  _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_); 
  } ; \
  } ; \
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1), true); 
  } while(0) 

#define FL_INLINE_CALLBACK_1(WIDGET, TYPE0, NAME0, VALUE0, LAMBDA) \
  do { \
  class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
  public: \
  TYPE0 p0_; \
  static void fn(TYPE0 NAME0) \
  LAMBDA; \
  static void cb(Fl_Widget *w, void *user_data) { \
  _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
  _FL_CBD_CLASS_NAME::fn(d->p0_); 
  } ; \
  } ; \
  WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0), true); 
  } while(0) 
```

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584 }); \
585 _FL_CBD_CLASS_NAME (TYPE0 p0) \ 
586 : p0_(p0) (); \ 
587 ); \
588 WIDGET->callback (_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME (VALUE0), true); \ 
589 ) while(0)
590 
592 #define FL_INLINE_CALLBACK_0 (WIDGET, LAMBDA) \
593 do { \
594 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
595 public: \
596 static void fn(); \
597 LAMBDA; \
598 static void cb (Fl_Widget *w, void *user_data) { \
599 _FL_CBD_CLASS_NAME::fn(); \
600 } \
601 ); \
602 WIDGET->callback (_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME ()), true); \ 
603 ) while(0)
604 
605 #endif // FL_DOXYGEN
606
607 #endif /* !_FL_FL_CALLBACK_MACROS_H_ */

35.26 fl_casts.H

1 // 2 // Experimental inline "cast functions" for the Fast Light Toolkit (FLTK). 3 // See also issue #109: "VS2017 warnings when building fltk 1.4.x" 4 // 5 // Copyright 1998-2021 by Bill Spitzak and others.
6 // 7 // This library is free software. Distribution and use rights are outlined in 8 // the file "COPYING" which should have been included with this file. If this 9 // file is missing or damaged, see the license at:
10 // 11 // https://www.fltk.org/COPYING.php
12 // 13 // Please see the following page on how to report bugs and issues:
14 // 15 // https://www.fltk.org/bugs.php
16 //
17 #ifndef _FL_fl_casts_H_
18 #define _FL_fl_casts_H_
19 
20 #include <FL/platform_types.h>
21
22 inline char fl_char (void *v) { return (char)(fl_intptr_t)v; }
23 inline int fl_int (void *v) { return (int)(fl_intptr_t)v; }
24 inline long fl_long (void *v) { return (long)(fl_intptr_t)v; }
25
26 inline unsigned char fl_uchar (void *v) { return (unsigned char)(fl_uintptr_t)v; }
27 inline unsigned int fl_uint (void *v) { return (unsigned int)(fl_uintptr_t)v; }
28 inline unsigned long fl_ulong (void *v) { return (unsigned long)(fl_uintptr_t)v; }
29
30 #if the following conversions can be used to silence MSVC warning C4312:
31 // 'type cast': conversion from 'type' to 'void *' of greater size
32 #ifdef _FL_fl_casts_H_
33 #define fl_voidptr(type) (void *)((fl_intptr_t)type)
34
35 inline void *fl_voidptr (int v) { return (void *)fl_intptr_t[v]; }
36 inline void *fl_voidptr (unsigned int v) { return (void *)fl_intptr_t[v]; }
37 inline void *fl_voidptr (long v) { return (void *)fl_intptr_t[v]; }
38 inline void *fl_voidptr (unsigned long v) { return (void *)fl_intptr_t[v]; }
39 #endif /* _FL_fl_casts_H_ */

35.27 Fl_Chart.H File Reference

Fl_Chart widget.

#include "Fl_Widget.H"

Classes

- class Fl_Chart

Fl_Chart displays simple charts.
• struct FL_CHART_ENTRY
  For internal use only.

Macros

• #define FL_BAR_CHART 0
  type() for Bar Chart variant
• #define FL_CHART_LABEL_MAX 18
  max label length for entry
• #define FL_CHART_MAX 128
  max entries per chart
• #define FL_FILL_CHART 3
  type() for Fill Line Chart variant
• #define FL_FILLED_CHART FL_FILL_CHART
  for compatibility
• #define FL_HORBAR_CHART 1
  type() for Horizontal Bar Chart variant
• #define FL_LINE_CHART 2
  type() for Line Chart variant
• #define FL_PIE_CHART 5
  type() for Pie Chart variant
• #define FL_SPECIALPIE_CHART 6
  type() for Special Pie Chart variant
• #define FL_SPIKE_CHART 4
  type() for Spike Chart variant

35.27.1 Detailed Description

Fl_Chart widget.

35.28 Fl_Chart.H

Go to the documentation of this file.

1 //
2 // Fl_Chart widget header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 ifndef Fl_Chart_H
17 #define Fl_Chart_H
18 #define Fl_Chart_H
19 #ifndef Fl_Widget_H
20 #include "Fl_Widget.H"
21 #endif
22
23 #ifndef Fl_Widget_H
24 include "Fl_Widget.h"
25 #endif
26
27 // values for type()
28 #define FL_BAR_CHART 0
29 #define FL_HORBAR_CHART 1
30 #define FL_LINE_CHART 2
31 #define FL_FILL_CHART 3
32 #define FL_SPIKE_CHART 4
33 #define FL_PIE_CHART 5
34 #define FL_SPECIALPIE_CHART 6
35
#define FL_FILLED_CHART FL_FILL_CHART

#define FL_CHART_MAX 128
#define FL_CHART_LABEL_MAX 18

struct FL_CHART_ENTRY {
    float val;
    unsigned col;
    char str[FL_CHART_LABEL_MAX + 1];
};

class FL_EXPORT Fl_Chart : public Fl_Widget {
    int numb;
    int maxnumb;
    int sizenumb;
    FL_CHART_ENTRY *entries;
    double min, max;
    uchar autosize_;
    Fl_Font textfont_;
    Fl_Fontsize textsize_;
    Fl_Color textcolor_;

protected:
    void draw() FL_OVERRIDE;

    // (static) protected draw methods (STR 2022)
    // these methods are documented in src/Fl_Chart.cxx

    static void draw_barchart(int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[],
                              double min, double max, int autosize, int maxnumb, Fl_Color textcolor);
    static void draw_horbarchart(int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[],
                                  double min, double max, int autosize, int maxnumb,
                                  Fl_Color textcolor);
    static void draw_linechart(int type, int x, int y, int w, int h, int numb,
                                FL_CHART_ENTRY entries[], double min, double max, int autosize,
                                int maxnumb, Fl_Color textcolor);
    static void draw_piechart(int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[],
                               int special, Fl_Color textcolor);

public:
    Fl_Chart(int X, int Y, int W, int H, const char *L = 0);
    ~Fl_Chart();
    void clear();

    void add(double val, const char *str = 0, unsigned col = 0);
    void insert(int ind, double val, const char *str = 0, unsigned col = 0);
    void replace(int ind, double val, const char *str = 0, unsigned col = 0);
    void bounds(double *a, double *b) const {
        *a = min;
        *b = max;
    }
    void bounds(double a, double b);
    int size() const { return numb; }
    void size(int W, int H) { Fl_Widget::size(W, H); }
    int maxsize() const { return maxnumb; }
    void maxsize(int m);
    Fl_Font textfont() const { return textfont_; }
    Fl_Fontsize textsize() const { return textsize_; }
    Fl_Color textcolor() const { return textcolor_; }
    uchar autosize() const { return autosize_; }
};
# Fl_Check_Browser.H

1318 File Documentation

35.29 Fl_Check_Browser.H

1 //
2 // Fl_Check_Browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 //
17 /* file
18 Fl_Check_Browser widget. */
19
20 ifndef Fl_Check_Browser_H
21 define Fl_Check_Browser_H
22
23 #include "Fl.H"
24 #include "Fl_Browser_.H"
25
30 class FL_EXPORT Fl_Check_Browser : public Fl_Browser_ {
31  protected:
32   /* required routines for Fl_Browser_subclass: */
33   void *item_first() const FL_OVERRIDE;
34   void *item_next(void *) const FL_OVERRIDE;
35   void *item_prev(void *) const FL_OVERRIDE;
36   int item_height(void *) const FL_OVERRIDE;
37   int item_width(void *) const FL_OVERRIDE;
38   int item_selected(void *) const FL_OVERRIDE;
39   const char *item_text(void *) const FL_OVERRIDE;
40
44   public:
45   void *item_at(int index) const FL_OVERRIDE;
46   void item_swap(int ia, int ib);
47   void item_swap(void *a, void *b) FL_OVERRIDE;
48
49   /* private data */
50
51   public: // IRIX 5.3 C++ compiler doesn't support private structures...
52
55   struct cb_item {
56     cb_item *next;
57     cb_item *prev;
58     char checked;
59     char selected;
60     char *text;
61   };
62 #ifndef FL_DOXYGEN
63 #endif // !FL_DOXYGEN
64
65   private:
66   cb_item *first;
67   cb_item *last;
68   cb_item *cache;
69   int cached_item;
70   int nitems_;
71   cb_item *find_item(int) const;
72   int lineno(cb_item *) const;
73
74   public:
75   Fl_Check_Browser(int x, int y, int w, int h, const char *l = 0);
76
77   // inline const char * methods to avoid breaking binary compatibility...
78   int add(const char *s) { return add((const char *)s); }
79   int add(const char *s, int b) { return add((const char *)s, b); }
80
82   void clear(); // delete all items


35.30 Fl_Check_Button.H

1 //
2 // Check button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 #ifndef Fl_Check_Button_H
17 #define Fl_Check_Button_H
18
19 #include "Fl_Light_Button.H"
20
21 /*
22 class: Fl_Check_Button.
23
24 A button with a "checkmark" to show its status.
25 */
26
27 class FL_EXPORT Fl_Check_Button : public Fl_Light_Button {
28   public:
29     Fl_Check_Button(int X, int Y, int W, int H, const char *L = 0);
30   }
31 #endif

35.31 Fl_Choice.H

1 //
2 // Choice header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 \
17 #ifndef Fl_Choice_H
18 #define Fl_Choice_H
19
20 #include "Fl_Menu_.H"
21
22 class FL_EXPORT Fl_Choice : public Fl_Menu_ {
23   public:
24     Fl_Choice(int X, int Y, int W, int H, const char *L = 0);
25   }
26 #endif

Generated by Doxygen
```c++
int handle(int) FL_OVERRIDE;

Fl_Choice(int X, int Y, int W, int H, const char *L = 0);

int value() const {return Fl_Menu_::value();}

int value(int v);

int value(const Fl_Menu_Item * v);

};

#endif

35.32 Fl_Clock.H

/*
 * file Fl_Clock, Fl_Clock_Output widgets . */

 ifndef Fl_Clock_H
 define Fl_Clock_H

 ifndef Fl_Widget_H
 include "Fl_Widget.H"

 // Values for type():
 // Please change doxygen documentation below (class Fl_Clock_Output)
 // accordingly as well when changing the following type values:

 define FL_SQUARE_CLOCK 0
 define FL_ROUND_CLOCK 1
 define FL_ANALOG_CLOCK FL_SQUARE_CLOCK
 define FL_DIGITAL_CLOCK FL_SQUARE_CLOCK

 // fabien: Please keep the horizontal formatting of both images in class desc,
 // don't lose vertical space for nothing!

class FL_EXPORT Fl_Clock_Output : public Fl_Widget {
    int hour_, minute_, second_;
    ulong value_;
    int shadow_; // draw shadows of hands

    void drawhands(Fl_Color, Fl_Color); // part of draw

 protected:
    void draw() FL_OVERRIDE;
    void draw(int X, int Y, int W, int H);

 public:

    Fl_Clock_Output(int X, int Y, int W, int H, const char *L = 0);

    void value(ulong v); // set to this Unix time

    void value(int H, int m, int s);

    ulong value() const {return value_};

    int hour() const {return hour_;}

    int minute() const {return minute_;}

    int second() const {return second_;}

    int shadow() const {return shadow_;}

    void shadow(int mode) { shadow_ = mode ? 1 : 0; }  

};

class FL_EXPORT Fl_Clock : public Fl_Clock_Output {

    Fl_ClockOutput(int X, int Y, int W, int H, const char *L = 0);

    void value(ulong v); // set to this Unix time

    void value(int H, int m, int s);

    ulong value() const {return value_};

    int hour() const {return hour_;}

    int minute() const {return minute_;}

    int second() const {return second_;}

    int shadow() const {return shadow_;}

    void shadow(int mode) { shadow_ = mode ? 1 : 0; }

};

// a Fl_Clock displays the current time always by using a timeout:

class FL_EXPORT Fl_Clock : public Fl_Clock_Output {

    Fl_ClockOutput(int X, int Y, int W, int H, const char *L = 0);

    void value(ulong v); // set to this Unix time

    void value(int H, int m, int s);

    ulong value() const {return value_};

    int hour() const {return hour_;}

    int minute() const {return minute_;}

    int second() const {return second_;}

    int shadow() const {return shadow_;}

    void shadow(int mode) { shadow_ = mode ? 1 : 0; }

};

Generated by Doxygen
```
35.33 Fl_Color_Chooser.H File Reference

Fl_Color_Chooser widget.

```c
#include <FL/Fl_Group.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Return_Button.H>
#include <FL/Fl_Choice.H>
#include <FL/Fl_Value_Input.H>
```

Classes

- class Fl_Color_Chooser

  The Fl_Color_Chooser widget provides a standard RGB color chooser.

35.34 Fl_Color_Chooser.H

Go to the documentation of this file.

```c
 ifndef Fl_Color_Chooser_H
 define Fl_Color_Chooser_H
 #ifndef FL_DOXYGEN
 class FL_EXPORT Flcc_HueBox : public Fl_Widget { int px, py;
 protected:
  void draw() FL_OVERRIDE;
  int handle_key(int);
 public:
  int handle(int) FL_OVERRIDE;
  Flcc_HueBox(int X, int Y, int W, int H) : Fl_Widget(X,Y,W,H) {
    px = py = 0;
  }
```

Generated by Doxygen
class FL_EXPORT Flcc_ValueBox : public Fl_Widget {
int py;
protected:
void draw() FL_OVERRIDE;
int handle_key(int);
public:
int handle(int) FL_OVERRIDE;
Flcc_ValueBox(int x, int y, int w, int h) : Fl_Widget(x, y, w, h) {
py = 0;
};
};

class FL_EXPORT Flcc_Value_Input : public Fl_Value_Input {
public:
int format(char *) FL_OVERRIDE;
Flcc_Value_Input(int x, int y, int w, int h) : Fl_Value_Input(x, y, w, h) {};
};

#if !FL_DOXYGEN
#endif

class FL_EXPORT Fl_Color_Chooser : public Fl_Group {
Flcc_HueBox huebox;
Flcc_ValueBox valuebox;
Fl_Choice choice;
Flcc_Value_Input rvalue;
Flcc_Value_Input gvalue;
Flcc_Value_Input bvalue;
Fl_Box resize_box;
double hue_, saturation_, value_, r_, g_, b_,
void set_valuators();
static void rgb_cb(Fl_Widget *, void*);
static void mode_cb(Fl_Widget *, void*);
public:
int handle(int e) FL_OVERRIDE;
int mode() {return choice.value();}
void mode(int newMode);
double hue() const {return hue_};
double saturation() const {return saturation_};
double value() const {return value_};
double r() const {return r_};
double g() const {return g_};
double b() const {return b_};
int hsv(double H, double S, double V);
int rgb(double R, double G, double B);
static void hsv2rgb(double H, double S, double V, double &R, double &G, double &B);
static void rgb2hsv(double R, double G, double B, double &H, double &S, double &V);
Fl_Color_Chooser(int X, int Y, int W, int H, const char *L = 0);
};

FL_EXPORT int fl_color_chooser(const char* name, double& r, double& g, double& b, int m=-1);
FL_EXPORT int fl_color_chooser(const char* name, uchar& r, uchar& g, uchar& b, int m=-1);
#endif

fl_config.h

1 /* FL/fl_config.h. Generated from fl_config.in by configure. */
2 /*
3 * Build configuration file for the Fast Light Tool Kit (FLTK).
4 *
5 * Copyright 1998-2021 by Bill Spitzak and others.
6 *
7 * This library is free software. Distribution and use rights are outlined in
8 * the file "COPYING" which should have been included with this file. If this
9 * file is missing or damaged, see the license at:
10 *
11 * https://www.fltk.org/COPYING.php
12 *
13 * Please see the following page on how to report bugs and issues:

Generated by Doxygen
14 * 15 * https://www.fltk.org/bugs.php 16 */ 17 #ifndef _FL_fl_config_h_ 18 #define _FL_fl_config_h_ 19 20 21 */ 22 * FL_ABI_VERSION (ABI version) 23 * 24 * define FL_ABI_VERSION: 1xxyy for 1.x.y (xx,yy with leading zero) 25 */ 26 27 */ #undef FL_ABI_VERSION */ 28 29 30 */ 31 * FLTK_HAVE_CAIRO 32 * 33 * Do we have the Cairo library available? 34 */ 35 36 */ #undef FLTK_HAVE_CAIRO */ 37 38 39 */ 40 * FLTK_HAVE_CAIROEXT 41 * 42 * Do we have the Cairo library available and want extended Cairo use in FLTK? 43 * This implies to link cairo.lib in all FLTK based apps. 44 */ 45 46 */ #undef FLTK_HAVE_CAIROEXT */ 47 48 49 */ 50 * FLTK_USE_X11 51 * 52 * Do we use X11 for the current platform? 53 * 54 */ 55 56 #define FLTK_USE_X11 1 57 58 59 */ 60 * FLTK_USE_CAIRO 61 * 62 * Do we use Cairo to draw to the display? 63 * 64 */ 65 66 */ #undef FLTK_USE_CAIRO */ 67 68 69 */ 70 * FLTK_USE_WAYLAND 71 * 72 * Do we use Wayland for the current platform? 73 * 74 */ 75 76 */ #undef FLTK_USE_WAYLAND */ 77 78 79 */ 80 * FLTK_USE_STD 81 * 82 * May we use std::string and std::vector for the current build? 83 * 84 * This is a build configuration option which allows FLTK to add some 85 * features based on std::string and std::vector in FLTK 1.4.x 86 * 87 */ 88 89 #define FLTK_USE_STD 0 90 91 #endif */ _FL_fl_config_h_ */

35.36 Fl_Copy_Surface.H

1 // 2 // Copy-to-clipboard code for the Fast Light Tool Kit (FLTK). 3 // 4 // Copyright 1998-2023 by Bill Spitzak and others.

Generated by Doxygen
#ifndef Fl_Copy_Surface_H
#define Fl_Copy_Surface_H

#include <FL/Fl_Widget_Surface.H>

class FL_EXPORT Fl_Copy_Surface : public Fl_Widget_Surface {
private:
    class Fl_Copy_Surface_Driver *platform_surface;
protected:
    void translate(int x, int y) FL_OVERRIDE;
    void untranslate() FL_OVERRIDE;
public:
    Fl_Copy_Surface(int w, int h);
    ~Fl_Copy_Surface();
    void set_current() FL_OVERRIDE;
    bool is_current() FL_OVERRIDE;
    int w();
    int h();
    void origin(int *x, int *y) FL_OVERRIDE;
    void origin(int x, int y) FL_OVERRIDE;
    int printable_rect(int *w, int *h) FL_OVERRIDE;
};

class Fl_Copy_Surface_Driver : public Fl_Widget_Surface {
friend class Fl_Copy_Surface;
protected:
    int width;
    int height;
public:
    Fl_Copy_Surface_Driver(int w, int h) : Fl_Widget_Surface(NULL), width(w), height(h) {}
    virtual ~Fl_Copy_Surface_Driver() {}
    virtual void set_current() FL_OVERRIDE = 0;
    virtual void translate(int x, int y) FL_OVERRIDE = 0;
    virtual void untranslate() FL_OVERRIDE = 0;
    int printable_rect(int *w, int *h) FL_OVERRIDE;
    static Fl_Copy_Surface_Driver *newCopySurfaceDriver(int w, int h);
};
#endif // Fl_Copy_Surface_H

---

35.37 Fl_Counter.H

1 //
2 // Counter header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 */
18 Fl_Counter widget. */
19
20 // A numerical value with up/down step buttons. From Forms.
21
22 #ifndef Fl_Counter_H
23 #define Fl_Counter_H
24
25 #ifndef Fl_Valuator_H
26 #include "Fl_Valuator.H"
27 #endif
28
29 // values for type():
30 #define FL_NORMAL_COUNTER 0
31 #define FL_SIMPLE_COUNTER 1

Generated by Doxygen
```cpp
class FL_EXPORT Fl_Counter : public Fl_Valuator {
  Fl_Font textfont_;  // compute widths of arrow boxes
  Fl_Fontsize textsize_;  // compute widths of arrow boxes
  Fl_Color textcolor_;  // compute widths of arrow boxes
  double lstep_;  // compute widths of arrow boxes
  uchar mouseobj_;  // compute widths of arrow boxes
  static void repeat_callback(void *);
  int calc_mouseobj();
  void increment_cb();

protected:
  void draw() FL_OVERRIDE;
  void arrow_widths(int &w1, int &w2);

public:
  int handle(int) FL_OVERRIDE;
  Fl_Counter(int X, int Y, int W, int H, const char * L = 0);
  ~Fl_Counter();
  void lstep(double a) {lstep_ = a;}
  void step(double a, double b) {Fl_Valuator::step(a); lstep_ = b;}
  void step(double a) {Fl_Valuator::step(a);}
  double step() const {return Fl_Valuator::step();}
  Fl_Font textfont() const {return textfont_;}
  void textfont(Fl_Font s) {textfont_ = s;}
  Fl_Fontsize textsize() const {return textsize_;}
  void textsize(Fl_Fontsize s) {textsize_ = s;}
  Fl_Color textcolor() const {return textcolor_;}
  void textcolor(Fl_Color s) {textcolor_ = s;}
};
```

35.38 Fl_Device.H File Reference

Declaration of classes Fl_Surface_Device, Fl_Display_Device, Fl_Device_Plugin.

#include <FL/Fl_Plugin.H>
#include <FL/platform_types.h>

Classes

- class Fl_Device_Plugin

  This plugin socket allows the integration of new device drivers for special window or screen types.

- class Fl_Display_Device

  The computer's display.

- class Fl_Surface_Device

  A drawing surface that's susceptible to receive graphical output.

35.38.1 Detailed Description

Declaration of classes Fl_Surface_Device, Fl_Display_Device, Fl_Device_Plugin.

35.39 Fl_Device.H

Go to the documentation of this file.
# Fl_Surface_Device

```cpp
class FL_EXPORT Fl_Surface_Device {
  Fl_Graphics_Driver *pGraphicsDriver;
  static Fl_Surface_Device *surface_; // the surface that currently receives graphics requests
  static Fl_Surface_Device *default_surface(); // create surface if none exists yet
  protected:
    virtual void end_current() { surface_ = 0;}
    Fl_Surface_Device(Fl_Graphics_Driver *graphics_driver) {pGraphicsDriver = graphics_driver; }
    inline void driver(Fl_Graphics_Driver *graphics_driver) {pGraphicsDriver = graphics_driver; }
  public:
    virtual void set_current(void);
    virtual bool is_current();
    inline Fl_Graphics_Driver *driver() {return pGraphicsDriver; }
    static inline Fl_Surface_Device *surface() {
      return surface_ ? surface_ : default_surface();
    }
    virtual ~Fl_Surface_Device();
    static void push_current(Fl_Surface_Device *new_current);
    static Fl_Surface_Device *pop_current();
  }
}
```

## Fl_Display_Device

```cpp
class FL_EXPORT Fl_Display_Device : public Fl_Surface_Device {
  Fl_Display_Device(Fl_Graphics_Driver *graphics_driver);  
}
```

## Fl_Device_Plugin

```cpp
class Fl_Device_Plugin : public Fl_Plugin {
  public:
    Fl_Device_Plugin(const char *pluginName)
      : Fl_Plugin(klass(), pluginName) { }
    virtual const char *klass() { return "fltk:device"; }
    virtual const char *name() = 0;
    virtual int print(Fl_Widget *w) = 0;
    virtual Fl_RGB_Image *rectangle_capture(Fl_Widget *widget, int x, int y, int w, int h) = 0;
    static Fl_Device_Plugin *opengl_plugin();
  }
}
```

---

## Fl_Dial

```cpp
#ifndef Fl_Dial_H
#define Fl_Dial_H
#include <FL/Fl_Plugin.H>
#include <FL/platform_types.h>

class Fl_Graphics_Driver;
class Fl_RGB_Image;
class Fl_Widget;
class Fl_Image_Surface;

class FL_EXPORT Fl_Surface_Device {
  Fl_Graphics_Driver *pGraphicsDriver;
  static Fl_Surface_Device *surface_; // the surface that currently receives graphics requests
  static Fl_Surface_Device *default_surface(); // create surface if none exists yet
  protected:
    virtual void end_current() { surface_ = 0;}
    Fl_Surface_Device(Fl_Graphics_Driver *graphics_driver) {pGraphicsDriver = graphics_driver; }
    inline void driver(Fl_Graphics_Driver *graphics_driver) {pGraphicsDriver = graphics_driver; }
  public:
    virtual void set_current(void);
    virtual bool is_current();
    inline Fl_Graphics_Driver *driver() {return pGraphicsDriver; }
    static inline Fl_Surface_Device *surface() {
      return surface_ ? surface_ : default_surface();
    }
    virtual ~Fl_Surface_Device();
    static void push_current(Fl_Surface_Device *new_current);
    static Fl_Surface_Device *pop_current();
  }
}
```

```cpp
class FL_EXPORT Fl_Display_Device : public Fl_Surface_Device {
  Fl_Display_Device(Fl_Graphics_Driver *graphics_driver);
}
```

```cpp
class Fl_Device_Plugin : public Fl_Plugin {
  public:
    Fl_Device_Plugin(const char *pluginName)
      : Fl_Plugin(klass(), pluginName) { }
    virtual const char *klass() { return "fltk:device"; }
    virtual const char *name() = 0;
    virtual int print(Fl_Widget *w) = 0;
    virtual Fl_RGB_Image *rectangle_capture(Fl_Widget *widget, int x, int y, int w, int h) = 0;
    static Fl_Device_Plugin *opengl_plugin();
  }
}
```

---

## Fl_Dial

```cpp
# ifndef Fl_Dial_H
#define Fl_Dial_H
#endif // Fl_Dial_H
```

---

## Fl_Dial

```cpp
// Fl_Dial.H
```

---

## Fl_Dial

```cpp
// Fl_Dial.H
```

---

## Fl_Dial

```cpp
// Fl_Dial.H
```
35.41 Fl_Double_Window.H

1 // 2 // Double-buffered window header file for the Fast Light Tool Kit (FLTK). 3 // 4 // Copyright 1998-2010 by Bill Spitzak and others. 5 // 6 // This library is free software. Distribution and use rights are outlined in 7 // the file "COPYING" which should have been included with this file. If this 8 // file is missing or damaged, see the license at: 9 // 10 // https://www.fltk.org/COPYING.php 11 // 12 // Please see the following page on how to report bugs and issues: 13 // 14 // https://www.fltk.org/bugs.php 15 // 16 17 /* 18 Fl_Double_Window widget. */ 19 20 ifndef Fl_Double_Window_H 21 #define Fl_Double_Window_H 22 23 #include "Fl_Window.H" 24 25 class FL_EXPORT Fl_Double_Window : public Fl_Window { 26 ( 27 public: 28 Fl_Double_Window *as_double_window() FL_OVERRIDE {return this; } 29 void show() FL_OVERRIDE; 30 void show(int a, char *b) [Fl_Window:show(a,b)]; 31 void resize(int, int, int, int) FL_OVERRIDE; 32 void hide() FL_OVERRIDE; 33 void flush() FL_OVERRIDE; 34 ~Fl_Double_Window(); 35 36 Fl_Double_Window(int w, int h, const char *l = 0); 37 Fl_Double_Window(int X, int Y, int W, int H, const char *l = 0); 38 39}; 40 41 #endif
35.42 fl_draw.H File Reference

utility header to pull drawing functions together
#include <FL/Enumerations.H>
#include <FL/Fl_Graphics_Driver.H>
#include <FL/Fl_Rect.H>

Enumerations

enum {
    FL_SOLID = 0 , FL_DASH = 1 , FL_DOT = 2 , FL_DASHDOT = 3 ,
    FL_DASHDOTDOT = 4 , FL_CAP_FLAT = 0x100 , FL_CAP_ROUND = 0x200 , FL_CAP_SQUARE = 0x300 ,
    FL_JOIN_MITER = 0x1000 , FL_JOIN_ROUND = 0x2000 , FL_JOIN_BEVEL = 0x3000
}

Functions

• int fl_add_symbol (const char ∗name, void(∗drawit)(Fl_Color), int scalable)
    Adds a symbol to the system.

• int fl_antialias ()
    Return whether line drawings are currently antialiased.

• void fl_antialias (int state)
    Turn antialiased line drawings ON or OFF, if supported by platform.

• void fl_arc (double x, double y, double r, double start, double end)
    Add a series of points to the current path on the arc of a circle.

• void fl_arc (int x, int y, int w, int h, double a1, double a2)
    Draw ellipse sections using integer coordinates.

• void fl_begin_complex_polygon ()
    Start drawing a complex filled polygon.

• void fl_begin_line ()
    Start drawing a list of lines.

• void fl_begin_loop ()
    Start drawing a closed sequence of lines.

• void fl_begin_offscreen (Fl_Offscreen ctx)
    Send all subsequent drawing commands to this offscreen buffer.

• void fl_begin_points ()
    Start drawing a list of points.

• void fl_begin_polygon ()
    Start drawing a convex filled polygon.

• char fl_can_do_alpha_blending ()
    Check whether platform supports true alpha blending for RGBA images.

• Fl_RGB_Image ∗ fl_capture_window (Fl_Window ∗win, int x, int y, int w, int h)
    Captures the content of a rectangular zone of a mapped window.

• void fl_chord (int x, int y, int w, int h, double a1, double a2)
    fl_chord declaration is a place holder - the function does not yet exist

• void fl_circle (double x, double y, double r)
    fl_circle(x,y,r) is equivalent to fl_arc(x,y,r,0,360), but may be faster.

• void fl_clip (int x, int y, int w, int h)
    Intersect the current clip region with a rectangle and push this new region onto the stack (deprecated).

• int fl_clip_box (int x, int y, int w, int h, int &X, int &Y , int &W, int &H)
    Intersect a rectangle with the current clip region and return the bounding box of the result.

• Fl_Region fl_clip_region ()
    Return the current clipping region.
• void fl_clip_region (Fl_Region r)
  Replace the top of the clipping stack with a clipping region of any shape.

• Fl_Color fl_color ()
  Return the last fl_color() that was set.

• void fl_color (Fl_Color c)
  Set the color for all subsequent drawing operations.

• void fl_color (int c)
  for back compatibility - use fl_color(Fl_Color c) instead

• void fl_color (uchar r, uchar g, uchar b)
  Set the color for all subsequent drawing operations.

• void fl_copy_offscreen (int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy)
  Copy a rectangular area of the given offscreen buffer into the current drawing destination.

• Fl_Offscreen fl_create_offscreen (int w, int h)
  Creation of an offscreen graphics buffer.

• void fl_cursor (Fl_Cursor)
  Sets the cursor for the current window to the specified shape and colors.

• void fl_cursor (Fl_Cursor, Fl_Color fg, Fl_Color bg=FL_WHITE)

• void fl_curve (double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3)
  Add a series of points on a Bézier curve to the path.

• void fl_delete_offscreen (Fl_Offscreen ctx)
  Deletion of an offscreen graphics buffer.

• int fl_descent ()
  Return the recommended distance above the bottom of a fl_height() tall box to draw the text at so it looks centered vertically in that box.

• void fl_draw (const char ∗str, int n, int x, int y)
  Draws starting at the given x, y location a UTF-8 string of length n bytes.

• void fl_draw (const char ∗str, int x, int y)
  Draw a nul-terminated UTF-8 string starting at the given x, y location.

• void fl_draw (const char ∗str, int x, int y, int w, int h, Fl_Align align, Fl_Image ∗img=0, int draw_symbols=1)
  Fancy string drawing function which is used to draw all the labels.

• void fl_draw (const char ∗str, int x, int y, int w, int h, Fl_Align align, Fl_Image ∗img=0, int draw_symbols=1)
  The same as fl_draw(const char ∗str, int, int, int, Fl_Align, Fl_Image ∗img=0, int draw_symbols=1) with the addition of the calithis parameter, which is a pointer to a text drawing function such as fl_draw(const char ∗str, int, int, int) to do the real work.

• void fl_draw (int angle, const char ∗str, int x, int y, int, int)
  Draw at the given x, y location a UTF-8 string of length n bytes rotating angle degrees counter-clockwise.

• void fl_draw (int angle, const char ∗str, int x, int y)
  Draw a nul-terminated UTF-8 string starting at the given x, y location and rotating angle degrees counter-clockwise.

• void fl_draw_arrow (Fl_Rect bb, Fl_Arrow_Type t, Fl_Orientation o, Fl_Color color)
  Draw an "arrow like" GUI element for the selected scheme.

• void fl_draw_box (Fl_Boxtype, int x, int y, int w, int h, Fl_Color)
  Draws a box using given type, position, size and color.

• void fl_draw_check (Fl_Rect bb, Fl_Color col)
  Draw a check mark inside the given bounding box.

• void fl_draw_circle (int x, int y, int d, Fl_Color color)
  Draw a potentially small, filled circle using a given color.

• void fl_draw_image (const uchar ∗buf, int X, int Y, int W, int H, int D=3, int L=0)
  Draw an 8-bit per color RGB or luminance image.

• void fl_draw_image (Fl_Draw_Image_Cb cb, void ∗data, int X, int Y, int W, int H, int D=3)
  Draw an image using a callback function to generate image data.

• void fl_draw_image_mono (const uchar ∗buf, int X, int Y, int W, int H, int D=1, int L=0)

Generated by Doxygen
Draw a gray-scale (1 channel) image.

- void fl_draw_image_mono (Fl_Draw_Image_Cb cb, void *data, int X, int Y, int W, int H, int D=1)
  
  Draw a gray-scale image using a callback function to generate image data.

- int fl_draw_pixmap (char *const *data, int x, int y, Fl_Color bg=FL_GRAY)
  
  Draw XPM image data, with the top-left corner at the given position.

- int fl_draw_pixmap (const char *const *data, int x, int y, Fl_Color bg=FL_GRAY)
  
  Draw XPM image data, with the top-left corner at the given position.

- void fl_draw_radio (int x, int y, int d, Fl_Color color)
  
  Draw a round check mark (circle) of a radio button.

- int fl_draw_symbol (const char *label, int x, int y, int w, int h, Fl_Color)
  
  Draw the named symbol in the given rectangle using the given color.

- void fl_end_complex_polygon ()
  
  End complex filled polygon, and draw.

- void fl_end_line ()
  
  End list of lines, and draw.

- void fl_end_loop ()
  
  End closed sequence of lines, and draw.

- void fl_end_offscreen ()
  
  Quit sending drawing commands to the current offscreen buffer.

- void fl_end_points ()
  
  End list of points, and draw.

- void fl_end_polygon ()
  
  End convex filled polygon, and draw.

- const char * fl_expand_text (const char *from, char *buf, int maxbuf, double maxw, int &n, double &width, int wrap, int draw_symbols=0)
  
  Copy from to buf, replacing control characters with ^X.

- void fl_focus_rect (int x, int y, int w, int h)
  
  Draw a dotted rectangle, used to indicate keyboard focus on a widget.

- Fl_Font fl_font ()
  
  Return the face set by the most recent call to fl_font().

- void fl_font (Fl_Font face, Fl_Fontsize fsize)
  
  Sets the current font, which is then used in various drawing routines.

- void fl_frame (const char *s, int x, int y, int w, int h)
  
  Draws a series of line segments around the given box.

- void fl_frame2 (const char *s, int x, int y, int w, int h)
  
  Draws a series of line segments around the given box.

- void fl_gap ()
  
  Separate loops of the path.

- int fl_height ()
  
  Return the recommended minimum line spacing for the current font.

- int fl_height (int font, int size)
  
  This function returns the actual height of the specified font and size.

- const char * fl_latin1_to_local (const char *t, int n=-1)
  
  Convert text from Windows/X11 latin1 character set to local encoding.

- void fl_line (int x, int y, int x1, int y1)
  
  Draw a line from (x,y) to (x1,y1)

- void fl_line (int x, int y, int x1, int y1, int x2, int y2)
  
  Draw a line from (x,y) to (x1,y1) and another from (x1,y1) to (x2,y2)

- void fl_line_style (int style, int width=0, char *dashes=0)
  
  Set how to draw lines (the “pen”).
Set the transformation matrix to identity.

- void fl_load_matrix (double a, double b, double c, double d, double x, double y)
  Set the current transformation matrix.
  
- const char * fl_local_to_latin1 (const char *t, int n=-1)
  Convert text from local encoding to Windows/X11 latin1 character set.
  
- const char * fl_local_to_mac_roman (const char *t, int n=-1)
  Convert text from local encoding to Mac Roman character set.
  
- void fl_loop (int x, int y, int x1, int y1, int x2, int y2)
  Outline a 3-sided polygon with lines.
  
- void fl_loop (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
  Outline a 4-sided polygon with lines.
  
- const char * fl_mac_roman_to_local (const char *t, int n=-1)
  Convert text from Mac Roman character set to local encoding.
  
- void fl_measure (const char *str, int &x, int &y, int draw_symbols=1)
  Measure how wide and tall the string will be when printed by the fl_draw() function with align parameter.
  
- int fl_measure_pixmap (char *const *data, int &w, int &h)
  Get the dimensions of a pixmap.
  
- int fl_measure_pixmap (const char *const *cdata, int &w, int &h)
  Get the dimensions of a pixmap.
  
- void fl_mult_matrix (double a, double b, double c, double d, double x, double y)
  Concatenate another transformation onto the current one.
  
- int fl_not_clipped (int x, int y, int w, int h)
  Does the rectangle intersect the current clip region?
  
- unsigned int fl_old_shortcut (const char *s)
  Emulation of XForms named shortcuts.
  
- void fl_overlay_clear ()
  Erase a selection rectangle without drawing a new one.
  
- void fl_overlay_rect (int x, int y, int w, int h)
  Draw a transient dotted selection rectangle.
  
- float fl_override_scale ()
  Removes any GUI scaling factor in subsequent drawing operations.
  
- void fl_pie (int x, int y, int w, int h, double a1, double a2)
  Draw filled ellipse sections using integer coordinates.
  
- void fl_point (int x, int y)
  Draw a single pixel at the given coordinates.
  
- void fl_polygon (int x, int y, int x1, int y1, int x2, int y2)
  Fill a 3-sided polygon.
  
- void fl_polygon (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
  Fill a 4-sided polygon.
  
- void fl_pop_clip ()
  Restore the previous clip region.
  
- void fl_pop_matrix ()
  Restore the current transformation matrix from the stack.
  
- void fl_push_clip (int x, int y, int w, int h)
  Intersect the current clip region with a rectangle and push this new region onto the stack.
  
- void fl_push_matrix ()
  Save the current transformation matrix on the stack.
  
- void fl_push_no_clip ()
  Push an empty clip region onto the stack so nothing will be clipped.
  
- uchar * fl_read_image (uchar *p, int X, int Y, int W, int H, int alpha=0)
  Reads an RGB(A) image from the current window or off-screen buffer.
• void fl_rect (Fl_Rect r)
  Draw a border inside the given bounding box.
• void fl_rect (int x, int y, int w, int h)
  Draw a border inside the given bounding box.
• void fl_rect (int x, int y, int w, int h, Fl_Color c)
  Draw with passed color a border inside the given bounding box.
• void fl_rectf (Fl_Rect bb, uchar r, uchar g, uchar b)
  Color a rectangle with "exactly" the passed r, g, b color.
• void fl_rectf (Fl_Rect r)
  Color with current color a rectangle that exactly fills the given bounding box.
• void fl_rectf (Fl_Rect r, Fl_Color c)
  Color with passed color a rectangle that exactly fills the given bounding box.
• void fl_rectf (int x, int y, int w, int h)
  Color with current color a rectangle that exactly fills the given bounding box.
• void fl_rectf (int x, int y, int w, int h, Fl_Color c)
  Color with passed color a rectangle that exactly fills the given bounding box.
• void fl_rectf (int x, int y, int w, int h, uchar r, uchar g, uchar b)
  Color a rectangle with "exactly" the passed r, g, b color.
• void fl_rescale_offscreen (Fl_Offscreen &ctx)
  Adapts an offscreen buffer to a changed value of the scale factor.
• void fl_reset_spot (void)
  Resets marked text.
• void fl_restore_clip ()
  Undo any clobbering of the clip region done by your program.
• void fl_restore_scale (float s)
  Restores the GUI scaling factor and the clipping region in subsequent drawing operations.
• void fl_rotate (double d)
  Concatenate rotation transformation onto the current one.
• void fl_rounded_rect (int x, int y, int w, int h, int r)
  Draw a rounded border inside the given bounding box.
• void fl_rounded_rectf (int x, int y, int w, int h, int r)
  Color with current color a rounded rectangle that exactly fills the given bounding box.
• void fl_rtl_draw (const char *str, int n, int x, int y)
  Draw a UTF-8 string of length n bytes right to left starting at the given x, y location.
• void fl_scale (double x)
  Concatenate scaling transformation onto the current one.
• void fl_scale (double x, double y)
  Concatenate scaling transformation onto the current one.
• void fl_scroll (int X, int Y, int W, int H, int dx, int dy, void(*draw_area)(void *, int, int, int, int), void *data)
  Scroll a rectangle and draw the newly exposed portions.
• void fl_set_spot (int font, int size, int X, int Y, int W, int H, Fl_Window *win=0)
  Inform text input methods about the current text insertion cursor.
• void fl_set_status (int X, int Y, int W, int H)
  Related to text input methods under X11.
• const char * flShortcut_label (unsigned int shortcut)
  Get a human-readable string from a shortcut value.
• const char * flShortcut_label (unsigned int shortcut, const char **eom)
  Get a human-readable string from a shortcut value.
• Fl_Fontsize fl_size ()
  Return the size set by the most recent call to fl_font().
• void fl_text_extents (const char *, int &dx, int &dy, int &w, int &h)
Determine the minimum pixel dimensions of a null-terminated string using the current \texttt{fl_font()}.

- \texttt{void fl_text_extents (const char *t, int n, int &dx, int &dy, int &w, int &h)}
  Determine the minimum pixel dimensions of a sequence of \textit{n} characters (bytes) using the current \texttt{fl_font()}.

- \texttt{double fl_transform_dx (double x, double y)}
  Transform distance using current transformation matrix.

- \texttt{double fl_transform_dy (double x, double y)}
  Transform distance using current transformation matrix.

- \texttt{double fl_transform_x (double x, double y)}
  Transform coordinate using the current transformation matrix.

- \texttt{double fl_transform_y (double x, double y)}
  Transform coordinate using the current transformation matrix.

- \texttt{void fl_transformed_vertex (double xf, double yf)}
  Add coordinate pair to the vertex list without further transformations.

- \texttt{void fl_translate (double x, double y)}
  Concatenate translation transformation onto the current one.

- \texttt{void fl_vertex (double x, double y)}
  Add a single vertex to the current path.

- \texttt{double fl_width (const char *txt)}
  Return the typographical width of a null-terminated string using the current font face and size.

- \texttt{double fl_width (const char *txt, int n)}
  Return the typographical width of a sequence of \textit{n} characters using the current font face and size.

- \texttt{double fl_width (unsigned int c)}
  Return the typographical width of a single character using the current font face and size.

- \texttt{void fl_xyline (int x, int y, int x1)}
  Draw a horizontal line from \((x,y)\) to \((x1,y)\).

- \texttt{void fl_xyline (int x, int y, int x1, int y2)}
  Draw a horizontal line from \((x,y)\) to \((x1,y)\), then vertical from \((x1,y)\) to \((x1,y2)\).

- \texttt{void fl_xyline (int x, int y, int x1, int y2, int x3)}
  Draw a horizontal line from \((x,y)\) to \((x1,y)\), then a vertical from \((x1,y)\) to \((x1,y2)\) and then another horizontal from \((x1,y2)\) to \((x3,y2)\).

- \texttt{void fl_yxline (int x, int y, int y1)}
  Draw a vertical line from \((x,y)\) to \((x,y1)\).

- \texttt{void fl_yxline (int x, int y, int y1, int x2)}
  Draw a vertical line from \((x,y)\) to \((x,y1)\), then a horizontal from \((x,y1)\) to \((x2,y1)\).

- \texttt{void fl_yxline (int x, int y, int y1, int x2, int y3)}
  Draw a vertical line from \((x,y)\) to \((x,y1)\), then a horizontal from \((x,y1)\) to \((x2,y1)\), then another vertical from \((x2,y1)\) to \((x2,y3)\).

**Variables**

- \texttt{char fl_drawShortcut}  
  utility header to pull drawing functions together
35.43 fl_draw.H

Go to the documentation of this file.

```c
#ifndef fl_draw_H
#define fl_draw_H

#include <FL/Enumerations.H> // color names
#include <FL/Fl_Graphics_Driver.H> // fl_graphics_driver + Fl_Region
#include <FL/Fl_Rect.H>

// Image class...
class Fl_Image;
class Fl_Window;

// Label flags...
FL_EXPORT extern char fl_draw_shortcut;

class Fl_Draw

// Colors:
inline void fl_color(Fl_Color c) {
   fl_graphics_driver->color(c);
} // select indexed color
inline void fl_color(int c) {
   fl_color((Fl_Color)c);
}
inline void fl_color(uchar r, uchar g, uchar b) {
   fl_graphics_driver->color(r, g, b);
}
inline Fl_Color fl_color() {
   return fl_graphics_driver->color();
}

// clip:
inline void fl_push_clip(int x, int y, int w, int h) {
   fl_graphics_driver->push_clip(x, y, w, h);
}
inline void fl_clip(int x, int y, int w, int h) {
   fl_graphics_driver->push_clip(x, y, w, h);
}
inline void fl_push_no_clip() {
   fl_graphics_driver->push_no_clip();
}
inline void fl_pop_clip() {
   fl_graphics_driver->pop_clip();
}
inline void fl_restore_clip() {
   fl_graphics_driver->restore_clip();
}
inline void fl_clip_region(Fl_Region r) {
   fl_graphics_driver->clip_region(r);
}
inline Fl_Region fl_clip_region() {
   return fl_graphics_driver->clip_region();
}

// points:
inline void fl_point(int x, int y) {
   fl_graphics_driver->point(x, y);
}
```

Generated by Doxygen
// line type:
inline void fl_line_style(int style, int width = 0, char *dashes = 0) {
    fl_graphics_driver->line_style(style, width, dashes);
}

enum {
    FL_SOLID = 0,
    FL_DASH = 1,
    FL_DOT = 2,
    FL_DASHDOT = 3,
    FL_DASHDOTDOT = 4,
    FL_CAP_FLAT = 0x100,
    FL_CAP_ROUND = 0x200,
    FL_CAP_SQUARE = 0x300,
    FL_JOIN_MITER = 0x1000,
    FL_JOIN_ROUND = 0x2000,
    FL_JOIN_BEVEL = 0x3000
};

inline void fl_antialias(int state) {
    fl_graphics_driver->antialias(state);
}

inline int fl_antialias() {
    return fl_graphics_driver->antialias();
}

// rectangles tweaked to exactly fill the pixel rectangle:
inline void fl_rect(int x, int y, int w, int h) {
    fl_graphics_driver->rect(x, y, w, h);
}
inline void fl_rounded_rect(int x, int y, int w, int h, int r) {
    fl_graphics_driver->rounded_rect(x, y, w, h, r);
}
inline void fl_rect(Fl_Rect r) {
    fl_rect(r.x(), r.y(), r.w(), r.h());
}
inline void fl_rounded_rect(Fl_Rect r, int r) {
    fl_graphics_driver->rounded_rect(r.x(), r.y(), r.w(), r.h(), r);
}
inline void fl_rect(int x, int y, int w, int h, Fl_Color c) {
    fl_color(c);
    fl_rect(x, y, w, h);
}
inline void fl_rectf(int x, int y, int w, int h) {
    fl_graphics_driver->rectf(x, y, w, h);
}
inline void fl_rounded_rectf(int x, int y, int w, int h, int r) {
    fl_graphics_driver->rounded_rectf(x, y, w, h, r);
}
inline void fl_rectf(Fl_Rect r) {
    fl_rectf(r.x(), r.y(), r.w(), r.h());
}
inline void fl_rectf(Fl_Rect r, Fl_Color c) {
    fl_color(c);
    fl_rectf(r);
}
inline void fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b) {
    fl_graphics_driver->colored_rectf(x, y, w, h, r, g, b);
}
inline void fl_rectf(Fl_Rect bb, uchar r, uchar g, uchar b) {
    fl_graphics_driver->colored_rectf(bb.x(), bb.y(), bb.w(), bb.h(), r, g, b);
}

// line segments:
inline void fl_line(int x, int y, int x1, int y1) {
    fl_graphics_driver->line(x, y, x1, y1);
}
inline void fl_line(int x, int y, int x1, int y1, int x2, int y2) {
    fl_graphics_driver->line(x, y, x1, y1, x2, y2);
}
// closed line segments:
inline void fl_loop(int x, int y, int x1, int y1, int x2, int y2) {
    fl_graphics_driver->loop(x, y, x1, y1, x2, y2);
}

inline void fl_loop(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3) {
    fl_graphics_driver->loop(x, y, x1, y1, x2, y2, x3, y3);
}

// filled polygons
inline void fl_polygon(int x, int y, int x1, int y1, int x2, int y2) {
    fl_graphics_driver->polygon(x, y, x1, y1, x2, y2);
}

inline void fl_polygon(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3) {
    fl_graphics_driver->polygon(x, y, x1, y1, x2, y2, x3, y3);
}

// draw rectilinear lines, horizontal segment first:
inline void fl_xyline(int x, int y, int x1) {
    fl_graphics_driver->xyline(x, y, x1);
}

inline void fl_xyline(int x, int y, int x1, int y2) {
    fl_graphics_driver->xyline(x, y, x1, y2);
}

inline void fl_xyline(int x, int y, int x1, int y2, int x3) {
    fl_graphics_driver->xyline(x, y, x1, y2, x3);
}

// draw rectilinear lines, vertical segment first:
inline void fl_yxline(int x, int y, int y1) {
    fl_graphics_driver->yxline(x, y, y1);
}

inline void fl_yxline(int x, int y, int y1, int x2) {
    fl_graphics_driver->yxline(x, y, y1, x2);
}

inline void fl_yxline(int x, int y, int y1, int x2, int y3) {
    fl_graphics_driver->yxline(x, y, y1, x2, y3);
}

// circular lines and pie slices (code in fl_arci.C):
inline void fl_arc(int x, int y, int w, int h, double a1, double a2) {
    fl_graphics_driver->arc(x, y, w, h, a1, a2);
}

inline void fl_pie(int x, int y, int w, int h, double a1, double a2) {
    fl_graphics_driver->pie(x, y, w, h, a1, a2);
}

FL_EXPORT void fl_chord(int x, int y, int w, int h, double a1, double a2); // nyi

// scalable drawing code (code in fl_vertex.cxx and fl_arc.cxx):
inline void fl_push_matrix() {
    fl_graphics_driver->push_matrix();
}

inline void fl_pop_matrix() {
    fl_graphics_driver->pop_matrix();
}

inline void fl_scale(double x, double y) {
    fl_graphics_driver->mult_matrix(x, 0, 0, y, 0, 0);
}

inline void fl_scale(double x) {
    fl_graphics_driver->mult_matrix(x, 0, 0, x, 0, 0);
}

inline void fl_translate(double x, double y) {
    fl_graphics_driver->translate(x, y);
}

inline void fl_rotate(double d) {
    fl_graphics_driver->rotate(d);
}

inline void fl_load_identity() {
    fl_graphics_driver->load_identity();
}

inline void fl_load_matrix(double a, double b, double c, double d, double x, double y) {
    fl_graphics_driver->load_matrix(a, b, c, d, x, y);
}

inline void fl_mult_matrix(double a, double b, double c, double d, double x, double y) {
    fl_graphics_driver->mult_matrix(a, b, c, d, x, y);
}

inline void fl_begin_points() {
    fl_graphics_driver->begin_points();
}

inline void fl_begin_line() {
    fl_graphics_driver->begin_line();
}

inline void fl_begin_loop() {
    fl_graphics_driver->begin_loop();
}

inline void fl_begin_polygon() {
604    fl_graphics_driver->begin_polygon();
605 }
606 inline void fl_vertex(double x, double y) {
607     fl_graphics_driver->vertex(x, y);
608 }
609 inline void fl_curve(double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3) {
610     fl_graphics_driver->curve(X0, Y0, X1, Y1, X2, Y2, X3, Y3);
611 }
612 inline void fl_arc(double x, double y, double r, double start, double end) {
613     fl_graphics_driver->arc(x, y, r, start, end);
614 }
615 inline void fl_circle(double x, double y, double r) {
616     fl_graphics_driver->circle(x, y, r);
617 }
618 inline void fl_end_points() {
619     fl_graphics_driver->end_points();
620 }
621 inline void fl_end_line() {
622     fl_graphics_driver->end_line();
623 }
624 inline void fl_end_loop() {
625     fl_graphics_driver->end_loop();
626 }
627 inline void fl_end_polygon() {
628     fl_graphics_driver->end_polygon();
629 }
630 inline void fl_begin_complex_polygon() {
631     fl_graphics_driver->begin_complex_polygon();
632 }
633 inline void fl_gap() {
634     fl_graphics_driver->gap();
635 }
636 inline void fl_end_complex_polygon() {
637     fl_graphics_driver->end_complex_polygon();
638 }
639 inline double fl_transform_x(double x, double y) {
640     return fl_graphics_driver->transform_x(x, y);
641 }
642 inline double fl_transform_y(double x, double y) {
643     return fl_graphics_driver->transform_y(x, y);
644 }
645 inline double fl_transform_dx(double x, double y) {
646     return fl_graphics_driver->transform_dx(x, y);
647 }
648 inline double fl_transform_dy(double x, double y) {
649     return fl_graphics_driver->transform_dy(x, y);
650 }
651 inline void fl_transformed_vertex(double xf, double yf) {
652     fl_graphics_driver->transformed_vertex(xf, yf);
653 }
654 inline void fl_copy_offscreen(int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy) {
655     fl_graphics_driver->copy_offscreen(x, y, w, h, pixmap, srcx, srcy);
656 }
657 #define fl_create_offscreen(w, h) fl_create_offscreen(w, h, Fl_Offscreen(*this));
658 FL_EXPORT void fl_begin_offscreen(Fl_Offscreen b);
659 FL_EXPORT void fl_end_offscreen(void);
660 FL_EXPORT void fl_delete_offscreen(Fl_Offscreen ctx);
661 FL_EXPORT void fl_rescale_offscreen(Fl_Offscreen &ctx);
662 // Get and use transformed positions:
663 inline double fl_transform_x(double x, double y) {
664     return fl_graphics_driver->transform_x(x, y);
665 }
666 inline double fl_transform_y(double x, double y) {
667     return fl_graphics_driver->transform_y(x, y);
668 }
669 inline double fl_transform_dx(double x, double y) {
670     return fl_graphics_driver->transform_dx(x, y);
671 }
672 inline double fl_transform_dy(double x, double y) {
673     return fl_graphics_driver->transform_dy(x, y);
674 }
675 inline void fl_transformed_vertex(double xf, double yf) {
676     fl_graphics_driver->transformed_vertex(xf, yf);
677 }
678 inline void fl_font(Fl_Font face, Fl_Fontsize fsize) {
679     fl_graphics_driver->font(face, fsize);
680     fl_graphics_driver->size(fsize);
681 }
682 inline Fl_Font fl_font() {
683     return fl_graphics_driver->font();
684 }
685 inline Fl_Fontsize fl_size() {
686     return fl_graphics_driver->size();
687 }
688 inline int fl_height() {
689     return fl_graphics_driver->height();
690 }
691 inline int fl_descent() {
692     return fl_graphics_driver->descent();
693 }
694 // Fonts:
695 /*
696 Set the current font, which is then used in various drawing routines.
697 Implemented and documented in src/fl_draw.cxx
698 */
699 FL_EXPORT void fl_begin_font(Fl_Font face, Fl_Fontsize fsize);
700 inline Fl_Font fl_font() {
701     return fl_graphics_driver->font();
702 }
703 inline Fl_Fontsize fl_size() {
704     return fl_graphics_driver->size();
705 }
706 inline int fl_height() {
707     return fl_graphics_driver->height();
708 }
709 inline int fl_descent() {
710     return fl_graphics_driver->descent();
711 }
712 // Information you can get about the current font:
713 inline int fl_height() {
714     return fl_graphics_driver->height();
715 }
716 inline int fl_descent() {
717     return fl_graphics_driver->descent();
718 }
719 // Information you can get about the current font:
720 inline int fl_height() {
721     return fl_graphics_driver->height();
722 }
723 inline int fl_descent() {
724     return fl_graphics_driver->descent();
725 }
726 // Information you can get about the current font:
FL_EXPORT double fl_width(const char *txt);

inline double fl_width(const char *txt, int n) {
  return fl_graphics_driver->width(txt, n);
}

inline double fl_width(unsigned int c) {
  return fl_graphics_driver->width(c);
}

FL_EXPORT void fl_text_extents(const char *, int &dx, int &dy, int &w, int &h);

inline void fl_text_extents(const char *t, int n, int &dx, int &dy, int &w, int &h) {
  fl_graphics_driver->text_extents(t, n, dx, dy, w, h);
}

FL_EXPORT void fl_restore_scale(float s);

FL_EXPORT void fl_draw(const char *str, int x, int y);
FL_EXPORT void fl_draw(int angle, const char *str, int x, int y);
inline void fl_draw(const char *str, int n, int x, int y) {
  fl_graphics_driver->draw(str, n, x, y);
}
inline void fl_draw(int angle, const char *str, int n, int x, int y) {
  fl_graphics_driver->draw(angle, str, n, x, y);
}
inline void fl_draw(const char *str, int n, int x, int y) {
  fl_graphics_driver->rtl_draw(str, n, x, y);
}

FL_EXPORT const char *fl_latin1_to_local(const char *t, int n = -1);
FL_EXPORT const char *fl_local_to_latin1(const char *t, int n = -1);
FL_EXPORT const char *fl_mac_roman_to_local(const char *t, int n = -1);
FL_EXPORT const char *fl_local_to_mac_roman(const char *t, int n = -1);
FL_EXPORT float fl_override_scale();

FL_EXPORT void fl_frame(const char *s, int x, int y, int w, int h);
FL_EXPORT void fl_frame2(const char *s, int x, int y, int w, int h);
FL_EXPORT void fl_draw_box(Fl_Boxtype, int x, int y, int w, int h, Fl_Color);

void fl_draw_check(Fl_Rect bb, Fl_Color col);

FL_EXPORT void fl_draw_arrow(Fl_Rect bb, Fl_Arrow_Type t, Fl_Orientation o, Fl_Color color);

FL_EXPORT void fl_draw_circle(int x, int y, int d, Fl_Color color);

FL_EXPORT void fl_draw_radio(int x, int y, int d, Fl_Color color);

FL_EXPORT uchar *fl_read_image(uchar *p, int X, int Y, int W, int H, int alpha = 0);
```c
1095 FL_EXPORT Fl_RGB_Image *fl_capture_window(Fl_Window *win, int x, int y, int w, int h);
1096
1097 // pixmaps:
1098 FL_EXPORT int fl_draw_pixmap(const char *const *data, int x, int y, Fl_Color bg = FL_GRAY);
1099 inline int fl_draw_pixmap(/*const*/ char *const *data, int x, int y, Fl_Color bg = FL_GRAY) {
1100 return fl_draw_pixmap((const char *const *)data, x, y, bg);
1101 }
1102 FL_EXPORT int fl_measure_pixmap(/*const*/ char *const *data, int &w, int &h);
1103 FL_EXPORT int fl_measure_pixmap(const char *const *cdata, int &w, int &h);
1104
1105 // other:
1106 FL_EXPORT void fl_scroll(int X, int Y, int W, int H, int dx, int dy,
1107 void (*draw_area)(void *, int, int, int, int), void *data);
1108 FL_EXPORT const char *fl_shortcut_label(unsigned int shortcut);
1109 FL_EXPORT const char *fl_shortcut_label(unsigned int shortcut, const char **eom);
1110 FL_EXPORT unsigned int fl_old_shortcut(const char *s);
1111 FL_EXPORT void fl_overlay_rect(int x, int y, int w, int h);
1112 FL_EXPORT void fl_overlay_clear();
1113 FL_EXPORT void fl_cursor(Fl_Cursor);
1114 FL_EXPORT void fl_cursor(Fl_Cursor, Fl_Color fg, Fl_Color bg = FL_WHITE);
1115 FL_EXPORT const char *fl_expand_text(const char *from, char *buf, int maxbuf, double maxw,
1116 int &n, double &width, int wrap, int draw_symbols = 0);
1117
1118 // XIM:
1119 FL_EXPORT void fl_set_status(int X, int Y, int W, int H);
1120 FL_EXPORT void fl_set_spot(int font, int size, int X, int Y, int W, int H, Fl_Window *win = 0);
1121 FL_EXPORT void fl_reset_spot(void);
1122 FL_EXPORT int fl_draw_symbol(const char *label, int x, int y, int w, int h, Fl_Color);
1123 FL_EXPORT int fl_add_symbol(const char *name, void (*drawit)(Fl_Color), int scalable);
```

---

**35.44 Fl_Export.H**

1 /*
2 * Windows DLL export .
3 */
4
5 * Copyright 1998-2018 by Bill Spitzak and others.
6 *
7 * This library is free software. Distribution and use rights are outlined in
8 * the file "COPYING" which should have been included with this file. If this
9 * file is missing or damaged, see the license at:
10 * https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 * https://www.fltk.org/bugs.php
14 */
15
16 #ifndef Fl_Export_H
17 # define Fl_Export_H
18 # define FL_EXPORT __declspec(dllexport)
19 # elif __GNUC__ >= 4
20 # define FL_EXPORT __attribute__ ((visibility ("default")))
21 # else
22 # define FL_EXPORT
23 # endif
24 #endif /* !Fl_Export_H */

---

**35.45 Fl_File_Browser.H**

1 //
2 // FileBrowser definitions.
3 */
4 *
5 * Copyright 1999-2010 by Michael Sweet.
6 */
7
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12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 17 /*
18 Fl_File_Browser widget . */
19
20 // Include necessary header files...
21 //
22 ifndef _Fl_File_Browser_H_
23 # define _Fl_File_Browser_H_
24 # include "Fl_Browser.H"
25 # include "Fl_File_Icon.H"
26 # include "filename.H"
27 # include "Fl_File_Chooser.H"
28 # include "Fl_font.H"
29 # include "Fl_FontSize.H"
30
31 // Fl_File_Browser class...
32 //
33 class FL_EXPORT Fl_File_Browser : public Fl_Browser {
34
35  int filetype_;  
36  const char *directory_;  
37  uchar iconsize_;  
38  const char *pattern_;  
39  const char *errmsg_;  
40
41  int full_height() const FL_OVERRIDE;  
42  int item_height(void *) const FL_OVERRIDE;  
43  int item_width(void *) const FL_OVERRIDE;  
44  void item_draw(void *, int, int, int, int) const FL_OVERRIDE;  
45  int incr_height() const FL_OVERRIDE { return (item_height(0) + linespacing()); }  
46
47 public:  
48  enum { FILES, DIRECTORIES };  
49
50  Fl_File_Browser(int, int, int, int, const char * = 0);  
51  ~Fl_File_Browser();  
52
53  uchar iconsize()const { return (iconsize_); }  
54  void iconsize(uchar s) { iconsize_ = s; redraw(); }  
55
56  void filter(const char *pattern);  
57  void filetype(const char *pattern);  
58  void filetype(int t) { filetype_ = t; }  
59  void errmsg(const char *emsg);  
60  const char * errmsg()const { return errmsg_; }  
61
62 #endif // !_Fl_File_Browser_H_
35.46 Fl_File_Chooser.H
// Please use fluid to change src/Fl_File_Chooser.fl interactively
// and then use fluid to "write code" or edit and use fluid -c.
//
// generated by Fast Light User Interface Designer (fluid) version 1.0400

#ifndef Fl_File_Chooser_H
#define Fl_File_Chooser_H
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Choice.H>
#include <FL/Fl_Menu_Button.H>
#include <FL/Fl_Button.H>
#include <FL/Fl_Preferences.H>
#include <FL/Fl_Tile.H>
#include <FL/Fl_File_Browser.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Check_Button.H>
#include <FL/Fl_File_Input.H>
#include <FL/Fl_Return_Button.H>
#include <FL/fl_ask.H>

class FL_EXPORT Fl_File_Chooser {
public:
enum Type {
  SINGLE = 0,
  MULTI = 1,
  CREATE = 2,
  DIRECTORY = 4
};
private:
static Fl_Preferences *prefs_
void (callback_)(Fl_File_Chooser*, void *);
void *data_
char directory_[FL_PATH_MAX];
char pattern_[FL_PATH_MAX];
char preview_text_[2048];
type_
void favoritesButtonCB();
void favoritesCB(Fl_Widget *);
void fileListCB();
void fileNameCB();
void newdir();
static void previewCB(Fl_File_Chooser *fc);
void showChoiceCB();
void update_favorites();
void update_preview();
public:
Fl_File_Chooser(const char *pathname, const char *pattern, int type_val, const char *title);
private:
Fl_Double_Window *window;
inline void cb_window_i(Fl_Double_Window *, void);
static void cb_window(Fl_Double_Window *, void);
Fl_Choice *showChoice;
inline void cb_showChoice_i(Fl_Choice *, void);
static void cb_showChoice(Fl_Choice *, void);
Fl_Menu_Button *favoritesButton;
inline void cb_favoritesButton_i(Fl_Menu_Button *, void);
static void cb_favoritesButton(Fl_Menu_Button *, void);
Fl_Button *newButton;
private:
inline void cb__i(Fl_Tile *, void);
static void cb_(Fl_Tile *, void);
Fl_File_Browser *fileList;
inline void cb_fileList_i(Fl_File_Browser *, void);
static void cb_fileList(Fl_File_Browser *, void);
Fl_Box *errorBox;
Fl_Box *previewBox;
public:
Fl_Check_Button *previewButton;
private:
inline void cb_previewButton_i(Fl_Check_Button *, void);
static void cb_previewButton(Fl_Check_Button *, void);
Fl_Check_Button *showHiddenButton;
private:
inline void cb_showHiddenButton_i(Fl_Check_Button *, void);
static void cb_showHiddenButton(Fl_Check_Button *, void);
Fl_File_Input *fileName;
inline void cb_fileName_i(Fl_File_Input *, void);
static void cb_fileName(Fl_File_Input *, void);
Fl_Return_Button *okButton;
inline void cb_okButton_i(Fl_Return_Button *, void*);
static void cb_okButton(Fl_Return_Button *, void*);
Fl_Button *cancelButton;
inline void cb_cancelButton_i(Fl_Button *, void*);
static void cb_cancelButton(Fl_Button *, void*);
Fl_Double_Window *favWindow;
Fl_File_Browser *favList;
inline void cb_favList_i(Fl_File_Browser *, void*);
static void cb_favList(Fl_File_Browser *, void*);
Fl_Button *favUpButton;
inline void cb_favUpButton_i(Fl_Button *, void*);
static void cb_favUpButton(Fl_Button *, void*);
Fl_Button *favDeleteButton;
inline void cb_favDeleteButton_i(Fl_Button *, void*);
static void cb_favDeleteButton(Fl_Button *, void*);
Fl_Button *favDownButton;
inline void cb_favDownButton_i(Fl_Button *, void*);
static void cb_favDownButton(Fl_Button *, void*);
Fl_Button *favCancelButton;
inline void cb_favCancelButton_i(Fl_Button *, void*);
static void cb_favCancelButton(Fl_Button *, void*);
Fl_Return_Button *favOkButton;
inline void cb_favOkButton_i(Fl_Return_Button *, void*);
static void cb_favOkButton(Fl_Return_Button *, void*);
public:
~Fl_File_Chooser();
void callback(void (*cb)(Fl_File_Chooser *, void *), void *d = 0);
void color(Fl_Color c);
Fl_Color color();
int count();
directory(const char *d);
Fl_Color color();
directory();
filter(const char *p);
int filter_value();
void filter_value(int f);
void hide();
void iconsize(uchar s);
uchar iconsize();
void label(const char *l);
const char * label();
oke_label(const char *l);
const char * ok_label();
void preview(int e);
void showHidden(int e);
void remove_hidden_files();
void show();
int shown();
void textcolor(Fl_Color c);
Fl_Color textcolor();
void textfont(Fl_Font f);
Fl_Font textfont();
void textsize(Fl_Fontsize s);
Fl_Fontsize textsize();
void type(int t);
int type();
void * user_data() const;
void user_data(void *d);
void value(int f = 1);
void value(const char *filename);
int visible();
void position(int x, int y);
int x() const;
int y() const;
int w() const;
int h() const;
void resize(int w, int h);
void size(int w, int h);

static const char *add_favorites_label;
static const char *all_files_label;
static const char *existing_files_label;
static const char *favorites_label;
static const char *filename_label;
static const char *filesystems_label;
static const char *manage_favorites_label;
static const char *new_directory_label;
static const char *new_directory_tooltip;
static const char *preview_label;
static const char *save_label;
static const char *show_label;
static const char *hidden_label;
static Fl_File_Sort_F *sort;
private:
 Fl_Widget* ext_group;
public:
 Fl_Widget* add_extra(Fl_Widget* gr);

protected:
 void show_error_box(int val);

FL_EXPORT char *fl_dir_chooser(const char *message,const char *fname,int relative=0);
FL_EXPORT char *fl_file_chooser(const char *message,const char *pat,const char *fname,int relative=0);
FL_EXPORT void fl_file_chooser_callback(void (*cb)(const char*));
FL_EXPORT void fl_file_chooser_ok_label(const char*l);
}
#endif

 Fl_File_Icon widget . */

// Include necessary header files...
#ifdef _Fl_Fl_File_Icon_H_
#define _Fl_Fl_File_Icon_H_

#include "Fl.H"

// Special color value for the icon color.

#define FL_ICON_COLOR (Fl_Color)0xffffffff

// Fl_File_Icon class...

class FL_EXPORT Fl_File_Icon {

47 static Fl_File_Icon *first_; // Pointer to first icon/filetype
48 Fl_File_Icon *next_; // Pointer to next icon/filetype
49 const char *pattern_; // Pattern string
50 int type_; // Match only if directory or file?
51 int num_data_; // Number of data elements
52 int alloc_data_; // Number of allocated elements
53 short *data_; // Icon data
54
55 public:
56 enum // File types
57 {
58 ANY, // Any kind of file
59 PLAIN, // Only plain files
60 FIFO, // Only named pipes
61 DEVICE, // Only character and block devices
62 LINK, // Only symbolic links
63 DIRECTORY // Only directories
64
j};
65
66 enum // Data opcodes
67 {
68 END, // End of primitive/icon
69 COLOR, // Followed by color value (2 shorts)
70 LINK, // Start of line
71 CLOSEDLINE, // Start of closed line
72 POLYGON, // Start of polygon
73 OUTLINEPOLYGON, // Followed by outline color (2 shorts)
74
    GENERATED BY DOXYGEN
short *add(short d);
short *add_color(Fl_Color c)
{ short *d = add((short)COLOR); add({(short)c & 16}); add({(short)c}; return (d); }
short *add_vertex(int x, int y)
{ short *d = add((short)VERTEX); add({(short)x}; add({(short)y}; return (d); }
short *add_vertex(float x, float y)
{ short *d = add((short)VERTEX); add({(short)x * 10000.0}; add({(short)y * 10000.0}; return (d); }
void clear() { num_data_ = 0; }
void draw(int x, int y, int w, int h, Fl_Color ic, int active = 1);
void label(Fl_Widget *w);
static void labeltype(const Fl_Label *o, int x, int y, int w, int h, Fl_Align a);
void load(const char *f);
int load_fti(const char *fti);
int load_image(const char *i);
Fl_File_Icon *next() { return (next_); }
const char *pattern() { return (pattern_); }
int size() { return (num_data_); }
type() { return (type_); }
short *value() { return (data_); }
static Fl_File_Icon *find(const char *filename, int filetype = ANY);
static Fl_File_Icon *first() { return (first_); }
static void load_system_icons(void);
}

#include <FL/Fl_Input.H>

class FL_EXPORT Fl_File_Input : public Fl_Input {
  char ok_entry_;uchar down_box_;short buttons_[200];short pressed_;void draw_buttons();int handle_button(int event);
void update_buttons();
}

35.48 Fl_File_Input.H

/* Fl_File_Input widget. */

*/

/* */

/* Fl_File_Input widget. */

/
56 public:
57 Fl_File_Input(int X, int Y, int W, int H, const char *L="0");
58 int handle(int event) FL_OVERRIDE;
59 protected:
60 void draw() FL_OVERRIDE;
61 public:
62 Fl_Boxtype down_box()const { return (Fl_Boxtype)down_box_; }
63 void down_box(Fl_Boxtype b) { down_box_ = b; }
64 Fl_Color errorcolor()const { return FL_RED; }
65 void errorcolor(Fl_Color c) {}
66 int value(const char *str);
67 int value(const char *str, int len);
68 const char *value() { return Fl_Input_::value(); }
69
70 #endif // !Fl_File_Input_H

35.49 Fl_Fill_Dial.H

1 */
8 Fl_Fill_Dial widget . */
15 #ifndef Fl_Fill_Dial_H
20 #define Fl_Fill_Dial_H
21 #define Fl_Fill_Dial
22 #include "Fl_Dial.H"
24 class FL_EXPORT Fl_Fill_Dial : public Fl_Dial {
27 public:
28 Fl_Fill_Dial(int X, int Y, int W, int H, const char *L);
30
32 #endif

35.50 Fl_Fill_Slider.H

1 */
8 Fl_Fill_Slider widget . */
15 #ifndef Fl_Fill_Slider_H
20 #define Fl_Fill_Slider_H
21 #define Fl_Fill_Slider
22 #include "Fl_Slider.H"
24 class FL_EXPORT Fl_Fill_Slider : public Fl_Slider {
27 public:
28 Fl_Fill_Slider(int X, int Y, int W, int H, const char *L);
30
32 #endif

Generated by Doxygen
#include "Fl_Slider.H"

class FL_EXPORT Fl_Fill_Slider: public Fl_Slider {
public:
  Fl_Fill_Slider(int X, int Y, int W, int H, const char *L = 0);
};

#endif

Fl_Flex.H

// Fl_Flex widget header file for the Fast Light Tool Kit (FLTK).

// Copyright 2020 by Karsten Pedersen
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//   https://www.fltk.org/COPYING.php
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// Please see the following page on how to report bugs and issues:
//
//   https://www.fltk.org/bugs.php

#ifndef Fl_Flex_H
#define Fl_Flex_H

#include <FL/Fl_Group.H>

class FL_EXPORT Fl_Flex: public Fl_Group {
  int margin_left_; // left margin
  int margin_top_; // top margin
  int margin_right_; // right margin
  int margin_bottom_; // bottom margin
  int gap_; // gap between widgets
  int fixed_size_size_; // number of fixed size widgets in array
  int fixed_size_alloc_; // allocated size of fixed size array
  Fl_Widget **fixed_size_; // array of fixed size widgets
  bool need_layout_; // true if layout needs to be calculated

  enum { // values for type(int)
    VERTICAL = 0,
    HORIZONTAL = 1,
    COLUMN = 0,
    ROW = 1
  };

  // FLTK standard constructor
  Fl_Flex(int X, int Y, int W, int H, const char *L = 0);

  // original Fl_Flex constructors:
  // backwards compatible if direction enums { ROW | COLUMN } are used
  Fl_Flex(int direction);
  Fl_Flex(int w, int h, int direction);
  Fl_Flex(int X, int Y, int W, int H, int direction);

  virtual ~Fl_Flex();

  virtual void end();
  virtual void resize(int x, int y, int w, int h) FL_OVERRIDE;
  void fixed(Fl_Widget &w, int size) {
    fixed(&w, size);
  }
  void fixed(Fl_Widget *w, int size);
  int fixed(Fl_Widget *w) const;

  protected:
  virtual int alloc_size(int size) const;
  virtual int alloc_size(int size) const;
  virtual void on_remove(int) FL_OVERRIDE;
  virtual void draw() FL_OVERRIDE;

public:

void need_layout(int set) {
  if (set) need_layout_ = true;
  else need_layout_ = false;
}

bool need_layout() const {
  return need_layout_;
}

int margin() const {
  return margin_left_;}

int margin(int *left, int *top, int *right, int *bottom) const {
  if (left) *left = margin_left_;  
  if (top) *top = margin_top_;   
  if (right) *right = margin_right_;  
  if (bottom) *bottom = margin_bottom_;     
  return 1;
}

return 0;
}

void margin(int m, int g = -1) {
  if (m < 0)
    m = 0;
  margin_left_ = margin_top_ = margin_right_ = margin_bottom_ = m;
  if (g >= 0)
    gap_ = g;
  need_layout(1);
}

void margin(int left, int top, int right, int bottom) {
  margin_left_ = left < 0 ? 0 : left;
  margin_top_ = top < 0 ? 0 : top;
  margin_right_ = right < 0 ? 0 : right;
  margin_bottom_ = bottom < 0 ? 0 : bottom;
  need_layout(1);
}

int gap() const {
  return gap_;}

void gap(int g) {
  gap_ = g < 0 ? 0 : g;
  need_layout(1);
}

int horizontal() const {
  return type() == Fl_Flex::HORIZONTAL ? 1 : 0;
}

// Calculate the layout of the widget and redraw it.
void layout();

int spacing() const {
  return gap_;}

void spacing(int i) {
  gap(i);
  need_layout(1);
}

// End of Fl_Float_Input.H
16 /* \file
17 Fl_Float_Input widget . */
18
19 #ifndef Fl_Float_Input_H
20 #define Fl_Float_Input_H
21
22 #include "Fl_Input.H"
23
24 class FL_EXPORT Fl_Float_Input : public Fl_Input {
25 public:
26 Fl_Float_Input(int X, int Y, int W, int H, const char *l = 0);
27
28 #endif

35.53 Fl_FormsBitmap.H

1 // Forms bitmap header file for the Fast Light Tool Kit (FLTK).
2 //
3 // Copyright 1998-2010 by Bill Spitzak and others.
4 //
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11 // Please see the following page on how to report bugs and issues:
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13 // https://www.fltk.org/bugs.php
14 //
15 //
16 /* \file
17 Fl_FormsBitmap widget . */
18
19 #ifndef Fl_FormsBitmap_H
20 #define Fl_FormsBitmap_H
21
22 #include "Fl_Bitmap.H"
23
24 class FL_EXPORT Fl_FormsBitmap : public Fl_Widget {
25 Fl_Bitmap *b;
26 protected:
27 void draw() FL_OVERRIDE;
28 public:
29 Fl_FormsBitmap(Fl_Boxtype, int, int, int, int, const char * = 0);
30 void set(int W, int H, const uchar *bits);
31 void bitmap(Fl_Bitmap *B) {b = B;}
32 Fl_Bitmap *bitmap()const {return b;}
33
34 #endif

35.54 Fl_FormsPixmap.H

1 // Forms pixmap header file for the Fast Light Tool Kit (FLTK).
2 //
3 // Copyright 1998-2010 by Bill Spitzak and others.
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13 // https://www.fltk.org/bugs.php
14 //
15 //
16 /* \file
17 Fl_FormsPixmap widget . */
18
19 #ifndef Fl_FormsPixmap_H
20 #define Fl_FormsPixmap_H
21
22 #include "Fl_Pixmap.H"
23
24 class FL_EXPORT Fl_FormsPixmap : public Fl_Widget {
```c++

FL_Pixmap *b;
protected:
void draw() FL_OVERRIDE;
public:
FL_ForePixmap(Fl_Boxtype t, int X, int Y, int W, int H, const char *L = 0);
void set(const char * const * bits);
void Pixmap(Fl_Pixmap *B) {b = B;}
FL_Pixmap *Pixmap() const {return b;}
};

typedef int (*FL_HANDLEPTR)(Fl_Widget *, int , float, float, char);

class FL_EXPORT Fl_Free : public Fl_Widget {
    FL_HANDLEPTR hfunc;
protected:
    void draw() FL_OVERRIDE;
public:
    int handle(int e) FL_OVERRIDE;
    Fl_Free(uchar t, int X, int Y, int W, int H, const char *L, FL_HANDLEPTR hdl);
    ~Fl_Free();
};

// old event names for compatibility:
#define FL_MOUSE FL_DRAG
#define FL_DRAW 100
#define FL_STEP 101
#define FL_FREEMEM 102
#define FL_FREEZE 103
#define FL_THAW 104
@endef

class FL_EXPORT Fl_Free : public Fl_Widget {
    FL_HANDLEPTR hfunc;
protected:
    void draw() FL_OVERRIDE;
public:
    int handle(int e) FL_OVERRIDE;
    Fl_Free(uchar t, int X, int Y, int W, int H, const char *L, FL_HANDLEPTR hdl);
    ~Fl_Free();
};
```

---

**35.55 Fl_Free.H**

1 //
2 // Forms free header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
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12 // Please see the following page on how to report bugs and issues:
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14 // https://www.fltk.org/bugs.php
15 //
16 //
17 /* file
18 Fl_Free widget . */
19 #ifndef Fl_Free_H
20 #define Fl_Free_H
21 #define Fl_Free_H
22 #ifndef Fl_Widget_H
23 #include "Fl_Widget.H"
24 #endif
25 #define FL_NORMAL_FREE 1
26 #define FL_SLEEPING_FREE 2
27 #define FL_INPUT_FREE 3
28 #define FL_CONTINUOUS_FREE 4
29 #define FL_ALL_FREE 5
30 typedef int (*FL_HANDLEPTR)(Fl_Widget *, int, float, float, char);
31
32 class FL_EXPORT Fl_Free : public Fl_Widget {
33     FL_HANDLEPTR hfunc;
34     static void step(void *);
35     protected:
36     void draw() FL_OVERRIDE;
37     public:
38     int handle(int e) FL_OVERRIDE;
39     Fl_Free(uchar t, int X, int Y, int W, int H, const char *L, FL_HANDLEPTR hdl);
40     ~Fl_Free();
41     }
42 #endif

---

**35.56 Fl_GIF_Image.H**

1 //
2 // GIF image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php

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/** 
 * Fl_GIF_Image widget. */

#ifndef Fl_GIF_Image_H
#define Fl_GIF_Image_H

#include "Fl_Pixmap.H"

class FL_EXPORT Fl_GIF_Image : public Fl_Pixmap {

public:

Fl_GIF_Image(const char * filename);

// deprecated constructor w/o length (for backwards compatibility)
Fl_GIF_Image(const char * imagename, const unsigned char *data);

// constructor with length (since 1.4.8)
Fl_GIF_Image(const char * imagename, const unsigned char *data, const size_t length);

static bool is_animated(const char *name_);

static bool animate;

protected:

// Protected constructors needed for animated GIF support through Fl_Anim_GIF_Image.
Fl_GIF_Image(const char * filename, bool anim);

Fl_GIF_Image(const char * imagename, const unsigned char *data, const size_t length, bool anim);

// Protected default constructor needed for Fl_Anim_GIF_Image.
Fl_GIF_Image();

void load_gif_(class Fl_Image_Reader &rdr, bool anim=false);

void load(const char * filename, bool anim);

void load(const char * imagename, const unsigned char *data, const size_t length, bool anim);

// Internal structure to "glue" animated GIF support into Fl_GIF_Image.
// This data is passed during decoding to the Fl_Anim_GIF_Image class.
struct GIF_FRAME {
  int ifrm, width, height, x, y, w, h,
  clrs, bkgd, trans,
  dispose, delay;
  const uchar *bptr;
  const struct CPAL {
    uchar r, g, b;
  } *cpal;
  GIF_FRAME(int frame, uchar *data) : ifrm(frame), bptr(data) {
  }
  GIF_FRAME(int frame, int W, int H, int fx, int fy, int fw, int fh, uchar *data) :
  ifrm(frame), width(W), height(H), x(fx), y(fy), w(fw), h(fh), bptr(data) {
  }
  void disposal(int mode, int delay) { dispose = mode; this->delay = delay; }
  void colors(int nclrs, int bg, int tp) { clrs = nclrs; bkgd = bg; trans = tp; }
};

// Internal virtual methods, which are called during decoding to pass data
// to the Fl_Anim_GIF_Image class.
virtual void on_frame_data(GIF_FRAME &) {}

virtual void on_extension_data(GIF_FRAME &) {}

private:

void lzw_decode(Fl_Image_Reader &rdr, uchar *Image, int Width, int Height, int CodeSize, int ColorMapSize, int Interlace);

};

#endif
```c
//
17 /* Fl_Gl_Window widget. */
19 #ifndef Fl_Gl_Window_H
21 #define Fl_Gl_Window_H
22
23 #include "Fl_Window.H"
24
25 class Fl_Gl_Choice; // structure to hold result of glXChooseVisual
26 class Fl_Gl_Window_Driver;
27 class FL_EXPORT Fl_Gl_Window : public Fl_Window {
29     friend class Fl_Gl_Window_Driver;
30     Fl_Gl_Window_Driver *pGlWindowDriver;
31
32     int mode_;      // glXChooseVisual returns a mode number
33     const int *alist;
34     Fl_Gl_Choice *g;
35     GLContext context_; // GLContext for this Fl_Gl_Window
36     char valid_f_;  // damage() of back buffer
37     char damage1_;  // damage() of front buffer
38     virtual void draw_overlay();
39     void init();
40
41     void *overlay;
42
43     static int can_do(int m, const int *a);
44     int mode(int a);
45     int mode(const int *a);
46     int mode();
47     protected:
48     virtual void draw_begin();
49     virtual void draw() FL_OVERRIDE;
50     virtual void draw_end();
51     virtual void show() FL_OVERRIDE;
52     virtual void flush() FL_OVERRIDE;
53     virtual void hide() FL_OVERRIDE;
54     virtual void resize(int, int, int, int) FL_OVERRIDE;
55     virtual int handle(int) FL_OVERRIDE;
56
57     char valid() const {return valid_f_ & 1;}
58     void valid(char v) {if (v) valid_f_ |= 1; else valid_f_ &= 0xfe;}
59     void invalidate();
60
61     char context_valid() const {return valid_f_ & 2;}
62     void context_valid(char v) {if (v) valid_f_ |= 2; else valid_f_ &= 0xfd;}
63
64     static int can_do(int m) {return can_do(m, 0);}
65     static int can_do(const int *m) {return can_do(0, m);}
66     int can_do() {return can_do(mode_, alist);}
67     Fl_Mode mode() const {return (Fl_Mode)mode_;}
68     int mode(int a) {return mode(a, 0);}
69     int mode(const int *a) {return mode(0, a);}
70     int mode();
71     GLContext context() const {return context_;
72     void context(GLContext, int destroy_flag = 0);
73     void make_current();
74     void swap_buffers();
75     void swap_interval(int);
76     int swap_interval() const;
77     void ortho();
78
79     virtual Fl_Gl_Window * as_gl_window() FL_OVERRIDE { return this; }
80     Fl_Gl_Window const * as_gl_window() const FL_OVERRIDE { return this; }
81
82     float pixels_per_unit();
83     int pixel_w() { return int(pixels_per_unit() * w() + 0.5f); }
84     int pixel_h() { return int(pixels_per_unit() * h() + 0.5f); }
85
86     ~Fl_Gl_Window();
87
88     // Note: Doxygen docs in Fl_Widget.H to avoid redundancy.
89     Fl_Gl_Window as_gl_window() const FL_OVERRIDE { return this; }
90
91     Fl_Gl_Window();
92     Fl_Gl_Window(int, int, int) { init(); }
93     Fl_Gl_Window(int, int, int, int) { init(); }
94     Fl_Gl_Window(int, int, int, int, int) { init(); }
95     Fl_Gl_Window(int, int, int, int, int, int) { init(); }
96     Fl_Gl_Window(int, int, int, int, int, int, int) { init(); }
97     Fl_Gl_Window(int, int, int, int, int, int, int, int) { init(); }
98     Fl_Gl_Window(int, int, int, int, int, int, int, int, int) { init(); }
99
100  #endif // Fl_Gl_Window_H
```
### Fl_Graphics_Driver.H

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  - [https://www.fltk.org/COPYING.php](https://www.fltk.org/COPYING.php)
  - Please see the following page on how to report bugs and issues:
    - [https://www.fltk.org/bugs.php](https://www.fltk.org/bugs.php)

```c
#ifndef FL_GRAPHICS_DRIVER_H
#define FL_GRAPHICS_DRIVER_H

#include <FL/Fl_Device.H>
#include <FL/Fl_Image.H>
#include <FL/Fl_Bitmap.H>
#include <FL/Fl_Pixmap.H>
#include <FL/Fl_RGB_Image.H>

class Fl_Graphics_Driver;
class Fl_Font_Descriptor;
class Fl_Image_Surface;
FL_EXPORT extern Fl_Graphics_Driver *fl_graphics_driver;

typedef void (*Fl_Draw_Image_Cb)(void* data,int x,int y,int w,uchar* buf);

struct Fl_Fontdesc;
typedef struct _PangoFontDescription PangoFontDescription;

#define FL_REGION_STACK_SIZE 10
#define FL_MATRIX_STACK_SIZE 32

class FL_EXPORT Fl_Graphics_Driver {
friend class Fl_Surface_Device;
friend class Fl_Pixmap;
friend class Fl_Bitmap;
friend class Fl_RGB_Image;
friend class Fl_SVG_Image;
friend void fl_draw_image(const uchar* buf, int X,int Y,int W,int H, int D, int L);
friend void fl_draw_image_mono(const uchar* buf, int X,int Y,int W,int H, int D, int L);
friend void fl_draw_image_mono(Fl_Draw_Image_Cb cb, void * data, int X, int Y, int W, int H, int D);
friend void fl_draw_image(Fl_Draw_Image_Cb cb, void * data, int X, int Y, int W, int H, int D);
friend void fl_copy_offscreen(int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy);
friend int fl_convert_pixmap(const char *const* cdata, uchar* out, Fl_Color bg);
friend FL_EXPORT void gl_start();

/* ============== Implementation note about image drawing =========================
A graphics driver can implement up to 6 virtual member functions to draw images:
virtual void draw_pixmap(Fl_Pixmap *pxm,int XP, int YP, int WP, int HP, int cx, int cy)
virtual void draw_bitmap(Fl_Bitmap *bm,int XP, int YP, int WP, int HP, int cx, int cy)
virtual void draw_rgb(Fl_RGB_Image *rgb,int XP, int YP, int WP, int HP, int cx, int cy)
virtual void draw_fixed(Fl_Pixmap *pxm,int XP, int YP, int WP, int HP, int cx, int cy)
virtual void draw_fixed(Fl_Bitmap *bm,int XP, int YP, int WP, int HP, int cx, int cy)
virtual void draw_fixed(Fl_RGB_Image *rgb,int XP, int YP, int WP, int HP, int cx, int cy)
- The platform-independent Fl_Graphics_Driver class implements the 1st group of functions.
- Some drivers implement, for a given image class, the function of both groups, e.g.:
  - Fl_GDI_Graphics_Driver implements both draw_rgb(Fl_RGB_Image *,....) and

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122 draw_fixed(Fl_RGB_Image *, ...) because scale-and-draw may require function Alphablend() from MSIMG32.DLL. In the absence of that, the draw_rgb() implementation calls Fl_Graphics_Driver::draw_rgb() which runs Fl_GDI_Graphics_Driver::draw_fixed(Fl_RGB_Image *, ...).

126 Graphics drivers also implement cache(Fl_Pixmap*), cache(Fl_Bitmap*) and cache(Fl_RGB_Image*) to compute the cached form of all image types, and uncache(Fl_RGB_Image *, ...), uncache_pixmap(Fl_uintptr_t) and delete_bitmask(Fl_uintptr_t) to destroy cached image forms.

130 Graphics drivers that use the mask_ variable of class Fl_Pixmap to cache an Fl_Pixmap object also reimplement the uchar **Fl_Graphics_Driver::mask_bitmap() member function.

132 private:
133 virtual void draw_fixed(Fl_Pixmap *pxm, int XP, int YP, int WP, int HP, int cx, int cy);
134 virtual void draw_fixed(Fl_Bitmap *bm, int XP, int YP, int WP, int HP, int cx, int cy);
135 virtual void draw_fixed(Fl_RGB_Image *rgb, int XP, int YP, int WP, int HP, int cx, int cy);

137 virtual void make_unused_color_(unsigned char &r, unsigned char &g, unsigned char &b, int color_count, void **data);
138 // some platforms may need to reimplement this
139 virtual void set_current_();

140 float scale_; // scale between FLTK and drawing coordinates: drawing = FLTK * scale_
141
144 static Fl_Graphics_Driver *newMainGraphicsDriver();
145 struct matrix {double a, b, c, d, x, y;};
146 typedef enum {
147 NATIVE = 1,
148 PRINTER = 2
149 } driver_feature;
151
152 protected:
153 int fl_clip_state_number;
154 static const matrix m0;
155 Fl_Font font_; // Font?
156 Fl_Fontsize size_; // Font size?
157 Fl_Color color_; // Color?
158 int sptr;
159 static const int matrix_stack_size = FL_MATRIX_STACK_SIZE;
160 matrix stack[FL_MATRIX_STACK_SIZE];
161 matrix m;
162 int n;
163 int gap_;
164 enum SHAPE {NONE=0, LINE, LOOP, POLYGON, POINTS, COMPLEX_POLYGON} what;
165 int rstackptr;
166 static const int region_stack_max = FL_REGION_STACK_SIZE - 1;
167 Fl_Region rstack[FL_REGION_STACK_SIZE];
168 Fl_Font_Descriptor *font_descriptor_; // Font descriptor?
169 int p_size;
170 typedef struct { float x; float y; } XPOINT;
171 XPOINT *xpoint; // Xpoint?
173 virtual void global_gc();
174 virtual void cache(Fl_Pixmap *img);
175 virtual void cache(Fl_Bitmap *img);
176 virtual void cache(Fl_RGB_Image *img);
177 virtual void uncache(Fl_RGB_Image *img, fl_uintptr_t &id_, fl_uintptr_t &mask_);
178 // --- implementation is in src/drivers/xxx/Fl_xxx_Graphics_Driver_image.cxx
180 virtual void draw_image(const uchar * buf, int X, int Y, int W, int H, int D=3, int L=0);
181 virtual void draw_image_mono(const uchar * buf, int X, int Y, int W, int H, int D=1, int L=0);
182 virtual void draw_image(Fl_Draw_Image_Cb cb, void* data, int X, int Y, int W, int H, int D=3);
183 virtual void draw_image mono(Fl_Draw_Image_Cb cb, void* data, int X, int Y, int W, int H, int D=1);
184 virtual void draw_rgb(Fl_RGB_Image *rgb, int XP, int YP, int WP, int HP, int cx, int cy);
185 virtual void draw_rgb(Fl_Bitmap *bm, int XP, int YP, int WP, int HP, int cx, int cy);
186 virtual void copy_offscreen(int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy);
188 static fl_uintptr_t * id(Fl_RGB_Image *rgb) {return &(rgb->id_);}
189 static fl_uintptr_t * id(Fl_Pixmap *pm) {return &(pm->id_);}
190 static fl_uintptr_t * mask(Fl_RGB_Image *rgb) {return &(rgb->mask_);}
191 static void cache_w_h(Fl_Pixmap *pm, int *pwidth, int *pheight) {
192 pwidth = &pm->width;
193 pheight = &pm->height;
194 }
195 static void cache_w_h(Fl_Bitmap *bm, int *pwidth, int *pheight) {
196 pwidth = &bm->width;
197 pheight = &bm->height;
198 }
199 static void cache_w_h(Fl_RGB_Image *rgb, int *pwidth, int *pheight) {
200 pwidth = &rgb->width;
201 pheight = &rgb->height;
202 }
203 // the default implementation of make_unused_color() is most probably enough
204 virtual void global_gc();
205 virtual void set_current_();
206 float scale_; // scale between FLTK and drawing coordinates: drawing = FLTK * scale_
static Fl_Offscreen get_offscreen_and_delete_image_surface(Fl_Image_Surface *img);
static void draw_empty(Fl_Image *img, int X, int Y) { img->draw_empty(X, Y); }
Fl_Graphics_Driver();
virtual void cache_size(Fl_Image *img, int &width, int &height);
virtual void cache_size_finalize(Fl_Image *img, int &width, int &height);
static unsigned need_pixmap_bg_color;
public:
virtual -Fl_Graphics_Driver();
static Fl_Graphics_Driver &default_driver();
// support of "complex shapes"
void push_matrix();
void pop_matrix();
void load_identity();
void load_matrix(double a, double b, double c, double d, double x, double y);
void multi_matrix(double a, double b, double c, double d, double x, double y);
void rotate(double d);
void translate(double x, double y);
double transform_x(double x, double y);
double transform_y(double x, double y);
double transform_dx(double x, double y);
double transform_dy(double x, double y);
inline Fl_Font_Descriptor *font_descriptor() { return font_descriptor_;
inline void font_descriptor(Fl_Font_Descriptor *d) { font_descriptor_ = d;
float scale() { return scale_; }
virtual void scale(float f);
virtual char can_do_alpha_blending();
virtual void point(int x, int y);
virtual void rect(int x, int y, int w, int h);
virtual void focus_rect(int x, int y, int w, int h);
virtual void rectf(int x, int y, int w, int h);
virtual void push_clip(int x, int y, int w, int h);
virtual int clip_box(int x, int y, int w, int h, int &X, int &Y, int &W, int &H);
virtual int clip_region(Fl_Region r);
virtual void push_no_clip(); // has default implementation
virtual void pop_clip(); // has default implementation
virtual Fl_Region clip_region(); // has default implementation
virtual void restore_clip();
virtual void begin_points();
virtual void begin_line();
virtual void begin_loop();
virtual void begin_polygon();
virtual void begin_complex_polygon();
virtual void transformed_vertex(double x, double y);
virtual void transformed_vertex0(float x, float y);
virtual void vertex(double x, double y);
virtual void end_points();
virtual void end_line();
virtual void end_loop();
virtual void fixloop();
virtual void end_polygon();
virtual void end_complex_polygon();
virtual bool can_fill_non_convex_polygon() { return true; }
virtual void gap();
virtual void circle(double x, double y, double r);
virtual void arc(int x, int y, int w, int h, double start, double end);
virtual void arc(int x, int y, int w, int h, double a1, double a2);
virtual void pie(int x, int y, int w, int h, double a1, double a2);
virtual bool can_draw_circle(int x, int y, int w, int h, Fl_Color color);
// the default implementation is most probably enough.
virtual void draw_circle(int x, int y, int d, Fl_Color c);
virtual void draw_curve(double x0, double y0, double x1, double y1, double x2, double y2, double x3, double y3);
virtual void line_style(int style, int width=0, char * dashes=0);
virtual void color(Fl_Color c);
virtual void set_color(Fl_Color i, unsigned int c);
virtual void free_color(Fl_Color i, int overlay);
virtual Fl_Color color();
virtual void color(uchar r, uchar g, uchar b);
virtual void draw(const char *str, int nChars, int x, int y);
virtual void draw(uchar *s, int nChars, float x, float y);
virtual void draw(int angle, const char *str, int nChars, int x, int y);
virtual void rti_draw(const char *str, int nChars, int x, int y);
virtual int has_feature(driver_feature feature);
virtual void font(Fl_Font face, Fl_Fontsize fsize);
virtual Fl_Font size();
virtual Fl_Fontsize size();
virtual double width(const char *str, int nChars);
virtual double width(unsigned int c);
virtual void text_extents(const char *, int n, int& dx, int& dy, int& w, int& h);
virtual int height();
virtual int descent();
virtual void gc(void*);
virtual void *gc(void);
virtual uchar **mask_bitmap();
virtual void gc(void);
virtual uchar **mask_bitmap();
virtual float scale_font_for_PostScript(Fl_Font_Descriptor *desc, int s);
virtual float scale_bitmap_for_PostScript();
virtual void add_rectangle_to_region(Fl_Region r, int x, int y, int w, int h);
virtual Fl_Region XRectangleRegion(int x, int y, int w, int h);
virtual void XDestroyRegion(Fl_Region r);
virtual const char * get_font_name(Fl_Font fnum, int* ap);
virtual int get_font_sizes(Fl_Font fnum, int *& sizep);
virtual Fl_Font set_fonts(const char *name);
virtual Fl_Fontdesc * calc_fl_fonts(void);
virtual unsigned font_desc_size();
virtual const char *font_name(int num);
class FL_EXPORT Fl_Scalable_Graphics_Driver : public Fl_Graphics_Driver |
\public:
\FL_CLASS(Fl_Scalable_Graphics_Driver);

// This function aims to compute accurately int(x * s) in
// presence of rounding errors existing with floating point numbers
// and that sometimes differ between 32 and 64 bits.
\static inline int floor(int x) { return int(x * s + 0.001f); }
\inline int line_width_;}
\void unscale_clip(Fl_Region r);
\void untransform_clip();
\protected:
\void xyline(int x, int y, int x1, int y2) FL_OVERRIDE;
\void yxline(int x, int y, int x1, int y2) FL_OVERRIDE;
\void rect(int x, int y, int w, int h) FL_OVERRIDE;
\void draw(const char *str, int n, int x, int y) FL_OVERRIDE;
\void draw_unscaled(const char *str, int n, int x, int y) FL_OVERRIDE;
\void draw_unscaled(const char *str, int n, int x, int y);}
\virtual void round(unBox);
virtual void change_pen_width(int lwidth);
virtual void reset_pen_width(void *data);

#endif // FL_DOXYGEN
#endif // FL_GRAPHICS_DRIVER_H

---

35.59 Fl_Grid.H File Reference

**Fl_Grid** container widget.

```c
#include <FL/Fl_Group.H>
#include <FL/Fl_Rect.H>
```

### Classes

- class **Fl_Grid::Cell**
- class **Fl_Grid**

**Fl_Grid** is a container (layout) widget with multiple columns and rows.

### Typedefs

- typedef unsigned short **Fl_Grid_Align**

**Fl_Grid** type for child widget alignment control.

### Variables

- const **Fl_Grid_Align** **FL_GRID_BOTTOM** = 0x0002
  Align the widget at the bottom of the cell.
- const **Fl_Grid_Align** **FL_GRID_BOTTOM_LEFT** = **FL_GRID_BOTTOM** | **FL_GRID_LEFT**
- const **Fl_Grid_Align** **FL_GRID_BOTTOM_RIGHT** = **FL_GRID_BOTTOM** | **FL_GRID_RIGHT**
- const **Fl_Grid_Align** **FL_GRID_CENTER** = 0x0000
  Align the widget in the middle of the cell (default).
- const **Fl_Grid_Align** **FL_GRID_FILL** = 0x0030
  Stretch the widget in both directions to fill the cell.
- const **Fl_Grid_Align** **FL_GRID_HORIZONTAL** = 0x0010
  Stretch the widget horizontally to fill the cell.
- const **Fl_Grid_Align** **FL_GRID_LEFT** = 0x0004
  Align the widget at the left side of the cell.
- const **Fl_Grid_Align** **FL_GRID_PROPORTIONAL** = 0x0040
  Stretch the widget proportionally.
- const **Fl_Grid_Align** **FL_GRID_RIGHT** = 0x0008
  Align the widget at the right side of the cell.
- const **Fl_Grid_Align** **FL_GRID_TOP** = 0x0001
  Align the widget at the top of the cell.
- const **Fl_Grid_Align** **FL_GRID_TOP_LEFT** = **FL_GRID_TOP** | **FL_GRID_LEFT**
- const **Fl_Grid_Align** **FL_GRID_TOP_RIGHT** = **FL_GRID_TOP** | **FL_GRID_RIGHT**
- const **Fl_Grid_Align** **FL_GRID_VERTICAL** = 0x0020
  Stretch the widget vertically to fill the cell.

---

35.59.1 Detailed Description

**Fl_Grid** container widget.
Go to the documentation of this file.

1 //
2 // Fl_Grid widget header for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2021-2022 by Albrecht Schlosser.
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7 // This library is free software. Distribution and use rights are outlined in
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9 // file is missing or damaged, see the license at:
10 //
11 // https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 // https://www.fltk.org/bugs.php
16 //
17 ifndef _FL_FL_GRID_H_
18 #define _FL_FL_GRID_H_
19 #include <FL/Fl_Group.H>
20 #include <FL/Fl_Rect.H>
21
typedef unsigned short Fl_Grid_Align;
22
23 const Fl_Grid_Align FL_GRID_CENTER = 0x0000;
24 const Fl_Grid_Align FL_GRID_TOP = 0x0001;
25 const Fl_Grid_Align FL_GRID_BOTTOM = 0x0002;
26 const Fl_Grid_Align FL_GRID_LEFT = 0x0004;
27 const Fl_Grid_Align FL_GRID_RIGHT = 0x0008;
28 const Fl_Grid_Align FL_GRID_HORIZONTAL = 0x0010;
29 const Fl_Grid_Align FL_GRID_VERTICAL = 0x0020;
30 const Fl_Grid_Align FL_GRID_FILL = 0x0030;
31 const Fl_Grid_Align FL_GRID_PROPORTIONAL = 0x0040;
32
33 const Fl_Grid_Align FL_GRID_TOP_LEFT = FL_GRID_TOP | FL_GRID_LEFT;
34 const Fl_Grid_Align FL_GRID_TOP_RIGHT = FL_GRID_TOP | FL_GRID_RIGHT;
35 const Fl_Grid_Align FL_GRID_BOTTOM_LEFT = FL_GRID_BOTTOM | FL_GRID_LEFT;
36 const Fl_Grid_Align FL_GRID_BOTTOM_RIGHT = FL_GRID_BOTTOM | FL_GRID_RIGHT;
37
class FL_EXPORT Fl_Grid : public Fl_Group {
38 friend class Fl_Grid_Type;
39
cell public:
40 class Fl_Grid;
41
42 private:
43 Fl_Grid_Align row_, column_, rowspan_, colspan_;
44 Fl_Widget *widget_; // assigned widget
45
46 void Cell_() { cell
47 next_ = NULL;
48 row_ = 0;
49 column_ = 0;
50 rowspan_ = 1;
51 colspan_ = 1;
52 widget_ = NULL;
53 }
54
55 Cell(int row, int col) { cell
56 row_ = row;
57 column_ = col;
Cell(Fl_Widget *w, int row, int col) {
    Cell_();
    widget_ = w;
    row_ = row;
    col_ = col;
}

~Cell() {} 

Fl_Widget *widget()const { return widget_; }

short row()const { return row_; }
short col()const { return col_; }

void rowspan(short v) { rowspan_ = v; }
void colspan(short v) { colspan_ = v; }
short rowspan()const { return rowspan_; }
short colspan()const { return colspan_; }

void align(Fl_Grid_Align align) { align_ = align; }
Fl_Grid_Align_align()const { return align_; }

void minimum_size(int w, int h) { if (w>=0) w_ = w; if (h>=0) h_ = h; }
void minimum_size(int *w, int *h)const { if (w) *w = w_; if (h) *h = h_; }
}; // class Cell

private:
    class Row;
    class Col;
    short rows_; 
    short cols_; 
    short margin_left_; // left margin
    short margin_top_; // top margin
    short margin_right_; // right margin
    short margin_bottom_; // bottom margin
    short gap_row_; // gap between rows
    short gap_col_; // gap between columns
    Fl_Rect old_size; // only for resize callback (TBD)
    Col *Cols_; // array of columns
    Row *Rows_; // array of rows
    bool need_layout_; // true if layout needs to be calculated

protected:
    Fl_Color grid_color; // color for drawing the grid lines (design helper)
    bool draw_grid_; // draw the grid for testing / design

    void init(); 
    Cell *add_cell(int row, int col);
    void remove_cell(int row, int col);

public:
    Fl_Grid(int X, int Y, int W, int H, const char *L = 0);
    virtual ~Fl_Grid();

    virtual void layout(int rows, int cols, int margin = -1, int gap = -1);
    virtual void layout();
    virtual void clear_layout();
    virtual void resize(int X, int Y, int W, int H) FL_OVERRIDE;

    short rows()const { return rows_; }
    short cols()const { return cols_; }

    void need_layout(int set) { 
        if (set) {
            need_layout_ = true;
            redraw();
        } else {
            need_layout_ = false;
        }
    }
    bool need_layout()const { 
        return need_layout_; 
    }

    protected:
    virtual void draw() FL_OVERRIDE;
    void on_remove(int) FL_OVERRIDE;
    virtual void draw_grid(); // draw grid lines for debugging

public:

// get and set individual margins
virtual void margin(int left, int top = -1, int right = -1, int bottom = -1);  
int margin(int *left, int *top, int *right, int *bottom) const;

// get and set default row and column gaps for all rows and columns, respectively
virtual void gap(int row_gap, int col_gap = -1); // set default row and column gap(s)
void gap(int *row_gap, int *col_gap) const;

// find cells, get cell pointers
Fl_Grid::Cell* cell(int row, int col) const;
Fl_Grid::Cell* cell(Fl_Widget *widget) const;

// assign a widget to a cell
Fl_Grid::Cell* widget(Fl_Widget *wi, int row, int col, Fl_Grid_Align align = FL_GRID_FILL);
Fl_Grid::Cell* widget(Fl_Widget *wi, int row, int col, int rowspan, int colspan, Fl_Grid_Align align = FL_GRID_FILL);

// set minimal column and row sizes (widths and heights, respectively),
// set row and column specific gaps and weights
void col_width(int col, int value);
void col_width(const int *value, size_t size);
int col_width(int col) const;

void col_weight(int col, int value);
void col_weight(const int *value, size_t size);
int col_weight(int col) const;

void col_gap(int col, int value);
void col_gap(const int *value, size_t size);
int col_gap(int col) const;

void row_height(int row, int value);
void row_height(const int *value, size_t size);
int row_height(int row) const;

void row_weight(int row, int value);
void row_weight(const int *value, size_t size);
int row_weight(int row) const;

void row_gap(int row, int value);
void row_gap(const int *value, size_t size);
int row_gap(int row) const;

int computed_col_width(int col) const;
int computed_row_height(int row) const;

void show_grid(int set) {
  draw_grid_ = set ? true : false;
}

void show_grid(int set, Fl_Color col) {
  draw_grid_ = set ? true : false;
  grid_color = col;
}

void debug(int level = 127);

}; // class Fl_Grid

#endif // _FL_FL_GRID_H_

35.61 Fl_Group.H File Reference

Fl_Group and Fl_End classes.
#include "Fl_Widget.H"

Classes
• class Fl_End
  This is a dummy class that allows you to end a Fl_Group in a constructor list of a class:
• class Fl_Group

Generated by Doxygen
The **Fl_Group** class is the FLTK container widget.

### Detailed Description

**Fl_Group** and **Fl_End** classes.

### Fl_Group.H

Go to the documentation of this file.

```c
// Group header file for the Fast Light Tool Kit (FLTK).
//
// Copyright 1998-2022 by Bill Spitzak and others.
//
// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
//https://www.fltk.org/COPYING.php
//
// Please see the following page on how to report bugs and issues:
//https://www.fltk.org/bugs.php

#ifndef Fl_Group_H
#define Fl_Group_H

#include "Fl_Widget.H"

// Don't #include Fl_Rect.H because this would introduce lots
// of unnecessary dependencies on Fl_Rect.H
class Fl_Rect;

class FL_EXPORT Fl_Group : public Fl_Widget {
union {
    Fl_Widget ** array_; // used if group has two or more children or NULL
    Fl_Widget * child1_; // used if group has one child or NULL
};
Fl_Widget * savedfocus_;
Fl_Widget * resizable_;
int children_
Fl_Rect *bounds_; // remembered initial sizes of children
int *sizes_; // remembered initial sizes of children (FLTK 1.3 compat.)

int navigation(int);
static Fl_Group *current_

// unimplemented copy ctor and assignment operator
Fl_Group(const Fl_Group&);
Fl_Group& operator=(const Fl_Group&);

protected:
void draw() FL_OVERRIDE;
void draw_child(Fl_Widget& widget) const;
void draw_children();
void draw_outside_label(const Fl_Widget& widget) const;
void update_child(Fl_Widget& widget) const;
Fl_Rect *bounds();
int *sizes(); // FLTK 1.3 compatibility
virtual int on_insert(Fl_Widget *, int);
virtual int on_move(int, int);
virtual void on_remove(int);
Fl_Rect *bounds();
int *sizes(); // FLTK 1.3 compatibility
virtual int on_insert(Fl_Widget*, int);
virtual int on_move(int, int);
virtual void on_remove(int);

public:
int handle(int) FL_OVERRIDE;
void begin();
void end();
static Fl_Group *current();
static void current(Fl_Group *g);
int children() const {return children_;
Fl_Widget * child(int n) const {return array()[n];
int find(const Fl_Widget& o) const {return find(&o);
int find(const Fl_Widget& o) const {return find(&o);
Fl_Widget * const* array() const;
void resize(int, int, int, int) FL_OVERRIDE;
Fl_Group(int, int, int, int, const char * = 0);
```

Generated by Doxygen
virtual ~Fl_Group();
void add(Fl_Widget&);
void add(Fl_Widget* o) {add(*o);}
void insert(Fl_Widget&, int i);
void insert(Fl_Widget& o, Fl_Widget* before) {insert(o, find(before));}
void remove(int index);
void remove(Fl_Widget&);
void remove(Fl_Widget* o) {remove(*o);}
void clear();

/* delete child n (by index) */
virtual int delete_child(int n);

void resizable(Fl_Widget& o) {resizable_ = &o;}
void resizable(Fl_Widget* o) {resizable_ = o;}
Fl_Widget* resizable()const {return resizable_;}

void add_resizable(Fl_Widget& o) {resizable_ = &o; add(o);}
void init_sizes();

void clip_children(int c) {if (c) set_flag(CLIP_CHILDREN); else clear_flag(CLIP_CHILDREN);}
unsigned int clip_children() {return (flags() & CLIP_CHILDREN) != 0;}

// Note: Doxygen docs in Fl_Widget.H to avoid redundancy.
Fl_Widget* as_group() FL_OVERRIDE {return this;}
Fl_Group* as_group() const FL_OVERRIDE {return this;}

// back compatibility functions:
void focus(Fl_Widget* W) {W->take_focus();}

Fl_Widget* & _ddfdesign_kludge() {return resizable_;

void forms_end();

};

// dummy class used to end child groups in constructors for complex
// subclasses of Fl_Group;
class FL_EXPORT Fl_End {
public:
  Fl_End() {Fl_Group::current()->end();}
  Fl_Widget* & _ddfdesign_kludge() {return resizable_;}

  void forms_end();
};

#endif

// Fl_Help_Dialog dialog for the Fast Light Tool Kit (FLTK).
// Copyright 1998-2021 by Bill Spitzak and others.
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// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php
// ========================================================================
// DO NOT EDIT FL/Fl_Help_Dialog.H and src/Fl_Help_Dialog.cxx !!!
// Please use fluid to change src/Fl_Help_Dialog.fl interactively
// and then use fluid to "write code" or edit and use fluid -c .
// ========================================================================
// generated by Fast Light User Interface Designer (fluid) version 1.0400
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Button.H>
#include <FL/Fl_Input.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Help_View.H>

class FL_EXPORT Fl_Help_Dialog {
  int index_,
  int max_,
  int line_[100]; // FIXME: we must remove those static numbers
char file_[100][FL_PATH_MAX]; //FIXME: we must remove those static numbers
int find_pos;
public:
Fl_Help_Dialog();
private:
Fl_Double_Window *window_; //FIXME: we must remove those static numbers
Fl_Button *back_;
inline void cb_back_i(Fl_Button *, void*);
static void cb_back_(Fl_Button *, void*);
Fl_Button *forward_;
inline void cb_forward_i(Fl_Button *, void*);
static void cb_forward_(Fl_Button *, void*);
Fl_Button *smaller_; //FIXME: we must remove those static numbers
inline void cb_smaller_i(Fl_Button *, void*);
static void cb_smaller_(Fl_Button *, void*);
Fl_Button *larger_; //FIXME: we must remove those static numbers
inline void cb_larger_i(Fl_Button *, void*);
static void cb_larger_(Fl_Button *, void*);
Fl_Input *find_; //FIXME: we must remove those static numbers
inline void cb_find_i(Fl_Input *, void*);
static void cb_find_(Fl_Input *, void*);
Fl_Help_View *view_; //FIXME: we must remove those static numbers
inline void cb_view_i(Fl_Help_View *, void*);
static void cb_view_(Fl_Help_View *, void*);
public:
~Fl_Help_Dialog();
int h();
void hide();
void load(const char *fl);
void position(int xx, int yy);
void resize(int xx, int yy, int ww, int hh);
void show();
void show(int argc, char **argv);
void textsize(Fl_Fontsize s);
Fl_Fontsize textsize();
void topline(const char *n);
void topline(int n);
void value(const char *f);
const char *value() const;
int visible();
int w();
int x();
int y();
};
#endif

/** Fl_Help_View widget. */
#ifndef Fl_Help_View_H
#define Fl_Help_View_H

// Include necessary header files...
#include "Fl_H.H"
#include "Fl_Group.H"
#include "Fl_Help<Func type> - link callback function for files...
typedef const char *(Fl_Help_Func)(Fl_Widget *, const char *);

struct Fl_Help_Block {
    const char *start, // Start of text
    *end; // End of text
    uchar border; // Draw border?
    Fl_Color bgcolor; // Background color
    int x, // Indentation/starting X coordinate
    y, // Starting Y coordinate
    W, // Width
    H; // Height
    int line[32]; // Left starting position for each line
    int ol; // is ordered list <OL> element
    int ol_num; // item number in ordered list
};

struct Fl_Help_Link {
    char filename[192],
    name[32];
    int x,
    y,
    W,
    H;
};

const size_t MAX_FL_HELP_FS_ELTS = 100;

struct FL_EXPORT Fl_Help_Font_Style {
    Fl_Font f;
    Fl_Fontsize s;
    Fl_Color c;
    void get(Fl_Font &afont, Fl_Fontsize &asize, Fl_Color &acolor) {afont=f; asize=s; acolor=c;}
    void set(Fl_Font afont, Fl_Fontsize asize, Fl_Color acolor) {f=afont; s=asize; c=acolor;}
    Fl_Help_Font_Style(Fl_Font afont, Fl_Fontsize asize, Fl_Color acolor) {set(afont, asize, acolor);}
    Fl_Help_Font_Style(){} // For in table use
};

const Fl_Help_Font_Stack fl_fonts = {
    .nfonts = 0,
};

void init(Fl_Font f, Fl_Fontsize s, Fl_Color c) {
    .nfonts = 0;
    .elts_[nfonts_].set(f, s, c);
    fl_font(f, s); fl_color(c);
}

void top(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) {
    .elts_[nfonts_].get(f, s, c);
    fl_font(f, s); fl_color(c);
}

void push(Fl_Font f, Fl_Fontsize s, Fl_Color c) {
    if (nfonts_ < MAX_FL_HELP_FS_ELTS-1) nfonts_ ++;
    .elts_[nfonts_].set(f, s, c);
    fl_font(f, s); fl_color(c);
}

void pop(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) {
    if (nfonts_ > 0) nfonts_ --;
    top(f, s, c);
    fl_font(f, s); fl_color(c);
}

size_t count()const {
    return nfonts_; // Gets the current number of fonts in the stack
}

protected:
    size_t nfonts_;
    Fl_Help_Font_Style elts_[MAX_FL_HELP_FS_ELTS];
};

class FL_EXPORT Fl_Help_View : public Fl_Group { // Help viewer widget
    enum { RIGHT = -1, CENTER, LEFT };
char title_[1024];
Fl_Color defcolor_,
bgcolor_,
textcolor_,
linkcolor_;  
Fl_Font textfont_,
Fl_Fontsize textsize_;
const char *value_;  
Fl_Help_Font_Stack fstack_;  
int nblocks_,
blocks_;  
Fl_Help_Block *blocks_;  
Fl_Help_Func *link_;  
int nlinks_,
links_;  
Fl_Help_Link *links_;  
int ntargets_,
targets_;  
Fl_Help_Target *targets_;  

directory_[FL_PATH_MAX];
filename_[FL_PATH_MAX];
topleft_,
lefttop_,
size_,
hsize_,
scrollbar_size_;  
Fl_Scrollbar scrollbar_,
hscrollbar_;  

static int selection_first;
static int selection_last;
static int selection_push_first;
static int selection_push_last;
static int selection_drag_first;
static int selection_drag_last;
static int selected;
static int draw_mode;
static int mouse_x;
static int mouse_y;
static int current_pos;
static Fl_Help_View *current_view;
static Fl_Color hv_selection_color;
static Fl_Color hv_selection_text_color;

void initfont(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) { f = textfont_; s = textsize_; c = textcolor_; fstack_.init(f, s, c); }
void pushfont(Fl_Font f, Fl_Fontsize s) {fstack_.push(f, s, textcolor_);}
void pushfont(Fl_Font f, Fl_Fontsize s, Fl_Color c) {fstack_.push(f, s, c);}
void popfont(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) {fstack_.pop(f, s, c);}
Fl_Help_Block *add_block(const char *s, int xx, int yy, int ww, int hh, uchar border = 0);
void add_link(const char *n, int xx, int yy, int ww, int hh);
void add_target(const char *n, int yy);
static int compare_targets(const Fl_Help_Target *t0, const Fl_Help_Target *t1);
int do_align(Fl_Help_Block *block, int line, int xx, int a, int &l);
protected:
void hv_draw(const char *t, int x, int y, int entity_extra_length = 0);
void begin_selection();
void end_selection(int c=0);
void clear_global_selection();
Fl_Help_Link *find_link(int, int);
void follow_link(Fl_Help_Link *);
public:
Fl_Help_View(int xx, int yy, int ww, int hh, const char *l = 0);
### Fl_Hold_Browser.H

```cpp
1 //
2 // Hold browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 /* \file
18 Fl_Hold_Browser widget . */
19
20 ifndef Fl_Hold_Browser_H
21 define Fl_Hold_Browser_H
22
23 include "Fl_Browser.H"
24
25 class FL_EXPORT Fl_Hold_Browser : public Fl_Browser {
26 public:
27     Fl_Hold_Browser(int X, int Y, int W, int H, const char *L=0);
28  }
29
30 #endif // Fl_Hold_Browser_H
```

### Fl_Hor_Fill_Slider.H

```cpp
1 //
2 // Horizontal fill slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
```

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https://www.fltk.org/bugs.php

/*
file Fl_Hor_Fill_Slider widget */

#ifndef Fl_Hor_Fill_Slider_H
#define Fl_Hor_Fill_Slider_H

#include "Fl_Slider.H"

class FL_EXPORT Fl_Hor_Fill_Slider : public Fl_Slider {
public:
    Fl_Hor_Fill_Slider(int X,int Y,int W,int H,const char *L=0);
};

#endif

/*
file Fl_Hor_Nice_Slider widget */

#ifndef Fl_Hor_Nice_Slider_H
#define Fl_Hor_Nice_Slider_H

#include "Fl_Slider.H"

class FL_EXPORT Fl_Hor_Nice_Slider : public Fl_Slider {
public:
    Fl_Hor_Nice_Slider(int X,int Y,int W,int H,const char *L=0);
};

#endif

/*
file Fl_Hor_Slider widget */

#ifndef Fl_Hor_Slider_H
#define Fl_Hor_Slider_H

#include "Fl_Slider.H"

class FL_EXPORT Fl_Hor_Slider : public Fl_Slider {
public:
    Fl_Hor_Slider(int X,int Y,int W,int H,const char *L=0);
};

#endif

Generated by Doxygen
36   Fl_Hor_Slider(int X, int Y, int W, int H, const char *l = 0);
37 #endif

35.69 Fl_Hor_Value_Slider.H

1 //
2 // Horizontal value slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //  https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //  https://www.fltk.org/bugs.php
15 //
16 //
17 /*
18 Fl_Hor_Value_Slider widget. */
19
20 ifndef Fl_Hor_Value_Slider_H
21 #define Fl_Hor_Value_Slider_H
22
23 #include "Fl_Value_Slider.H"
24
25 class FL_EXPORT Fl_Hor_Value_Slider : public Fl_Value_Slider {
26 public:
27   Fl_Hor_Value_Slider(int X, int Y, int W, int H, const char *l = 0);
28 #endif

35.70 Fl_ICO_Image.H

1 //
2 // ICO image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2022-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //  https://www.fltk.org/COPYING.php
11 //
12 // Please report all bugs and problems on the following page:
13 //
14 //  http://www.fltk.org/str.php
15 //
16 //
17 //https://en.wikipedia.org/wiki/ICO_(file_format)
19 #ifndef Fl_ICO_Image_H
20 #define Fl_ICO_Image_H
21 #define Fl_ICO_Image_H
22 #include "Fl_BMP_Image.H"
23
24 class FL_EXPORT Fl_ICO_Image : public Fl_BMP_Image {
25 public:
26   Fl_ICO_Image(const char *filename, int id = -1, const unsigned char *data = NULL, const size_t datasize = 0);
27   ~Fl_ICO_Image();
28 #endif
```cpp
int idcount() const { return idcount_; }
const IconDirEntry * icondirentry() const { return icondirentry_; }

private:
int idcount_;  
struct IconDirEntry * icondirentry;

void load_ico_(class Fl_Image_Reader &rdr, int id);
```

### 35.71 Fl_Image.H File Reference

**Fl_Image, Fl_RGB_Image** classes.

```cpp
#include "Enumerations.H"
#include "Fl_Widget.H"
```

**Classes**

- **class Fl_Image**  
  Base class for image caching, scaling and drawing.

- **class Fl_RGB_Image**  
  The **Fl_RGB_Image** class supports caching and drawing of full-color images with 1 to 4 channels of color information.

**Enumerations**

- **enum Fl_RGB_Scaling**  
  The scaling algorithm to use for RGB images.

```
enum Fl_RGB_Scaling { FL_RGB_SCALING_NEAREST = 0, FL_RGB_SCALING_BILINEAR }
```

#### 35.71.1 Detailed Description

**Fl_Image, Fl_RGB_Image** classes.

#### 35.71.2 Enumeration Type Documentation

##### 35.71.2.1 Fl_RGB_Scaling

```cpp
enum Fl_RGB_Scaling
```

The scaling algorithm to use for RGB images.

<table>
<thead>
<tr>
<th>Enumerators</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_RGB_SCALING_NEAREST</td>
<td>default RGB image scaling algorithm</td>
</tr>
<tr>
<td>FL_RGB_SCALING_BILINEAR</td>
<td>more accurate, but slower RGB image scaling algorithm</td>
</tr>
</tbody>
</table>

#### 35.72 Fl_Image.H

Go to the documentation of this file.

1 //
2 // Image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
```
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```
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

#ifndef Fl_Image_H
#define Fl_Image_H

#include "Enumerations.H"
#include "Fl_Widget.H" // for fl_uintptr_t

class Fl_Widget;
struct Fl_Menu_Item;
struct Fl_Label;
class Fl_RGB_Image;

enum Fl_RGB_Scaling {
    FL_RGB_SCALING_NEAREST = 0,
    FL_RGB_SCALING_BILINEAR
};

class FL_EXPORT Fl_Image {
friend class Fl_Graphics_Driver;
public:
    static const int ERR_NO_IMAGE = -1;
    static const int ERR_FILE_ACCESS = -2;
    static const int ERR_FORMAT = -3;
    static const int ERR_MEMORY_ACCESS = -4;

private:
    int w_, h_, d_, ld_, count_;
    int data_w_, data_h_;
    const char * const *data_;
    static Fl_RGB_Scaling RGB_scaling_; // method used when copying RGB images
    static Fl_RGB_Scaling scaling_algorithm_; // method used to rescale RGB source images before drawing
    // Forbid use of copy constructor and assign operator
    Fl_Image & operator=(const Fl_Image &);
    Fl_Image(const Fl_Image &);

protected:

    void w(int W) {w_ = W; data_w_ = W;}
    void h(int H) {h_ = H; data_h_ = H;}
    void d(int D) {d_ = D;}
    void ld(int LD) {ld_ = LD;}
    void data(const char * const *p, int c) {data_ = p; count_ = c;}
    void draw_empty(int X, int Y);

    static void labeltype(const Fl_Label *lo, int lx, int ly, int lw, int lh, Fl_Align la);
    static void measure(const Fl_Label *lo, int &lw, int &lh);
    int draw_scaled(int X, int Y, int W, int H);

public:

    int w()const {return w_;
    int h()const {return h_;
    int data_w()const {return data_w_;
    int data_h()const {return data_h_;
    int d()const {return d_;
    int ld()const {return ld_;
    int count()const {return count_;
    const char * const *data()const {return data_;

    Fl_Image(int W, int H, int D);
    Fl_SVG_Image(int W, int H, Fl_Align A);
    Fl_SVG_Image(int W, int H, Fl_Align A, int D);

    Fl_RGB_Image(int W, int H, Fl_Align A);
    Fl_RGB_Image(int W, int H, Fl_Align A, int D);
    Fl_RGB_Scaling FL_RGB_SCALING_NEAREST = 0;
    Fl_RGB_Scaling FL_RGB_SCALING_BILINEAR

    virtual void label(Fl_Widget *w);
    virtual void label(Fl_Menu_Item *m);
    virtual void release() {
        delete this;
    }
    virtual class Fl_Shared_Image *as_shared_image() {
        return 0;
    }
    virtual ~Fl_Image();
virtual void draw(int X, int Y, int W, int H, int cx=0, int cy=0); // platform dependent
void draw(int X, int Y) {draw(X, Y, w(), h(), 0, 0);} // platform dependent
virtual void uncache();

// set RGB image scaling method
static void RGB_scaling(Fl_RGB_Scaling);

// set the image drawing size
virtual void scale(int width, int height, int proportional = 1, int can_expand = 0);

static void RGB_scaling(Fl_RGB_Scaling algorithm) {scaling_algorithm_ = algorithm; }
static Fl_RGB_Scaling scaling_algorithm() {return scaling_algorithm_;
static bool register_images_done;

// set the image drawing size
virtual void scale(int width, int height, int proportional = 1, int can_expand = 0);

static void max_size(size_t size) { max_size_ = size; }
static size_t max_size() {return max_size_;

virtual Fl_SVG_Image *as_svg_image() { return NULL; }
virtual void normalize() {}
class FL_EXPORT Fl_Image_Surface : public Fl_Widget_Surface {
friend class Fl_Graphics_Driver;
private:
class Fl_Image_Surface_Driver *platform_surface;
Fl_Offscreen get_offscreen_before_delete_();
protected:
void translate(int x, int y) FL_OVERRIDE;
void untranslate() FL_OVERRIDE;
public:
Fl_Image_Surface(int w, int h, int high_res = 0, Fl_Offscreen off = 0);
~Fl_Image_Surface();
void set_current() FL_OVERRIDE;
bool is_current() FL_OVERRIDE;
Fl_RGB_Image *image();
Fl_Shared_Image *highres_image();
void origin(int *x, int *y) FL_OVERRIDE;
void origin(int x, int y) FL_OVERRIDE;
int printable_rect(int *w, int *h) FL_OVERRIDE;
Fl_Offscreen offscreen();
void rescale();
void mask(const Fl_RGB_Image *);
};

class Fl_Image_Surface_Driver : public Fl_Widget_Surface {
friend class Fl_Image_Surface;
private:
class Fl_Image_Surface *image_surface_;
protected:
int width;
int height;
Fl_Offscreen offscreen;
int external_offscreen;
virtual ~Fl_Image_Surface_Driver() {};
static void copy_with_mask(Fl_RGB_Image * mask, uchar *dib_dst, uchar *dib_src, int line_size, bool bottom_to_top);
static Fl_RGB_Image *RGB3_to_RGB1(const Fl_RGB_Image *rgb3, int W, int H);
void set_current() FL_OVERRIDE = 0;
void translate(int x, int y) FL_OVERRIDE = 0;
void untranslate() FL_OVERRIDE = 0;
int printable_rect(int *w, int *h) FL_OVERRIDE;
virtual Fl_RGB_Image *image() = 0;
virtual void mask(const Fl_RGB_Image *);;
};

static Fl_Image_Surface_Driver *newImageSurfaceDriver(int w, int h, int high_res, Fl_Offscreen off);

Fl_Image_Surface *image_surface() { return image_surface_; }
};
#endif // Fl_Image_Surface_H

#define Fl_Input_H
#include "Fl_Input_.H"

class FL_EXPORT Fl_Input : public Fl_Input_ {
friend class Fl_Screen_Driver;
friend class Fl_Cocoa_Screen_Driver; // Not ideal, but probably no other platform will use it
int shift_position(int p);
int shift_up_down_position(int p);
void handle_mouse(int keepmark=0);
};

extern "C" {
#ifndef Fl_Input_ H
#define Fl_Input_ H
#endif // Fl_Input_ H

/ * Fl_Input widget . */

17 /* the file "COPYING" which should have been included with this file. If this file is missing or damaged, see the license at:
19 // https://www.fltk.org/COPYING.php
11 // Please see the following page on how to report bugs and issues:
13 // https://www.fltk.org/bugs.php
15 //
16 */
17 #ifndef Fl_Input_H
18 #define Fl_Input_H
19 #define Fl_Input_H
20 #include "Fl_Input_.H"
21 #define Fl_Input_H
22 #include "Fl_Input_H"
24 class FL_EXPORT Fl_Input : public Fl_Input_ {
25 friend class Fl_Screen_Driver;
26 friend class Fl_Cocoa_Screen_Driver; // Not ideal, but probably no other platform will use it
27 int shift_position(int p);
28 int shift_up_down_position(int p);
29 void handle_mouse(int keepmark=0);
// Private keyboard functions
int kf_lines_up(int repeat_num);
int kf_lines_down(int repeat_num);
int kf_page_up();
int kf_page_down();
int kf_insert_toggle();
int kf_delete_word_right();
int kf_delete_word_left();
int kf_delete_EOL();
int kf_delete_EOL();
int kf_delete_char_right();
int kf_delete_char_left();
int kf_delete_EOL();
int kf_delete_EOL();
int kf_move_sol();
int kf_move_eol();
int kf_move_char_left();
int kf_move_char_right();
int kf_move_word_left();
int kf_move_word_right();
int kf_move_up_and_sol();
int kf_move_down_and_eol();
int kf_top();
int kf_bottom();
protected:
void draw() FL_OVERRIDE;
int handle_key();
int handle_rmb();
public:
int handle(int) FL_OVERRIDE;
Fl_Input(int,int,int,int,const char * = 0);
static const char *cut_menu_text;
static const char *copy_menu_text;
static const char *paste_menu_text;

#endif
#define FL_MULTILINE_INPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_WRAP)
#define FL_MULTILINE_OUTPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_READONLY | FL_INPUT_WRAP)

class Fl_Input_Undo_Action;
class Fl_Input_Undo_Action_List;

class FL_EXPORT Fl_Input_ : public Fl_Widget {
  const char* value_;  
  char* buffer;         
  int size_;  
  int bufsize;  
  int position_;  
  int mark_;  
  int tab_nav_;  
  int xscroll_, yscroll_;  
  int mu_p;  
  int maximum_size_;  
  int shortcut_;  
  uchar erase_cursor_only;  
  Fl_Font textfont_;  
  Fl_Fontsize textsize_;  
  Fl_Color textcolor_;  
  Fl_Color cursor_color_;  
  Fl_Input_Undo_Action* undo_;  
  Fl_Input_Undo_Action_List* undo_list_;  
  Fl_Input_Undo_Action_List* redo_list_;  
  static double up_down_pos;  
  static int was_up_down;

  /* Convert a given text segment into the text that will be rendered on screen. */
  const char* expand(const char*, char*) const;

  /* Calculates the width in pixels of part of a text buffer. */
  double expandpos(const char*, const char*, const char*, int*) const;

  /* Mark a range of characters for update. */
  void minimal_update(int, int);

  /* Mark a range of characters for update. */
  void minimal_update(int p);

  /* Copy the value from a possibly static entry into the internal buffer. */
  void put_in_buffer(int newsize);

  /* Set the current font and font size. */
  void setfont() const;

  protected:

  /* Find the start of a word. */
  int word_start(int i) const;

  /* Find the end of a word. */
  int word_end(int i) const;

  /* Find the start of a line. */
  int line_start(int i) const;

  /* Find the end of a line. */
  int line_end(int i) const;

  /* Draw the text in the passed bounding box. */
  void drawtext(int, int, int, int);

  /* Draw the text in the passed bounding box. */
  void drawtext(int, int, int, int, bool draw_active);

  /* Move the cursor to the column given by up_down_pos. */

  /* Find the start of a word. */
  int word_start(int i) const;

  /* Find the end of a word. */
  int word_end(int i) const;

  /* Find the start of a line. */
  int line_start(int i) const;

  /* Find the end of a line. */
  int line_end(int i) const;

  /* Draw the text in the passed bounding box. */
  void drawtext(int, int, int, int);

  /* Draw the text in the passed bounding box. */
  void drawtext(int, int, int, int, bool draw_active);
200 int up_down_position(int, int keepmark=0);
201
202 /* Handle mouse clicks and mouse moves. */
203 void handle_mouse(int, int, int, int, int keepmark=0);
204
205 /* Handle all kinds of text field related events. */
206 int handle_text(int, int, int, int, int);
207
208 /* Check the when() field and do a callback if indicated. */
209 void maybe_do_callback(Fl_Callback_Reason reason = FL_REASON_UNKNOWN);
210
211 int xscroll() const { return xscroll_; }
212
213 int yscroll() const { return yscroll_; }
214 void yscroll(int yOffset) { yscroll_ = yOffset; damage(FL_DAMAGE_EXPOSE); }
215
216 /* Return the number of lines displayed on a single page. */
217 int linesPerPage();
218
219 /* Apply the current undo/redo operation, called from undo() or redo() */
220 int apply_undo();
221
222 public:
223
224 /* Change the size of the widget. */
225 void resize(int, int, int, int) FL_OVERRIDE;
226
227 /* Constructor */
228 Fl_Input_(int, int, int, int, const char * = 0);
229
230 /* Destructor */
231 ~Fl_Input_();
232
233 /* Changes the widget text. */
234 int value(const char *);
235
236 /* Changes the widget text. */
237 int value(const char *, int);
238
239 /* Changes the widget text. */
240 int value(int value);
241
242 /* Changes the widget text. */
243 int value(double value);
244
245 /* Changes the widget text. */
246 int static_value(const char *);
247
248 /* Changes the widget text. */
249 int static_value(const char *, int);
250
251 const char * value() const { return value_; }
252
253 int ivalue() const;
254
255 double dvalue() const;
256
257 /* Returns the Unicode character at index \p i. */
258 unsigned int index(int i) const;
259
260 int size() const { return size_; }
261
262 int maximum_size() const { return maximum_size_; }
263
264 void maximum_size(int m) { maximum_size_ = m; }
265
266 int insert_position() const { return position_; }
267 FL_DEPRECATED("in 1.4.0 - use insert_position() instead",
268 int position(int p, int m)) { return insert_position(p, m); }
269
270 int mark() const { return mark_; }
271
272 /* Sets the index for the cursor and mark. */
273 int insert_position(int p, int m);
274 FL_DEPRECATED("in 1.4.0 - use insert_position(p, m) or Fl_Widget::position(x, y) instead",
275 int position(int p, int m)) { return insert_position(p, m); }
276
277 int insert_position(int p) { return insert_position(p, p); }
278 FL_DEPRECATED("in 1.4.0 - use insert_position(p) instead",
279 int position(int p)) { return insert_position(p); }
280
281 int mark(int m) { return insert_position(insert_position(), m); }
282
283 /* Deletes text from \p b to \p e and inserts the new string \p text. */
284 int replace(int b, int e, const char *text, int llen=0);
int cut() {return replace(insert_position(), mark(), 0);}

int cut(int n) {return replace(insert_position(), insert_position()+n, 0);}

int cut(int a, int b) {return replace(a, b, 0);}

int insert(const char * t, int l=0){return replace(position_, mark_, t, l);}

int append(const char * t, int l=0, char keep_selection=0);

/* Append text at the end. */
int copy(int clipboard);

/* Put the current selection into the clipboard. */
int copy(int clipboard);

/* Undo previous changes to the text buffer. */
textfont()const {return textfont_;}

void shortcut(int s) {shortcut_ = s;}

Fl_Font textfont()const {return textfont_;}

void textfont(Fl_Font s) {textfont_ = s;}

Fl_Fontsize textsize()const {return textsize_;}

void textsize(Fl_Fontsize s) {textsize_ = s;}

Fl_Color textcolor()const {return textcolor_;}

void textcolor(Fl_Color n) {textcolor_ = n;}

Fl_Color cursor_color()const {return cursor_color_;}

void cursor_color(Fl_Color n) {cursor_color_ = n;}

int input_type()const {return type() & FL_INPUT_TYPE; }

void input_type(int t) { type((uchar)(t | readonly())); }

int readonly()const { return type() & FL_INPUT_READONLY; }

void readonly(int b) { if (b) type((uchar)(type() | FL_INPUT_READONLY));
else type((uchar)(type() & ~FL_INPUT_READONLY)); }

int wrap()const { return type() & FL_INPUT_WRAP; }

void wrap(int b) { if (b) type((uchar)(type() | FL_INPUT_WRAP));
else type((uchar)(type() & ~FL_INPUT_WRAP)); }

int tab_nav()const { return tab_nav_;}

void tab_nav(int val) { tab_nav_ = val;
}

int tab_nav()const { return tab_nav_;}

};

35.76 Fl_Input_Choice.H

// An input/chooser widget.

// Copyright 2004 by Greg Ercolano.
/* Fl_Input_Choice widget. */

#ifndef Fl_Input_Choice_H
#define Fl_Input_Choice_H

#include <FL/Fl.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Input.H>
#include <FL/Fl_Menu_Button.H>

class FL_EXPORT Fl_Input_Choice : public Fl_Group {

private:

  // note: this is used by the Fl_Input_Choice ctor.
  static void menu_cb(Fl_Widget *, void *data);

  // note: this is used by the Fl_Input_Choice ctor.
  static void inp_cb(Fl_Widget *, void *data);

public:

  Fl_Input_Choice(int X, int Y, int W, int H, const char *L=0);
  ~Fl_Input_Choice();

  void resize(int X, int Y, int W, int H) FL_OVERRIDE;

  virtual int inp_x()const { return(x() + Fl::box_dx(box())); }
  virtual int inp_y()const { return(y() + Fl::box_dy(box())); }
  virtual int inp_w()const { return(w() - Fl::box_dw(box()) - 20); }
  virtual int inp_h()const { return(h() - Fl::box_dh(box())); }

  virtual int menu_x()const { return(x() + w() - 20 - Fl::box_dx(box())); }
  virtual int menu_y()const { return(y() + Fl::box_dy(box())); }
  virtual int menu_w()const { return(20); }
  virtual int menu_h()const { return(h() - Fl::box_dh(box())); }

  Fl_Boxtype down_box()const { return (menu_->down_box()); }

protected:

  // Custom resize behavior -- input stretches, menu button doesn't

  virtual int inp_x()const { return(x() + Fl::box_dx(box())) + 1; }
  virtual int inp_y()const { return(y() + Fl::box_dy(box())) + 1; }
  virtual int inp_w()const { return(w() - Fl::box_dw(box()) - 20); }
  virtual int inp_h()const { return(h() - Fl::box_dh(box())) + 1; }

  virtual int menu_x()const { return(x() + w() - 20 - Fl::box_dx(box()) + 1); }
  virtual int menu_y()const { return(y() + Fl::box_dy(box())) + 1; }
  virtual int menu_w()const { return(20); }
  virtual int menu_h()const { return(h() - Fl::box_dh(box()) + 1); }

public:

  Fl_Input_Choice(int X, int Y, int W, int H, const char *L=0);

  void resize(int X, int Y, int W, int H) FL_OVERRIDE;

  void add(const char *s) { menu_->add(s); }

  virtual int inp_x()const { return(x() + Fl::box_dx(box())); }
  virtual int inp_y()const { return(y() + Fl::box_dy(box())); }
  virtual int inp_w()const { return(w() - Fl::box_dw(box()) - 20); }
  virtual int inp_h()const { return(h() - Fl::box_dh(box())); }

  Fl_Boxtype down_box()const { return (menu_->down_box()); }

  Fl_Input *inp_;
  InputMenuButton *menu_;
1378  void down_box(Fl_Boxtype b) { menu_->down_box(b); }
1380  
1383  const Fl_Menu_Item *menu() { return (menu_->menu()); }
1385  
1386  void menu(const Fl_Menu_Item *m) { menu_->menu(m); }
1388  
1390  Fl_Color textcolor() const { return (inp_->textcolor());}
1392  
1394  void textcolor(Fl_Color c) { inp_->textcolor(c); }
1396  
1398  Fl_Font textfont() const { return (inp_->textfont()); }
1400  
1402  void textfont(Fl_Font f) { inp_->textfont(f); }
1404  
1406  Fl_Fontsize textsiz() const { return (inp_->textsiz()); }
1408  
1410  void textsiz(Fl_Fontsize s) { inp_->textsiz(s); }
1412  
1414  const char * value() const { return (inp_->value()); }
1416  
1419  void value(const char *val) { inp_->value(val); }
1421  
1422  /* Chooses item #p val in the menu, and sets the Fl_Input text field to that value. Any previous text is cleared. */
1424  
1425  void value(int val);
1427  
1428  int update_menubutton();
1430  
1432  Fl_Menu_Button *menubutton() { return menu_; }
1434  
1435  Fl_Input *input() { return inp_; } #endif // !Fl_Input_Choice_H
1437

35.77  Fl_Int_Input.H

1 // 2 // Integer input header file for the Fast Light Tool Kit (FLTK).
3 // 4 // Copyright 1998-2010 by Bill Spitzak and others.
5 // 6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 // 10 //  https://www.fltk.org/COPYING.php
11 // 12 // Please see the following page on how to report bugs and issues:
13 // 14 //  https://www.fltk.org/bugs.php
15 // 16 // */ \file
17 18 #ifndef Fl_Int_Input_H
19 #define Fl_Int_Input_H
20 
21 class FL_EXPORT Fl_Int_Input : public Fl_Input {
22 public:
23  Fl_Int_Input(int X, int Y, int W, int H, const char *l = 0);
24  
25 #ifndef Fl_Int_Input_H
26 #endif

35.78  Fl_JPEG_Image.H

1 // 2 // JPEG image header file for the Fast Light Tool Kit (FLTK).
3 // 4 // Copyright 1998-2010 by Bill Spitzak and others.
5 // 6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 // 10 //  https://www.fltk.org/COPYING.php
11 // 12 // Please see the following page on how to report bugs and issues:
35.79 Fl_Light_Button.H

13 //
14 // Lighted button header file for the Fast Light Tool Kit (FLTK).
15 //
16 // Copyright 1998-2022 by Bill Spitzak and others.
17 //
18 // This library is free software. Distribution and use rights are outlined in
19 // the file "COPYING" which should have been included with this file. If this
20 // file is missing or damaged, see the license at:
21 //
22 // https://www.fltk.org/COPYING.php
23 //
24 // Please see the following page on how to report bugs and issues:
25 //
26 // https://www.fltk.org/bugs.php
27 //
28 //
29 /*
30 Fl_Light_Button widget . */
31
32 #ifndef Fl_Light_Button_H
33 #define Fl_Light_Button_H
34
35 #include "Fl_Button.H"
36
37 class FL_EXPORT Fl_Light_Button : public Fl_Button {
38 protected:
39   void draw() FL_OVERRIDE;
40
41   int handle(int) FL_OVERRIDE;
42
43 public:
44   Fl_Light_Button(int x, int y, int w, int h, const char *l = 0);
45 };
46
47 #endif

35.80 Fl_Line_Dial.H

1 //
2 // Line dial header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 /*
18 Fl_Line_Dial widget . */
19
20 #ifndef Fl_Line_Dial_H
21 #define Fl_Line_Dial_H
22
23 #include "Fl_Widget.H"
24
25 class FL_EXPORT Fl_Line_Dial : public Fl_Widget {
26 public:
27   int handle(int) FL_OVERRIDE;
28   int value();
29
30   Fl_Line_Dial(int x, int y, int w, int h, const char *l = 0);
31   Fl_Line_Dial(int x, int y, int w, int h, const char *l = 0, int max = 100);
32   Fl_Line_Dial(int x, int y, int w, int h, const char *l = 0, int min = 0, int max = 100);
33   Fl_Line_Dial(int x, int y, int w, int h, const char *l = 0, int min = 0, int max = 100, int step = 1);
34   Fl_Line_Dial(int x, int y, int w, int h, const char *l = 0, int min = 0, int max = 100, int step = 1, int def = 0);
35   Fl_Line_Dial(int x, int y, int w, int h, const char *l = 0, int min = 0, int max = 100, int step = 1, int def = 0, int type = Fl-slider);
36
37 #endif
Fl_Line_Dial widget. */
#ifndef Fl_Line_Dial_H
#define Fl_Line_Dial_H
#include "Fl_Dial.H"

class FL_EXPORT Fl_Line_Dial : public Fl_Dial {
 public:
 Fl_Line_Dial(int X, int Y, int W, int H, const char *L = 0);
};
#endif

35.81 Fl_Menu.H

/*
 * Fl_Menu_ widget.
 */
#ifndef Fl_Menu_H
#define Fl_Menu_H
#ifndef Fl_Widget_H
#include "Fl_Widget.H"
#endif
#include "Fl_Menu_Item.H"

class FL_EXPORT Fl_Menu_ : public Fl_Widget {

 Fl_Menu_Item *menu_; // path to menu
 const Fl_Menu_Item *value_; // selected menu item
 const Fl_Menu_Item *prev_value_; // previous selected menu item

 protected:
 uchar alloc; // flag indicates if menu_ is a dynamic copy (=1) or not (=0)
 uchar down_box_; // down arrow box
 Fl_Boxtype menu_box_; // menu box type
 Fl_Font textfont_; // text font
 Fl_Fontsize textsize_; // text size
 Fl_Color textcolor_; // text color

 int item_pathname_(char *name, int namelen, const Fl_Menu_Item *finditem,
 const Fl_Menu_Item *menu=0); // item name
 public:

35.82 Fl_Menu_.H

/*
 * Fl_Menu_ widget.
 */
#ifndef Fl_Menu_.H
#define Fl_Menu_.H
#ifndef Fl_Widget_H
#include "Fl_Widget.H"
#endif
#include "Fl_Menu_Item.H"

class FL_EXPORT Fl_Menu_ : public Fl_Widget {

 Fl_Menu_Item *menu_; // path to menu
 const Fl_Menu_Item *value_; // selected menu item
 const Fl_Menu_Item *prev_value_; // previous selected menu item

 protected:
 uchar alloc; // flag indicates if menu_ is a dynamic copy (=1) or not (=0)
 uchar down_box_; // down arrow box
 Fl_Boxtype menu_box_; // menu box type
 Fl_Font textfont_; // text font
 Fl_Fontsize textsize_; // text size
 Fl_Color textcolor_; // text color

 int item_pathname_(char *name, int namelen, const Fl_Menu_Item *finditem,
 const Fl_Menu_Item *menu=0); // item name
 public:
const Fl_Menu_Item * test_shortcut() { return picked(menu()->test_shortcut()); }
void global();

const Fl_Menu_Item * menu() const { return menu_; }
const Fl_Menu_Item * menu_end(); // in src/Fl_Menu_add.cxx
void menu(const Fl_Menu_Item * m);
void copy(const Fl_Menu_Item * m, void * user_data = 0);
int insert(int index, const char *, int shortcut, Fl_Callback *, void * user_data = 0, int); // see src/Fl_Menu_add.cxx
int add(const char * a, const char * b, Fl_Callback * c, void * d = 0, int e = 0);
int add(const char * a, const char * b, Fl_Callback * c, void * d = 0, int e = 0) {
  return add(a, fl_old_shortcut(b), c, d, e);
}
int insert(int index, const char * a, const char * b, Fl_Callback * c, void * d = 0, int e = 0) {
  return insert(index, a, fl_old_shortcut(b), c, d, e);
}
int add(const char * a);
int size() const ;
void size(int W, int H) { Fl_Widget::size(W, H); }

const Fl_Menu_Item * mvalue() const { return value_;
}
const Fl_Menu_Item * prev_mvalue() const { return prev_value_; }
int value() const { return value_ ? (int)(value_-menu_) : -1;
}
int value(const Fl_Menu_Item * item);
int value(int i) { return value(menu_+i);
const char * text() const { return value_ ? value_->text : 0;
}
const char * text(int i) const { return menu_[i].text;
}

Fl_Font textfont() const { return textfont_;
}
void textfont(Fl_Font c) { textfont_ = c;
Fl_Fontsize textsize() const { return textsize_;
}
void textsize(Fl_Fontsize c) { textsize_ = c;
Fl_Color textcolor() const { return textcolor_;
}
void textcolor(Fl_Color c) { textcolor_ = c;
Fl_Boxtype down_box() const { return down_box_;
}
void down_box(Fl_Boxtype b) { down_box_ = b;
Fl_Boxtype menu_box() const { return menu_box_;
}
void menu_box(Fl_Boxtype b) { menu_box_ = b;

// Menu bar header file for the Fast Light Tool Kit (FLTK).
// Copyright 1998-2017 by Bill Spitzak and others.
// This library is free software. Distribution and use rights are outlined in the file "COPYING" which should have been included with this file. If this file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

Generated by Doxygen
File Documentation

```cpp
17 /* 
18 Fl_Menu_Bar widget. */
19
20 ifndef Fl_Menu_Bar_H
21 define Fl_Menu_Bar_H
22
23 #include "Fl_Menu_.H"
24
65 class FL_EXPORT Fl_Menu_Bar : public Fl_Menu_ {
66 friend class Fl_Sys_Menu_Bar_Driver;
67 protected:
68 void draw() FL_OVERRIDE;
69 public:
70 int handle(int) FL_OVERRIDE;
71 Fl_Menu_Bar(int X, int Y, int W, int H, const char *l=0);
72 virtual void update() {};
73
74 #endif

35.84 Fl_Menu_Button.H

1 //
2 // Menu button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
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12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* 
18 Fl_Menu_Button widget. */
19
20 ifndef Fl_Menu_Button_H
21 define Fl_Menu_Button_H
22
23 #include "Fl_Menu_.H"
24
56 class FL_EXPORT Fl_Menu_Button : public Fl_Menu_ {
57 protected:
58 void draw() FL_OVERRIDE;
59 static Fl_Menu_Button* pressed_menu_button_;
60 public:
61 enum popup_buttons {POPUP1 = 1,
62 POPUP2,
63 POPUP12,
64 POPUP3,
65 POPUP13,
66 POPUP23,
67 POPUP123
68);
69 int handle(int) FL_OVERRIDE;
70 const Fl_Menu_Item* popup();
71 Fl_Menu_Button(int X, int Y, int H, const char *l=0);
72 }
73
74 #endif

35.85 Fl_Menu_Item.H File Reference

#include "Fl_Widget.H"
#include "Fl_Image.H"
#include <FL/platform_types.h>

Classes

- struct Fl_Menu_Item

The Fl_Menu_Item structure defines a single menu item that is used by the Fl_Menu_ class.
Typedefs

- typedef Fl_Menu_Item Fl_Menu

Enumerations

- enum {
  FL_MENU_INACTIVE = 1, FL_MENU_TOGGLE = 2, FL_MENU_VALUE = 4, FL_MENU_RADIO = 8,
  FL_MENU_INVISIBLE = 0x10, FL_SUBMENU_POINTER = 0x20, FL_SUBMENU = 0x40, FL_MENU_DIVIDER = 0x80,
  FL_MENU_HORIZONTAL = 0x100, FL_MENU_RESERVED = 0xffffffff
}

Functions

- Fl_Shortcut fl_old_shortcut (const char *)
  Emulation of XForms named shortcuts.

35.85.1 Enumeration Type Documentation

35.85.1.1 anonymous enum

anonymous enum

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_MENU_INACTIVE</td>
<td>Deactivate menu item (gray out)</td>
</tr>
<tr>
<td>FL_MENU_TOGGLE</td>
<td>Item is a checkbox toggle (shows checkbox for on/off state)</td>
</tr>
<tr>
<td>FL_MENU_VALUE</td>
<td>The on/off state for checkbox/radio buttons (if set, state is 'on')</td>
</tr>
<tr>
<td>FL_MENU_RADIO</td>
<td>Item is a radio button (one checkbox of many can be on)</td>
</tr>
<tr>
<td>FL_MENU_INVISIBLE</td>
<td>Item will not show up (shortcut will work)</td>
</tr>
<tr>
<td>FL_SUBMENU_POINTER</td>
<td>Indicates user_data() is a pointer to another menu array.</td>
</tr>
<tr>
<td>FL_SUBMENU</td>
<td>Item is a submenu to other items.</td>
</tr>
<tr>
<td>FL_MENU_DIVIDER</td>
<td>Creates divider line below this item. Also ends a group of radio buttons.</td>
</tr>
<tr>
<td>FL_MENU_HORIZONTAL</td>
<td>??? – reserved, internal (do not use)</td>
</tr>
<tr>
<td>FL_MENU_RESERVED</td>
<td>These bits are reserved for internal or future usage (do not use)</td>
</tr>
</tbody>
</table>

35.86 Fl_Menu_Item.H

Go to the documentation of this file.
```c
#ifndef Fl_Menu_Item_H
#define Fl_Menu_Item_H

#include "Fl_Widget.H"
#include "Fl_Image.H"
#include <FL/platform_types.h> // for FL_COMMAND and FL_CONTROL

// doxygen needs the following line to enable e.g. ::FL_MENU_TOGGLE to link to the enums
enum { // values for flags:
  FL_MENU_INACTIVE = 1,
  FL_MENU_TOGGLE = 2,
  FL_MENU_VALUE = 4,
  FL_MENU_RADIO = 8,
  FL_MENU_INVISIBLE = 0x10,
  FL_SUBMENU_POINTER = 0x20,
  FL_SUBMENU = 0x40,
  FL_MENU_DIVIDER = 0x80,
  FL_MENU_HORIZONTAL = 0x100,
  FL_MENU_RESERVED = 0xffffff00
};

extern FL_EXPORT Fl_Shortcut fl_old_shortcut(const char*);

class Fl_Menu;

struct FL_EXPORT Fl_Menu_Item {
  const char *text;
  int shortcut_; 
  Fl_Callback *callback_; 
  void *user_data_; 
  int flags;
  uchar labeltype_; 
  Fl_Font labelfont_; 
  Fl_Fontsize labelsize_; 
  Fl_Color labelcolor_; 

  // advance N items, skipping submenus:
  const Fl_Menu_Item *next(int=1) const;

  Fl_Menu_Item *next(int i=1) {
    return (Fl_Menu_Item *)(((const Fl_Menu_Item*)this)->next(i));
  }

  const Fl_Menu_Item *first()const { return next(0); }

  Fl_Menu_Item *first() { return next(0); }

  // methods on menu items:
  const char * label()const {return text;}
  void label(const char * a) {text=a;}
  void label(Fl_Labeltype a, const char * b) {labeltype_ = a; text = b;}
  Fl_Labeltype labeltype()const {return (Fl_Labeltype)labeltype_;
  void labeltype(Fl_Labeltype a) {labeltype_ = a;}
  Fl_Color labelcolor()const {return labelcolor_;
  void labelcolor(Fl_Color a) {labelcolor_ = a;}
  Fl_Font labelfont()const {return labelfont_;
  void labelfont(Fl_Font a) {labelfont_ = a;}
  Fl_Fontsize labelsize()const {return labelsize_;
  void labelsize(Fl_Fontsize a) {labelsize_ = a;}
  Fl_Callback_p callback()const {return callback_;}
  void callback(Fl_Callback * c, void* p) {callback_=c; user_data_=p;}
  void callback(Fl_Callback * c) {callback_=(Fl_Callback*)c;
  void user_data()const {return user_data_;
  void user_data(void * v) {user_data_ = v;}
  long argument()const {return (long)(fl_intptr_t)user_data_;}
  void argument(long v) {user_data_ = (void*)(fl_intptr_t)v;
```
int shortcut() const {return shortcut_ ;}
void shortcut(int s) {shortcut_ = s ;}
int submenu() const {return flags& (FL_SUBMENU | FL_SUBMENU_POINTER) ;}
int checkbox() const {return flags&FL_MENU_TOGGLE ;}
int radio() const {return flags&FL_MENU_RADIO ;}
int value() const {return (flags & FL_MENU_VALUE) ? 1 : 0 ;}
void value(int v) {v ? set() : clear() ;}
void set() {flags |= FL_MENU_VALUE ;}
void clear() {flags &~FL_MENU_VALUE ;}
void setonly(Fl_Menu_Item const* first = NULL) ;
int visible() const {return !(flags&FL_MENU_INVISIBLE) ;}
void show() {flags &= ~FL_MENU_INVISIBLE ;}
void hide() {flags |= FL_MENU_INVISIBLE ;}
int active() const {return !(flags & FL_MENU_INACTIVE) ;}
void activate() {flags &= ~FL_MENU_INACTIVE ;}
void deactivate() {flags |= FL_MENU_INACTIVE ;}
int activevisible() const {return !(flags & (FL_MENU_INACTIVE | FL_MENU_INVISIBLE)) ;}
void image(Fl_Image* image) {image->label(this) ;}
void image(Fl_Image& image) {image.label(this) ;}
int measure(int* h, const Fl_Menu_* const* ) const ;
void draw(int x, int y, int w, int h, const Fl_Menu_* const* , int t=0) const ;
const Fl_Menu_Item* popup(int X, int Y, const char* title = 0, const Fl_Menu_Item* picked=0, const Fl_Menu_* const* = 0) const ;
const Fl_Menu_Item* pulldown(int X, int Y, int w, int h, const Fl_Menu_Item_* const* , int t=0) const ;
void do_callback(Fl_Widget* o) const {Fl::callback_reason_=FL_REASON_SELECTED; callback_(o, user_data_) ;}
void do_callback(Fl_Widget* o, void* arg) const {Fl::callback_reason_=FL_REASON_SELECTED; callback_(o, arg) ;}
void do_callback(Fl_Widget* o, long arg) const {Fl::callback_reason_=FL_REASON_SELECTED; callback_(o, (void*)(fl_intptr_t)arg) ;}
inline int checked() const {return value() ;}
inline void check() {set() ;}
inline void uncheck() {clear() ;}
int insert(int,const char*,int,Fl_Callback*,void* =0, int =0) ;
int add(const char*, int shortcut, Fl_Callback*, void* =0, int = 0) ;
int add(const char* a, const char* b, Fl_Callback* c, void* d = 0, int e = 0) {
    return add(a,fl_old_shortcut(b),c,d,e) ;
}
int size() const ;

enum {FL_PUP_NONE = 0, FL_PUP_GREY = FL_MENU_INACTIVE, FL_PUP_GRAY = FL_MENU_INACTIVE, FL_MENU_BOX = FL_MENU_TOGGLE, FL_PUP_BOX = FL_MENU_TOGGLE} ;

// typing?
Fl_Menu_Item Fl_Menu; // back compatibility

// back-compatibility enum:
FL_PUP_NONE = 0,
FL_PUP_Grey = FL_MENU_INACTIVE,
FL_PUP_GRAY = FL_MENU_INACTIVE,
FL_MENU_BOX = FL_MENU_TOGGLE,
FL_PUP_BOX = FL_MENU_TOGGLE,
35.87 Fl_Menu_Window.H

1 //
2 // Menu window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
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12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 /*
18 file
19 */
20 ifndef Fl_Menu_Window_H
21 #define Fl_Menu_Window_H
22
23 #include "Fl_Single_Window.H"
24
25 class FL_EXPORT Fl_Menu_Window : public Fl_Single_Window {
26 public:
27 ~Fl_Menu_Window();
28 Fl_Menu_Window(int W, int H, const char *l = 0);
29 Fl_Menu_Window(int X, int Y, int W, int H, const char *l = 0);
30
31 #endif

35.88 fl_message.H

1 //
2 // Standard message header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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14 // https://www.fltk.org/bugs.php
15 //
16 //
17 ifndef _FL_fl_message_H_
18 #define _FL_fl_message_H_
19 #if defined _FL_fl_message_H_
20 #define _FL_fl_message_H_
21 #endif

35.89 Fl_Multi_Browser.H

1 //
2 // Multi browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
35.90 Fl_Multi_Label.H

9 //
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11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 /*
17 Fl_Multi_Browser widget.
18 */
19 ifndef Fl_Multi_Browser_H
20 define Fl_Multi_Browser_H
21
22 #include "Fl_Browser.H"
23
41 class FL_EXPORT Fl_Multi_Browser : public Fl_Browser {
42 public:
49 Fl_Multi_Browser(int X,int Y,int W,int H,const char *L=0);
50
51 #endif

35.90 Fl_Multi_Label.H

1 //
2 // Multi-label header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2015 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 ifndef Fl_Multi_Label_H
17 define Fl_Multi_Label_H
18
19 class Fl_Widget;
20 struct Fl_Menu_Item;
21
70 struct FL_EXPORT Fl_Multi_Label {
74 const char * labela;
78 const char * labelb;
83 uchar typea;
88 uchar typeb;
91 void label(Fl_Widget*);
93 void label(Fl_Menu_Item*);
94
95 #endif

35.91 Fl_Multiline_Input.H

1 //
2 // Multiline input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 /*
17 Fl_Multiline_Input widget.
18 */
19 ifndef Fl_Multiline_Input_H
20 define Fl_Multiline_Input_H
21
22
35.92  Fl_Multiline_Output.H

1 //
2 // Multi line output header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //  https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //  https://www.fltk.org/bugs.php
15 //
16 17 /*
18 Fl_Multiline_Output widget. */
19 20 ifndef Fl_Multiline_Output_H
21 #define Fl_Multiline_Output_H
22 23 #include "Fl_Output.H"
24 25 class FL_EXPORT Fl_Multiline_Output : public Fl_Output {
26 public:
27   Fl_Multiline_Output(int X, int Y, int W, int H, const char *l = 0);
28 ;
29 30 #endif

35.93  Fl_Native_File_Chooser.H File Reference

Fl_Native_File_Chooser widget.
#include <FL/Fl_Export.H>
#include <FL/Fl_File_Chooser.H>

Classes

• class Fl_Native_File_Chooser

  This class lets an FLTK application easily and consistently access the operating system’s native file chooser.

35.93.1  Detailed Description

Fl_Native_File_Chooser widget.

35.94  Fl_Native_File_Chooser.H

Go to the documentation of this file.
1 //
2 // FLTK native OS file chooser widget
3 //
4 // Copyright 1998-2016 by Bill Spitzak and others.
5 // Copyright 2004 Greg Ercolano.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
35.94 Fl_Native_File_Chooser.H

// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

/* Implementation note:

class Fl_Native_File_Chooser <== public API used by applications
class Fl_Native_File_Chooser_Driver <== virtual API that a platform may implement
this API has a do-nothing default implementation

class Fl_Native_File_Chooser_FLTK_Driver <== this API implementation is the default FLTK file chooser
class Fl_GTK_Native_File_Chooser_Driver <== this API implementation runs a GTK file chooser
it is determined at run-time if the GTK dynamic libraries are available
and the KDE file chooser runs under the KDE desktop

class Fl_Quartz_Native_File_Chooser_Driver <== this API implementation runs a Mac OS X file chooser

class Fl_WinAPI_Native_File_Chooser_Driver <== this API implementation runs a Windows file chooser

Each platform must implement the constructor of the Fl_Native_File_Chooser class.
This particular implementation:

Fl_Native_File_Chooser::Fl_Native_File_Chooser(int val) {
  platform_fnfc = new Fl_Native_File_Chooser_FLTK_Driver(val);
}
can be used by any platform.
No more code is required. The cross-platform Fl_Native_File_Chooser_FLTK.cxx file must be compiled in libfltk,
and the default FLTK file chooser will be used.

This other implementation:

Fl_Native_File_Chooser::Fl_Native_File_Chooser(int val) {
  platform_fnfc = 0;
}
can be used by a platform that needs no file chooser.
*/

#ifndef FL_NATIVE_FILE_CHOOSER_H
#define FL_NATIVE_FILE_CHOOSER_H

#include <FL/Fl_Export.H>
#include <FL/Fl_File_Chooser.H>

class Fl_Native_File_Chooser_Driver;

class FL_EXPORT Fl_Native_File_Chooser {
private:
  Fl_Native_File_Chooser_Driver *platform_fnfc;
public:
  enum Type {
    BROWSE_FILE = 0,
    BROWSE_DIRECTORY,
    BROWSE_MULTI_FILE,
    BROWSE_MULTI_DIRECTORY,
    BROWSE_SAVE_FILE,
    BROWSE_SAVE_DIRECTORY
  };
  enum Option {
    NO_OPTIONS = 0x0000,
    SAVEAS_CONFIRM = 0x0001,
    NEW_FOLDER = 0x0002,
    PREVIEW = 0x0004,
    USE_FILTER_EXT = 0x0008
  };
  static const char *file_exists_message;

  Fl_Native_File_Chooser(int val = BROWSE_FILE); // each platform implements it
  ~Fl_Native_File_Chooser();
  void type(int t);
  int type() const ;
  void options(int o);
  int options() const ;
  int count() const ;
  const char *filename() const ;
  const char *filename(int i) const ;
  void directory(const char *val);
  const char *directory() const ;
  void title(const char *t);
  const char *title() const ;
};

#endif
1390 File Documentation

const char *filter() const;
void filter(const char *f);
int filters() const;
void filter_value(int i);
int filter_value() const;
const char *preset_file(const char *f);
const char * preset_file() const;
const char *errmsg() const;
int show();

class Fl_Native_File_Chooser_Driver {
protected:
static void chrcat(char *s, char c);
static char *strapp(char *s, const char *val);
static char *strfree(char *val);
static char *strnew(const char *val);
public:
Fl_Native_File_Chooser_Driver(int);
virtual ~Fl_Native_File_Chooser_Driver();
virtual void type(int) FL_OVERRIDE;
virtual int type() const FL_OVERRIDE;
virtual void options(int) FL_OVERRIDE;
virtual int options() const FL_OVERRIDE;
virtual int count() const FL_OVERRIDE;
virtual const char *filename() const FL_OVERRIDE;
virtual const char *filename(int) const FL_OVERRIDE;
virtual void directory(const char *) FL_OVERRIDE;
virtual const char *directory() const FL_OVERRIDE;
virtual void title(const char *) FL_OVERRIDE;
virtual const char * title() const FL_OVERRIDE;
virtual const char *filter() const FL_OVERRIDE;
virtual void filter(const char *) FL_OVERRIDE;
virtual int filters() const FL_OVERRIDE;
virtual void filter_value(int) FL_OVERRIDE;
virtual int filter_value() const FL_OVERRIDE;
virtual void preset_file(const char *) FL_OVERRIDE;
virtual const char * preset_file() const FL_OVERRIDE;
virtual const char *errmsg() const FL_OVERRIDE;
virtual int show() FL_OVERRIDE;
};

class Fl_Native_File_Chooser_FLTK_Driver : public Fl_Native_File_Chooser_Driver {
private:
void errmsg(const char *msg);
int type_fl_file(int val);
int exist_dialog();
void parse_filter();
protected:
int _btype; // kind-of browser to show()
int _options; // general options
char *_filter; // user supplied filter
char *parsedfilt; // parsed filter
int _filtvalue; // selected filter
char *_preset_file;
char *_prevvalue; // Returned filename
char *_directory;
char *_errmsg; // error message
Fl_File_Chooser *_file_chooser;
public:
Fl_Native_File_Chooser_FLTK_Driver(int val);
virtual ~Fl_Native_File_Chooser_FLTK_Driver();
virtual void type(int t) FL_OVERRIDE;
virtual int type() const FL_OVERRIDE;
virtual void options(int o) FL_OVERRIDE;
virtual int options() const FL_OVERRIDE;
virtual int count() const FL_OVERRIDE;
virtual const char *filename() const FL_OVERRIDE;
virtual const char *filename(int i) const FL_OVERRIDE;
virtual void directory(const char *val) FL_OVERRIDE;
virtual const char *directory() const FL_OVERRIDE;
virtual void title(const char *t) FL_OVERRIDE;
virtual const char * title() const FL_OVERRIDE;
virtual const char *filter() const FL_OVERRIDE;
virtual void filter(const char *f) FL_OVERRIDE;
virtual int filters() const FL_OVERRIDE;
virtual void filter_value(int i) FL_OVERRIDE;
virtual int filter_value() const FL_OVERRIDE;
virtual void preset_file(const char *f) FL_OVERRIDE;
virtual const char * preset_file() const FL_OVERRIDE;
virtual const char *errmsg() const FL_OVERRIDE;
virtual int show() FL_OVERRIDE;
};

#endif /*FL_NATIVE_FILE_CHOOSER_H*/
35.95  Fl_Nice_Slider.H

1 //
2 /* "Nice" slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 // */
17 #ifndef Fl_Nice_Slider_H
18 #define Fl_Nice_Slider_H
19 #ifdef Fl_Nice_Slider_H
20 #define Fl_Nice_Slider_H
21 #endif
22 #include "Fl_Slider.H"
23
24 class FL_EXPORT Fl_Nice_Slider : public Fl_Slider {
25     public:
26     Fl_Nice_Slider(int X,int Y,int W,int H,const char *L=0);
27     }
28 #endif

35.96  Fl_Object.H

1 //
2 /* Old Fl_Object header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 // This file is provided for back compatibility only. Please use Fl_Widget
17 #ifndef Fl_Object
18 #define Fl_Object Fl_Widget
19 #endif
20 #include "Fl_Widget.H"

35.97  Fl_Output.H

1 //
2 /* Output header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 // */
17 #ifndef Fl_Output_H
18 #define Fl_Output_H
19 #ifdef Fl_Output_H
20 #define Fl_Output_H
21 #endif
22 #include "Fl_Input.H"
**35.98 Fl_Output.H**

```cpp
class FL_EXPORT Fl_Output : public Fl_Input {
public:
    Fl_Output(int X, int Y, int W, int H, const char *l = 0);
};
```

**35.98 Fl_Overlay_Window.H**

```cpp
class FL_EXPORT Fl_Overlay_Window : public Fl_Double_Window {
    Fl_Window *overlay_
public:
    virtual void draw_overlay() = 0;
    void show() FL_OVERRIDE;
    void hide() FL_OVERRIDE;
    void flush() FL_OVERRIDE;
    void resize(int, int, int, int) FL_OVERRIDE;
    Fl_Overlay_Window(int W, int H, const char *l=0);
    Fl_Overlay_Window(int X, int Y, int W, int H, const char *l=0);
public:
    void show(int a, char **b) {Fl_Double_Window::show(a, b);} 
    Fl_Overlay_Window *as_overlay_window() FL_OVERRIDE [return this]; } 
};
```

**35.99 Fl_Pack.H**

```cpp
class FL_EXPORT Fl_Pack : public Fl_Double_Window {
friend class Fl_Pack;
friend class Fl_Window_Driver;
public:
    virtual void draw_overlay() = 0;
    void show() FL_OVERRIDE;
    void hide() FL_OVERRIDE;
    void flush() FL_OVERRIDE;
    void resize(int, int, int, int) FL_OVERRIDE;
    int can_do_overlay();
    void redraw_overlay();
protected:
    Fl_Pack Window_overlay;
public:
    void show(int w, int h, const char *l=0);
    Fl_Pack Window(int X, int Y, int W, int H, const char *l=0);
public:
    void show(int a, char **b) [Fl_Double_Window::show(a, b)]; 
    Fl_Pack *as_overlay_window() FL_OVERRIDE [return this]; } 
};
```
35.100 Fl_Paged_Device.H File Reference

declaration of class Fl_Paged_Device.
#include <FL/Fl_Widget_Surface.H>

Classes

- class Fl_Paged_Device
  Represents page-structured drawing surfaces.
- struct Fl_Paged_Device::page_format
  width, height and name of a page format

Macros

- #define NO_PAGE_FORMATS 30 /* MSVC6 compilation fix */
  Number of elements in enum Page_Format.

35.100.1 Detailed Description

declaration of class Fl_Paged_Device.

35.101 Fl_Paged_Device.H

Go to the documentation of this file.
// Printing support for the Fast Light Tool Kit (FLTK).
// Copyright 2010-2016 by Bill Spitzak and others.
// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

Generated by Doxygen
```c
#ifndef Fl_Paged_Device_H
#define Fl_Paged_Device_H

#include <FL/Fl_Widget_Surface.H>

#define NO_PAGE_FORMATS 30 /* MSVC6 compilation fix */

class FL_EXPORT Fl_Paged_Device : public Fl_Widget_Surface {
protected:
    Fl_Paged_Device() : Fl_Widget_Surface(NULL) {}

public:
    enum Page_Format {
        A0 = 0,
        A1,
        A2,
        A3,
        A4,
        A5,
        A6,
        A7,
        A8,
        A9,
        B0,
        B1,
        B2,
        B3,
        B4,
        B5,
        B6,
        B7,
        B8,
        B9,
        B10,
        C5E,
        DLE,
        EXECUTIVE,
        FOLIO,
        LEDGER,
        LEGAL,
        LETTER,
        TABLOID,
        ENVELOPE,
        MEDIA = 0x1000
    };

    enum Page_Layout {
        PORTRAIT = 0,
        LANDSCAPE = 0x100,
        REVERSED = 0x200,
        ORIENTATION = 0x300
    };

    typedef struct {
        int width;
        int height;
        const char *name;
    } page_format;

    static const page_format page_formats[NO_PAGE_FORMATS];

    virtual ~Fl_Paged_Device() {}

    virtual int begin_job(int pagecount = 0, int *frompage = NULL, int *topage = NULL, char **perr_message = NULL) {
        return begin_job(pagecount, frompage, topage, perr_message);
    }

    virtual int begin_page(void);
    virtual int start_job(int pagecount = 0, int *frompage = NULL, int *topage = NULL, char **perr_message = NULL) {
        return begin_job(pagecount, frompage, topage, perr_message);
    }

    virtual int start_page() {return begin_page();}
    virtual void margins(int *left, int *top, int *right, int *bottom);
    virtual void scale(float scale_x, float scale_y = 0.);
    virtual void rotate(float angle);

    void print_widget(Fl_Widget * widget, int delta_x = 0, int delta_y = 0) {draw(widget, delta_x, delta_y);}
    void draw_decorated_window(Fl_Window *win, int x_offset = 0, int y_offset = 0) {
        draw_decorated_window(win, x_offset, y_offset);
    }
    virtual int end_page (void);
    virtual void end_job (void);
}

#endif // Fl_Paged_Device_H
```

35.102 Fl_Pixmap.H
/*
 * FlPixmap widget . */

#ifndef Fl_Pixmap_H
#define Fl_Pixmap_H
#include "Fl_Image.H"

class Fl_Widget;
struct Fl_Menu_Item;

// Older C++ compilers don't support the explicit keyword... :(
# if defined(__sgi) && !defined(_COMPILER_VERSION)
# define explicit
# endif // __sgi && !_COMPILER_VERSION

class FL_EXPORT Fl_Pixmap : public Fl_Image {
friend class Fl_Graphics_Driver;
void copy_data();
void delete_data();
void set_data(const char * const *p);

protected:
void measure();

public:

int alloc_data; // Non-zero if data was allocated

private:
// for internal use
fluintptr_t id_; // size of pixmap when cached
fluintptr_t mask_; // size of pixmap when cached

public:
explicit Fl_Pixmap(char * const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
{set_data((const char*const*)D); measure();}
explicit Fl_Pixmap(uchar * const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
{set_data((const char*const*)D); measure();}
explicit Fl_Pixmap(const char * const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
{set_data((const char*const*)D); measure();}
explicit Fl_Pixmap(const uchar * const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
{set_data((const char*const*)D); measure();}
virtual ~Fl_Pixmap();
Fl_Image *copy(int W, int H) const FL_OVERRIDE;
Fl_Image *copy()const { return Fl_Image::copy(); }
void color_average(Fl_Color c, float i) FL_OVERRIDE;
void desaturate() FL_OVERRIDE;
void draw(int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE;
void draw(int X, int Y) {draw(X, Y, w(), h(), 0, 0);}
void label(Fl_Widget *w) FL_OVERRIDE;
void label(Fl_Menu_Item *m) FL_OVERRIDE;
void uncache() FL_OVERRIDE;
int cache_w() {return cache_w_};
int cache_h() {return cache_h_};

};
#endif

35.103 Fl_Pixmap.H

1 //
2 // A Plugin system for FLTK, implemented in Fl_Preferences.cxx.
3 //
4 // Copyright 2002-2023 by Matthias Melcher.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:

Generated by Doxygen
class Fl_EXPORT Fl_Plugin : public Fl_Preferences {
  Fl_Preferences::ID id;
public:
  Fl_Plugin(const char *klass, const char *name);
  virtual ~Fl_Plugin();
};

class Fl_EXPORT Fl_Plugin_Manager : public Fl_Preferences {
public:
  Fl_Plugin_Manager(const char *klass);
  ~Fl_Plugin_Manager();
private:
  int plugins() { return groups(); } // Fl_Plugin *plugin(int index);
  Fl_Plugin *plugin(const char *name);
  Fl_Preferences::ID addPlugin(const char *name, Fl_Plugin *plugin);
  static void removePlugin(Fl_Preferences::ID id);
  static int load(const char *filename);
  static int loadAll(const char *filepath, const char *pattern=0);
};

#endif // !Fl_Preferences_H

35.104 Fl_PNG_Image.H

class Fl_EXPORT Fl_PNG_Image : public Fl_RGB_Image {
friend class Fl_ICO_Image;
public:
  Fl_PNG_Image(const char * filename);
  Fl_PNG_Image (const char *name_png, const unsigned char *buffer, int datasize);
private:
  Fl_PNG_Image(const char *filename, int offset); // used by Fl_ICO_Image
  void load_png_(const char *name_png, int offset, const unsigned char *buffer_png, int datasize);
};

// Support functions to write PNG image files (since 1.4.0)
FL_EXPORT int fl_write_png(const char *filename, Fl_RGB_Image *img);
FL_EXPORT int fl_write_png(const char *pixels, int w, int h, int d=3, int ld=0);
FL_EXPORT int fl_write_png(const char *filename, const unsigned char *pixels, int w, int h, int d=3, int ld=0);
35.105 Fl_PNM_Image.H

1 // 2 // PNM image header file for the Fast Light Tool Kit (FLTK). 3 // 4 // Copyright 1998-2010 by Bill Spitzak and others. 5 // 6 // This library is free software. Distribution and use rights are outlined in 7 // the file "COPYING" which should have been included with this file. If this 8 // file is missing or damaged, see the license at: 9 // 10 // https://www.fltk.org/COPYING.php 11 // 12 // Please see the following page on how to report bugs and issues: 13 // 14 // https://www.fltk.org/bugs.php 15 // 16 /* 17 Fl_PNM_Image class . */ 18 19 ifndef Fl_PNM_Image_H 20 #define Fl_PNM_Image_H 21 22 #include "Fl_Image.H" 23 24 class FL_EXPORT Fl_PNM_Image : public Fl_RGB_Image { 25 26 public: 27 Fl_PNM_Image(const char * filename); 28 }; 29 30 #endif

35.106 Fl_Positioner.H

1 // 2 // Positioner header file for the Fast Light Tool Kit (FLTK). 3 // 4 // Copyright 1998-2022 by Bill Spitzak and others. 5 // 6 // This library is free software. Distribution and use rights are outlined in 7 // the file "COPYING" which should have been included with this file. If this 8 // file is missing or damaged, see the license at: 9 // 10 // https://www.fltk.org/COPYING.php 11 // 12 // Please see the following page on how to report bugs and issues: 13 // 14 // https://www.fltk.org/bugs.php 15 // 16 /* 17 Fl_Positioner widget . */ 18 19 ifndef Fl_Positioner_H 20 #define Fl_Positioner_H 21 22 ifndef Fl_Widget_H 23 #include "Fl_Widget.H" 24 #endif 25 26 class FL_EXPORT Fl_Positioner : public Fl_Widget { 27 28 double xmin, ymin; 29 double xmax, ymax; 30 double xvalue_, yvalue_; 31 double xstep_, ystep_; 32 33 protected: 34 // these allow subclasses to put the dial in a smaller area: 35 void draw(int, int, int, int); 36 int handle(int, int, int, int); 37 void draw(); FL_OVERRIDEx 38 public: 39 int handle(int) FL_OVERRIDE; 40
41 #endif

Generated by Doxygen
Fl_Positioner(int x, int y, int w, int h, const char *l=0);

double xvalue() const {return xvalue_;}
int xvalue(double);
int yvalue(double);
int value(double, double);
void xbounds(double, double);
double xminimum() const {return xmin;}
void xminimum(double a) {xbounds(a, xmax);}
double xmaximum() const {return xmax;}
void xmaximum(double a) {xbounds(xmin, a);}
void yminimum(double a) {ybounds(a, ymax);}
double yminimum() const {return ymin;}
void yminimum(double a) {ybounds(a, ymax);}
double ymaximum() const {return ymax;}
void ymaximum(double a) {ybounds(ymin, a);}
void xstep(double a) {xstep_ = a;}
void ystep(double a) {ystep_ = a;}

#endif

35.107 Fl_PostScript.H File Reference

declaration of classes Fl_PostScript_File_Device and Fl_EPS_File_Surface.
#include <FL/Fl_Paged_Device.H>
#include <FL/fl_draw.H>
#include <stdarg.h>

Classes

• class Fl_EPS_File_Surface
  Encapsulated PostScript drawing surface.

• class Fl_PostScript_File_Device
  To send graphical output to a PostScript file.

Typedefs

• typedef int(∗ Fl_PostScript_Close_Command)(FILE ∗)
  Signature of functions FLTK may use to close FILE variables after PostScript/EPS output.

35.107.1 Detailed Description

declaration of classes Fl_PostScript_File_Device and Fl_EPS_File_Surface.

35.107.2 Typedef Documentation

35.107.2.1 Fl_PostScript_Close_Command

typedef int(∗ Fl_PostScript_Close_Command)(FILE ∗)
Signature of functions FLTK may use to close FILE variables after PostScript/EPS output.
A non-null return value indicates output error.

See also
Fl_PostScript_File_Device::close_command() and Fl_EPS_File_Surface::Fl_EPS_File_Surface().

35.108 Fl_PostScript.H

Go to the documentation of this file.
1 //
// Support for graphics output to PostScript file for the Fast Light Tool Kit (FLTK).
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// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

#ifndef Fl_PostScript_H
#define Fl_PostScript_H

#include <FL/Fl_Paged_Device.H>
#include <FL/fl_draw.H>
#include <stdarg.h>

extern "C" {
typedef int (*Fl_PostScript_Close_Command)(FILE *);
}

class Fl_PostScript_Graphics_Driver;

class FL_EXPORT Fl_PostScript_File_Device : public Fl_Paged_Device {
private:
80 // memorize the display's current font to restore it when the object ceases being current
81 Fl_Font display_font_;
82 Fl_Fontsize display_size_;
protected:
87 inline Fl_PostScript_Graphics_Driver *driver() { return (Fl_PostScript_Graphics_Driver*)Fl_Surface_Device::driver(); }
88 public:
90 Fl_PostScript_File_Device();
92 ~Fl_PostScript_File_Device();
94 int begin_job(int pagecount, int * from, int * to, char * perr_message) FL_OVERRIDE;
104 int begin_job(int pagecount = 0, enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
105 enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT); 
108 int start_job(int pagecount = 0, enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
109 enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT) {
110 return begin_job(pagecount, format, layout);
111 }
122 int begin_job(FILE *ps_output, int pagecount = 0, enum Fl_Paged_Device::Page_Format format =
123 enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT);
126 int start_job(FILE *ps_output, int pagecount = 0, enum Fl_Paged_Device::Page_Format format =
127 enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT) {
128 return begin_job(ps_output, pagecount, format, layout);
129 }
131 int begin_page (void) FL_OVERRIDE;
132 int printable_rect(int *w, int *h) FL_OVERRIDE;
133 void margins(int *left, int *top, int *right, int *bottom) FL_OVERRIDE;
134 void origin(int *x, int *y) FL_OVERRIDE;
135 void origin(int x, int y) FL_OVERRIDE;
136 void scale (float scale_x, float scale_y = 0.) FL_OVERRIDE;
137 void rotate(float angle) FL_OVERRIDE;
138 void translate(int x, int y) FL_OVERRIDE;
139 void untranslate(void) FL_OVERRIDE;
140 int end_page (void) FL_OVERRIDE;
144 void end_job(void) FL_OVERRIDE;
146 static const char *file_chooser_title;
148 FILE *file();
150 void close_command(Fl_PostScript_Close_Command cmd);
151 void set_current() FL_OVERRIDE;
152 void end_current() FL_OVERRIDE;
153);
172 class FL_EXPORT Fl_EPS_File_Surface : public Fl_Widget_Surface {
175 inline Fl_PostScript_Graphics_Driver *driver() { return (Fl_PostScript_Graphics_Driver*)Fl_Surface_Device::driver(); }
176 public:
191 Fl_EPS_File_Surface(int width, int height, FILE *eps_output,
192 Fl_Color background = FL_WHITE, Fl_PostScript_Close_Command closef = NULL);
200 ~Fl_EPS_File_Surface();
201 int printable_rect(int *w, int *h) FL_OVERRIDE;
203 FILE *file();
204 void origin(int *x, int *y) FL_OVERRIDE;
205 void origin(int *px, int *py) FL_OVERRIDE;
206 void translate(int x, int y) FL_OVERRIDE;
207 void untranslate() FL_OVERRIDE;

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35.109  Fl_Preferences.H

1 //
2 // Preferences implementation for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2002-2023 by Matthias Melcher.
5 //
6 // This library is free software. Distribution and use rights are outlined in
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10 //   https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16 //
17 /*
18  Fl_Preferences class . */
19 */
20 ifndef Fl_Preferences_H
21 # define Fl_Preferences_H
22
23 # include <stdio.h>
24 # include "Fl_Export.H"
25 # include "fl_attr.h"
26
27 //class Fl_String;
28 #if (FLTK_USE_STD)
29 #include <string>
30 #endif
31
124 class FL_EXPORT Fl_Preferences { 
125 
130 enum Root { 
131   UNKNOWN_ROOT_TYPE = -1,
132   SYSTEM = 0,
133   USER,
134   MEMORY,
135   ROOT_MASK = 0x00FF,
136   CORE = 0x0100,
137   C_LOCALE = 0x1000,
138   CLEAR = 0x2000,
139   SYSTEM_L = SYSTEM | C_LOCALE,
140   USER_L = USER | C_LOCALE,
141   CORE_SYSTEM_L = CORE | SYSTEM_L,
142   CORE_USER_L = CORE | USER_L,
143   CORE_SYSTEM = CORE | SYSTEM,
144   CORE_USER = CORE | USER
145   };
146
155 typedef void *ID;
156
157 static const char *new_UUID();
158
159 static void file_access(unsigned int flags);
160 static unsigned int file_access();
161 static Root filename( char *buffer, size_t buffer_size, Root root, const char *vendor, const char *application);
162
163 Fl_Preferences( Root root, const char *vendor, const char *application );
164 Fl_Preferences( Fl_Preferences &parent, const char *group );
Fl_Preferences( Fl_Preferences *parent, const char *group );
Fl_Preferences( Fl_Preferences *parent, int groupIndex );
Fl_Preferences(Fl_Preferences *parent, int groupIndex);
Fl_Preferences(Fl_Preferences&);
Fl_Preferences( ID id );
virtual ~Fl_Preferences();

FL_DEPRECATED("in 1.4.0 - use Fl_Preferences(path, vendor, application, flags) instead",
Fl_Preferences( const char *path, const char *vendor, const char *application ) );

Root filename( char *buffer, size_t buffer_size);

ID id() { return (ID)node; }

static char remove(ID id_) { return ((Node *)id_)->remove(); }

const char *name() { return node->name(); }
const char *path() { return node->path(); }

int groups();
const char *group( int num_group );
char group_exists( const char *key );
char delete_group( const char *group );
char delete_all_groups();

int entries();
const char *entry( int index );
char entry_exists( const char *key );
char delete_entry( const char *entry );
char delete_all_entries();

char clear();

char set( const char *entry, int value );
char set( const char *entry, float value );
char set( const char *entry, float value, int precision );
char set( const char *entry, double value );
char set( const char *entry, double value, int precision );
char set( const char *entry, const char *value );
char set( const char *entry, const void *value, int size );

char get( const char *entry, int &value, int defaultValue );
char get( const char *entry, float &value, float defaultValue );
char get( const char *entry, double &value, double defaultValue );
char get( const char *entry, const char *&value, const char *defaultValue );
char get( const char *entry, char *value, const char *defaultValue, int maxSize );
char get( const char *entry, void *&value, const void *defaultValue, int defaultSize );
char get( const char *entry, void *value, const void *defaultValue, int defaultSize, int maxSize );
char get( const char *entry, void *value, const void *defaultValue, int defaultSize, int *size );

// char set( const char *entry, const Fl_String &value );
// char get( const char *entry, Fl_String &value, const Fl_String &defaultValue );

#if (FLTK_USE_STD)
char set( const char *entry, const std::string &value );
char get( const char *entry, std::string &value, const std::string &defaultValue );
#endif

int size( const char *entry );

char get_userdata_path( char *path, int pathlen );

int flush();

int dirty();

static const char *newUUID() { return new_UUID(); }

char groupExists( const char *key );
char deleteGroup( const char *group );
char delete_all_groups();
char delete_entry( const char *entry );
char delete_all_entries();

char getUserdataPath( char *path, int pathlen );

class Fl_EXPORT Name {

    char *data_;

public:
    Name( unsigned int n );
    Name( const char *format, ... );
    Name();
    ~Name();

};
struct Entry {
  char *name, *value;
};

private:
FL_Preferences() : node(0), rootNode(0) {
}
FL_Preferences &operator=(const FL_Preferences&);
static char nameBuffer[128];
static char uuidBuffer[40];
static FL_PREFERENCES *runtimePrefs;
static unsigned int fileAccess_;

public: // older Sun compilers need this (public definition of the following classes)
class RootNode;

class FL_EXPORT Node { // a node contains a list to all its entries
  // and all means to manage the tree structure
  union {
    Node *first_child_, *next_;
    RootNode *root_node_; // these two are mutually exclusive
  } parent_; // top_ bit clear
  RootNode *root_node_; // top_ bit set
  char *path_;
  Entry *entry_;
  int nEntry_, NEntry_;
  unsigned char dirty_:1;
  unsigned char top_:1;
  unsigned char indexed_:1;
  // indexing routines
  Node **index_;
  int nIndex_, NIndex_;
  void createIndex();
  void updateIndex();
  void deleteIndex();

public:
  static int lastEntrySet;
public:
  Node( const char *path );
  ~Node();
  // node methods
  int write( FILE *f );
  const char *name();
  const char *path() { return path_; }
  Node *find( const char *path );
  Node *search( const char *path, int offset=0 );
  Node *childNode( int ix );
  Node *addChild( const char *path );
  void setParent( Node *parent );
  Node *parent() { return top_?0L:parent_; }
  void setRoot(RootNode *r) { root_node_ = r; top_ = 1; }
  RootNode *findRoot();
  char remove();
  char dirty();
  void clearDirtyFlags();
  void deleteAllChildren();
  // entry methods
  int nChildren();
  const char *child( int ix );
  void set( const char *name, const char *value );
  void set( const char *line );
  void add( const char *line );
  const char *get( const char *name );
  int getEntry( const char *name );
  char deleteEntry( const char *name );
  char deleteAllEntries();
  int nEntry() { return nEntry_; }
  Entry *entry(int i) { return entry_[i]; }
};

friend class Node;

class FL_EXPORT RootNode { // the root node manages file paths and basic reading and writing
  FL_PREFERENCES *prefs_;
  char *filename_, *vendor_, *application_, *root_type_;
public:
  RootNode( FL_PREFERENCES * root, const char *vendor, const char *application );
  RootNode( FL_PREFERENCES * root, const char *path, const char *vendor, const char *application, Root
            flags );
  RootNode( FL_PREFERENCES * );
  ~RootNode();
  int read();
  int write();
  char getPath( char *path, int pathlen );
  char *filename() { return filename_; }
  Root root() { return root_type_; }
Classes

- class Fl_Printer

  OS-independent print support.

35.110.1 Detailed Description

declaration of class Fl_Printer.
#

Go to the documentation of this file.

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static const char *dialog_all;
static const char *dialog_pages;
static const char *dialog_from;
static const char *dialog_to;
static const char *dialog_properties;
static const char *dialog_copyNo;
static const char *dialog_print_button;
static const char *dialog_cancel_button;
static const char *dialog_print_to_file;
static const char *property_title;
static const char *property_pagesize;
static const char *property_mode;
static const char *property_use;
static const char *property_save;
static const char *property_cancel;
~Fl_Printer(void);
};
#endif // Fl_Printer_H

35.112 Fl_Progress.H

1 //
2 // Progress bar widget definitions.
3 //
4 // Copyright 2000-2010 by Michael Sweet.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 /* Fl_Progress widget. */
17 ifndef _Fl_Progress_H_
18 # define _Fl_Progress_H_
19 #include "Fl_Widget.H"
20 #ifndef _Fl_Progress_H_
21 # define _Fl_Progress_H_
22 // Include necessary headers.
23 //
24 #include "Fl_Widget.H"
25 //
26 class FL_EXPORT Fl_Progress : public Fl_Widget {
27 float value_,
28 minimum_,
29 maximum_;
30 protected:
31 void draw() FL_OVERRIDE;
32 public:
33 Fl_Progress(int x, int y, int w, int h, const char *l = 0);
34 void maximum(float v) { maximum_ = v; redraw(); };
35 float maximum() const { return (maximum_); };
36 void minimum(float v) { minimum_ = v; redraw(); };
37 float minimum() const { return (minimum_); };
38 void value(float v) { value_ = v; redraw(); };
39 float value() const { return (value_); };
40 #endif // !_Fl_Progress_H_
35.113  Fl_Radio_Button.H

1 //
2 // Radio button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
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11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php
15 //
16
17 /*
18  
19  Fl_Radio_Button widget . */
20
21 ifndef Fl_Radio_Button_H
22 #define Fl_Radio_Button_H
23 #include "Fl_Button.H"
24
25 class FL_EXPORT Fl_Radio_Button : public Fl_Button {
26 public:
27   Fl_Radio_Button(int X, int Y, int W, int H, const char *L=0);
28   
29 #endif

35.114  Fl_Radio_Light_Button.H

1 //
2 // Radio light button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
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12 // Please see the following page on how to report bugs and issues:
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14 //   https://www.fltk.org/bugs.php
15 //
16
17 /*
18  
19  Fl_Radio_Light_Button widget . */
20
21 ifndef Fl_Radio_Light_Button_H
22 #define Fl_Radio_Light_Button_H
23 #include "Fl_Light_Button.H"
24
25 class FL_EXPORT Fl_Radio_Light_Button : public Fl_Light_Button {
26 public:
27   Fl_Radio_Light_Button(int X, int Y, int W, int H, const char *L=0);
28   
29 #endif

35.115  Fl_Radio_Round_Button.H

1 //
2 // Radio round button header file for the Fast Light Tool Kit (FLTK).
3 //
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12 // Please see the following page on how to report bugs and issues:
13 //
14 //   https://www.fltk.org/bugs.php

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1 //
2 /* Fl_Radio_Round_Button widget. */
3 #ifndef Fl_Radio_Round_Button_H
4 #define Fl_Radio_Round_Button_H
5
6 #include "Fl_Round_Button.H"
7
8 class FL_EXPORT Fl_Radio_Round_Button : public Fl_Round_Button {
9 public:
10 Fl_Radio_Round_Button(int X,int Y,int W,int H,const char *L=0);  
11
12 #endif
13
14.116 Fl_Rect.H
15 // Fl_Rect header file for the Fast Light Tool Kit (FLTK).
16 //
17 // Copyright 1998-2023 by Bill Spitzak and others.
18 //
19 // This library is free software. Distribution and use rights are outlined in
20 // the file "COPYING" which should have been included with this file. If this
21 // file is missing or damaged, see the license at:
22 //
23 // https://www.fltk.org/COPYING.php
24 //
25 // Please see the following page on how to report bugs and issues:
26 //
27 // https://www.fltk.org/bugs.php
28 //
29 //
30 #ifndef Fl_Rect_H
31 #define Fl_Rect_H
32
33 #include <FL/Fl_Widget.H> // for c’tor based on Fl_Widget
34
35 class FL_EXPORT Fl_Rect {
36 int x_;  
37 int y_;  
38 int w_;  
39 int h_;  
40
41 public:
42 Fl_Rect() : x_(0), y_(0), w_(0), h_(0) {}  
43 Fl_Rect(int W, int H) : x_(0), y_(0), w_(W), h_(H) {}  
44 Fl_Rect(int X, int Y, int W, int H) : x_(X), y_(Y), w_(W), h_(H) {}  
45 Fl_Rect(int X, int Y, int W, int H, Fl_Boxtype bt) : x_(X), y_(Y), w_(W), h_(H) {}  
46 inset(bt);  
47 }
48
49 Fl_Rect(const Fl_Widget* widget) : x_(widget->x()), y_(widget->y()), w_(widget->w()), h_(widget->h()) {}
50
51 Fl_Rect(const Fl_Widget* const widget) : x_(widget->x()), y_(widget->y()), w_(widget->w()), h_(widget->h()) {}
52
53 int x()const { return x_; }  
54 int y()const { return y_; }  
55 int w()const { return w_; }  
56 int h()const { return h_; }  
57
58 void r(int R) { w_ = R - x_; }  
59 void b(int B) { h_ = B - y_; }  

35.116 Fl_Rect.H
```cpp
void inset(int d) {
    x_ += d;
    y_ += d;
    w_ -= 2 * d;
    h_ -= 2 * d;
}

void inset(Fl_Boxtype bt) {
    x_ += Fl::box_dx(bt);
    y_ += Fl::box_dy(bt);
    w_ -= Fl::box_dw(bt);
    h_ -= Fl::box_dh(bt);
}

void inset(int left, int top, int right, int bottom) {
    x_ += left;
    y_ += top;
    w_ -= (left + right);
    h_ -= (top + bottom);
}

friend bool operator==(const Fl_Rect& lhs, const Fl_Rect& rhs) {
    return (lhs.x_==rhs.x_) && (lhs.y_==rhs.y_) && (lhs.w_==rhs.w_) && (lhs.h_==rhs.h_);
}

friend bool operator!=(const Fl_Rect& lhs, const Fl_Rect& rhs) {
    return !(lhs==rhs);
}
);
```
// file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

/*
 * Fl_Return_Button widget . *
 */

#ifndef Fl_Return_Button_H
#define Fl_Return_Button_H
#include "Fl_Button.H"

class FL_EXPORT Fl_Return_Button : public Fl_Button {
protected:
    void draw() FL_OVERRIDE;
public:
    int handle(int) FL_OVERRIDE;
    Fl_Return_Button(int X, int Y, int W, int H, const char *l=0);
};
#endif

namespace Fl {
    class Fl_RGB_Image : public Fl {
protected:
    virtual ~Fl_RGB_Image();
    void draw() FL_OVERRIDE;
public:
    int handle(int) FL_OVERRIDE;
};
}

#endif // Fl_RGB_Image.H

/*
 * Fl_Roller widget . *
 */

#ifndef Fl_Roller_H
#define Fl_Roller_H

#ifndef Fl_Valuator_H
#include "Fl_Valuator.H"
#endif

class FL_EXPORT Fl_Roller : public Fl_Valuator {
protected:
    void draw() FL_OVERRIDE;
public:
    int handle(int) FL OVERRIDE;
    Fl_Roller(int X, int Y, int W, int H, const char *l=0);
};
#endif // Fl_Roller.H

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35.121 Fl_Round_Button.H

```c
Fl_Roller(int X, int Y, int W, int H, const char * L = 0);
```

35.122 Fl_Round_Clock.H

```c
Fl_Round_Clock(int X, int Y, int W, int H, const char * L = 0);
```

35.123 Fl_Scheme.H

```c
Fl_Round_Button(int X, int Y, int W, int H, const char * L = 0);
```
1410 File Documentation

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// Please see the following page on how to report bugs and issues:
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#ifndef FL_Fl_Scheme_H_
#define FL_Fl_Scheme_H_

#include <FL/Fl.H>

class Fl_Scheme {

private:
    static const char **names_; // registered scheme names
    static int num_schemes_; // number of registered schemes
    static int alloc_size_; // number of allocated scheme name entries

protected:
    // const char *name_; // the scheme's name
    // protected constructor - not yet implemented
    // Fl_Scheme(const char *name);

public:
    // Static methods.
    // Some of these methods will replace the scheme related methods of class Fl,
    // for instance Fl::scheme() and Fl::is_scheme().
    // Backwards compatibility must be kept though.
    static const char **names();
    static int num_schemes() {
        if (!names_) names(); // force initialization
        return num_schemes_;
    }
    static int add_scheme_name(const char *name);
}; // class Fl_Scheme

#endif // FL_Fl_Scheme_H_

35.124 Fl_Scheme_Choice.H

// Scheme Choice header for the Fast Light Tool Kit (FLTK).
// Copyright 2022-2023 by Bill Spitzak and others.
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// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

#ifndef FL_Fl_Scheme_Choice_H_
#define FL_Fl_Scheme_Choice_H_

#include <FL/Fl.H>
#include <FL/Fl_Scheme.H>
#include <FL/Fl_Choice.H>

class FL_EXPORT Fl_Scheme_Choice : public Fl_Choice {

protected:
    static void scheme_cb_(Fl_Widget *w, void *);

public:
    Fl_Scheme_Choice(int X, int Y, int W, int H, const char *L = 0);
    int handle(int event) FL_OVERRIDE;
}; // class Fl_Scheme_Choice

#endif // FL_Fl_Scheme_Choice_H_
virtual void init_value();
}; // class Fl_Scheme_Choice
#endif // FL_Fl_Scheme_Choice_H_

35.125 Fl_Scroll.H

1 //
2 // Fl_Scroll header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
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8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 17 /*
18 Fl_Scroll widget . */
19 20 ifndef Fl_Scroll_H
21 define Fl_Scroll_H
22 23 #include "Fl_Group.H"
24 #include "Fl_Scrollbar.H"
25 26 class FL_EXPORT Fl_Scroll : public Fl_Group {
27 28 int xposition_, yposition_, oldx, oldy;
29 int scrollbar_size_; 30 static void hscrollbar_cb(Fl_Widget *, void*);
31 static void scrollbar_cb(Fl_Widget *, void*);
32 static void draw_clip(void *, int, int, int, int);
33 typedef struct { int x,y,w,h; } Fl_Region_XYWH;
34 typedef struct { int l; int r; int t; int b; } Fl_Region_LRTB;
35 typedef struct { int x,y,w,h; int pos; int size; int first; int total; } Fl_Scrollbar_Data;
36 typedef struct { int scrollsize; Fl_Region_XYWH innerbox;
37 Fl_Region_XYWH innerchild;
38 Fl_Region_LRTB child;
39 int hneeded;
40 int vneeded;
41 } ScrollInfo;
42 void recalc_scrollbars(ScrollInfo &si) const;
43 protected: // (STR#1895)
44 int on_insert(Fl_Widget *, int) FL_OVERRIDE;
45 int on_move(int, int) FL_OVERRIDE;
46 void fix_scrollbar_order();
47 void bbox(int&, int&, int&, int&) const;
48 void draw() FL_OVERRIDE;
49 protected:
50 int on_insert(Fl_Widget *, int) FL_OVERRIDe;
51 void fix_scrollbar_order();
52 void bbox(int&, int&, int&, int&) const;
53 void draw() FL_OVERRIDe;
54 public:
55 int on_insert(Fl_Widget *, int) FL_OVERRIDe;
56 void fix_scrollbar_order();
57 void bbox(int&, int&, int&, int&) const;
58 void draw() FL_OVERRIDe;
59 void init_value();
60 }
61 
62 typedef struct { int x,y,w,h; } Fl_Region_XYWH;
63 typedef struct { int l; int r; int t; int b; } Fl_Region_LRTB;
64 typedef struct { int x,y,w,h; int pos; int size; int first; int total; } Fl_Scrollbar_Data;
65 typedef struct { int scrollsize; Fl_Region_XYWH innerbox;
66 Fl_Region_XYWH innerchild;
67 Fl_Region_LRTB child;
68 int hneeded;
69 int vneeded;
70 } ScrollInfo;
71 void recalc_scrollbars(ScrollInfo &si) const;
72 protected:
73 int on_insert(Fl_Widget *, int) FL_OVERRIDe;
74 void fix_scrollbar_order();
75 void bbox(int&, int&, int&, int&) const;
76 void draw() FL_OVERRIDe;
Fl_Scrollbar hscrollbar;

void resize(int X, int Y, int W, int H) FL_OVERRIDE;
int handle(int) FL_OVERRIDE;
Fl_Scroll(int X, int Y, int W, int H, const char *L = 0);
virtual ~Fl_Scroll();

eenum { // values for type()
  HORIZONTAL = 1,
  VERTICAL = 2,
  BOTH = 3,
  ALWAYS_ON = 4,
  HORIZONTAL_ALWAYS = 5,
  VERTICAL_ALWAYS = 6,
  BOTH_ALWAYS = 7
};

int xposition()const {return xposition_;}
int yposition()const {return yposition_;
void scroll_to(int, int);
void clear();

/* delete child n (by index) */
int delete_child(int n) FL_OVERRIDE;

int scrollbar_size()const {
return(scrollbar_size_);
}

void scrollbar_size(int newSize) {
if ( newSize != scrollbar_size_ ) redraw();
scrollbar_size_ = newSize;
}

};

#endif

Fl_Scrollbar.H

// Scroll bar header file for the Fast Light Tool Kit (FLTK).
// Copyright 1998-2010 by Bill Spitzak and others.
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// the file "COPYING" which should have been included with this file. If this
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// https://www.fltk.org/bugs.php

// Scrollbar widget . */
#endif Fl_Scrollbar_H
#define Fl_Scrollbar_H
#include "Fl_Slider.H"

class FL_EXPORT Fl_Scrollbar : public Fl_Slider {

int linesize_,
int pushed_,
static void timeout_cb(void*);
void increment_cb();
protected:
void draw() FL_OVERRIDE;

public:
Fl_Scrollbar(int X, int Y, int W, int H, const char *L = 0);
~Fl_Scrollbar();
int handle(int) FL_OVERRIDE;

int value()const {return int(Fl_Slider::value());}
int value(int p) {return int(Fl_Slider::value((double)p));
int value(int pos, int windowSize, int first_line, int total_lines) {
return scrollvalue(pos, windowSize, first_line, total_lines);
}
90 int linesize() const {return linesize_;}
91
92 void linesize(int i) {linesize_ = i;}
93
94
95 #endif

35.127 Fl_Secret_Input.H

1 //
2 // Secret input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 /* \file
17 Fl_Secret_Input widget . */
18 #ifndef Fl_Secret_Input_H
19 #define Fl_Secret_Input_H
20 #include <Fl_Input.H>
21 class FL_EXPORT Fl_Secret_Input : public Fl_Input {
22 public:
23 Fl_Secret_Input(int X,int Y,int W,int H,const char *l = 0);
24 int handle(int) FL_OVERRIDE;
25
26 #endif

35.128 Fl_Select_Browser.H

1 //
2 // Select browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 /* \file
17 Fl_Select_Browser widget . */
18 #ifndef Fl_Select_Browser_H
19 #define Fl_Select_Browser_H
20 #include <Fl_Browser.H>
21 class FL_EXPORT Fl_Select_Browser : public Fl_Browser {
22 public:
23 Fl_Select_Browser(int X,int Y,int W,int H,const char *L=0);
24
25 #endif

35.129 Fl_Shared_Image.H File Reference

Fl_Shared_Image class.

Generated by Doxygen
#include "Fl_Image.H"

## Classes

- **class Fl_Shared_Image**

  This class supports caching, loading, and drawing of image files.

## Typedefs

- **typedef Fl_Image *( Fl_Shared_Handler) (const char *name, uchar *header, int headerlen)**

  Test function (typedef) for adding new shared image formats.

## Functions

- **void fl_register_images ()**

  Register the known image formats.

### 35.129.1 Detailed Description

**Fl_Shared_Image** class.

### 35.129.2 Typedef Documentation

#### 35.129.2.1 Fl_Shared_Handler

**typedef Fl_Image *( Fl_Shared_Handler) (const char *name, uchar *header, int headerlen)**

Test function (typedef) for adding new shared image formats.

**fl_register_images()** adds all image formats known to FLTK. Call **Fl_Shared_Image::add_handler()** to add your own check function to the list of known image formats.

Your function will be passed the filename (**name**), some header bytes already read from the image file and the size (**headerlen**) of the data read. The max value of size is implementation dependent. If your handler function needs to check more bytes you must open the image file yourself.

The provided buffer **header** must not be overwritten.

If your handler function can identify the file type you must open the file and return a valid **Fl_Image** or derived type, otherwise you must return NULL. Example:

```c
static Fl_Image *check_my_image(const char *name, uchar *header, int headerlen) {
  // (test image type using header and headerlen)
  if (known) {
    // (load image data from file \p name)
    return new Fl_RGB_Image(data, ...);
  } else
    return 0;
}
```

// add your handler:
Fl_Shared_Image::add_handler(check_my_image);

#### Parameters

<table>
<thead>
<tr>
<th></th>
<th><strong>name</strong></th>
<th>filename to be checked and opened if applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td><strong>header</strong></td>
<td>portion of the file that has already been read</td>
</tr>
<tr>
<td>in</td>
<td><strong>headerlen</strong></td>
<td>length of provided header data</td>
</tr>
</tbody>
</table>
Returns
valid Fl_Image or NULL.

See also
Fl_Shared_Image::add_handler()

35.129.3 Function Documentation

35.129.3.1 fl_register_images()

void fl_register_images ( )

Register the known image formats.
This function is provided in the fltk_images library and registers all of the "extra" image file formats known to FLTK
that are not part of the core FLTK library.
You may add your own image formats with Fl_Shared_Image::add_handler().

35.130 Fl_Shared_Image.H

Go to the documentation of this file.

1 //
2 // Shared image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 #ifndef Fl_Shared_Image_H
17 # define Fl_Shared_Image_H
18
19 # include "Fl_Image.H"
20
21 typedef Fl_Image *(*Fl_Shared_Handler)(const char *name,
22 uchar *header,
23 int headerlen);
24
25 class FL_EXPORT Fl_Shared_Image : public Fl_Image {
26
27 friend class Fl_JPEG_Image;
28 friend class Fl_PNG_Image;
29 friend class Fl_SVG_Image;
30 friend class Fl_Graphics_Driver;
31
32 protected:
33
34 static Fl_Shared_Image **images_; // Shared images
35 static int num_images_; // Number of shared images
36 static int alloc_images_; // Allocated shared images
37 static Fl_Shared_Handler *handlers_; // Additional format handlers
38 static int num_handlers_; // Number of format handlers
39 static int alloc_handlers_; // Allocated format handlers
40
41 const char *name_; // Name of image file
42 int original_; // Original image?
43 int refcount_; // Number of times this image has been used
44 Fl_Image *image_; // The image that is shared
45 int alloc_image_; // Was the image allocated?
46
47 static int compare(Fl_Shared_Image **i0, Fl_Shared_Image **i1);
48
49 // Use get() and release() to load/delete images in memory...
50 Fl_Shared_Image();
51 Fl_Shared_Image(const char *n, Fl_Image *img = 0);
52 virtual ~Fl_Shared_Image();
1416 File Documentation

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```cpp
void add();
void update();

public:

const char *name() { return name_; }

int refcount() { return refcount_; }

int original() { return original_; }

void release() FL_OVERRIDE;
virtual void reload();

Fl_Shared_Image *as_shared_image() FL_OVERRIDE {
    return this;
}

Fl_Image *copy(int W, int H) const FL_OVERRIDE;
Fl_Image *copy() const {
    return Fl_Image::copy();
}

void color_average(Fl_Color c, float i) FL_OVERRIDE;
void desaturate() FL_OVERRIDE;
void draw(int X, int Y, int W, int H, int cx = 0, int cy = 0) FL_OVERRIDE;
void draw(int X, int Y) { draw(X, Y, w(), h(), 0, 0); }
void uncache() FL_OVERRIDE;

static Fl_Shared_Image *find(const char *name, int W = 0, int H = 0);
static Fl_Shared_Image *get(const char *name, int W = 0, int H = 0);
static Fl_Shared_Image *get(Fl_RGB_Image *rgb, int own_it = 1);
static Fl_Shared_Image **images();
static int num_images();
static void add_handler(Fl_Shared_Handler f);
static void remove_handler(Fl_Shared_Handler f);

const Fl_Image *image() const { return image_; }

}; // class Fl_Shared_Image
```

35.131 Fl_Shortcut_Button.H

```cpp
1
2 // Shortcut Button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 #ifndef Fl_Shortcut_Button_H
18 #define Fl_Shortcut_Button_H
19 
20 #include <FL/Fl_Button.H>

21 class FL_EXPORT Fl_Shortcut_Button : public Fl_Button {
22 private:
23 bool hot, pre_hot, default_set, handle_default_button;
24 Fl_Shortcut pre_esc;
25 Fl_Shortcut default_shortcut;
26 protected:
27 Fl_Shortcut shortcut_value;
28 void do_end_hot_callback();
29 int handle(int) FL_OVERRIDE;
30 void draw() FL_OVERRIDE;
31 public:
32 Fl_Shortcut_Button(int X, int Y, int W, int H, const char* l = 0);
33 void value(Fl_Shortcut shortcut);
```

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35.132 fl_show_colormap.H File Reference

The `fl_show_colormap()` function hides the implementation classes used to provide the popup window and color selection mechanism.

### Functions

- **Fl_Color fl_show_colormap (Fl_Color oldcol)**
  
  Pops up a window to let the user pick a colormap entry.

### Detailed Description

The `fl_show_colormap()` function hides the implementation classes used to provide the popup window and color selection mechanism.

35.133 fl_show_colormap.H

Go to the documentation of this file.

1 //
2 // Colormap picker header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 #ifndef fl_show_colormap_H
17 #define fl_show_colormap_H
18 #define fl_show_colormap_H
19 #endif
20 /*
21 // doxygen comment here to avoid exposing ColorMenu in fl_show_colormap.cxx
22 */
23 FL_EXPORT Fl_Color fl_show_colormap(Fl_Color oldcol);
24 #endif

35.134 fl_show_input.H

1 //
2 // Standard input dialog header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
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14 // https://www.fltk.org/bugs.php

Generated by Doxygen
35.135  Fl_Simple_Counter.H

```c
1 //
2 // Simple counter header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //  https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //  https://www.fltk.org/bugs.php
15 //
16 /*
17 Fl_Simple_Counter widget . */
18
19 #ifndef Fl_Simple_Counter_H
20 #define Fl_Simple_Counter_H
21
22 class FL_EXPORT Fl_Simple_Counter : public Fl_Counter {
23 public:
24    Fl_Simple_Counter(int x, int y, int w, int h, const char *l = 0);
25    ~Fl_Simple_Counter();
26
27 #endif
```

35.136  Fl_Simple_Terminal.H

```c
1 //
2 // A simple terminal widget for Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 // Copyright 2017 by Greg Ercolano.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //  https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //  https://www.fltk.org/bugs.php
16 //
17 /*
18 Fl_Simple_Terminal widget . */
19
20 #ifndef Fl_Simple_Terminal_H
21 #define Fl_Simple_Terminal_H
22
23 #include "Fl_Export.H"
24 #include "FL/Fl_Text_Display.H"
25
26 class FL_EXPORT Fl_Simple_Terminal : public Fl_Text_Display {
27 protected:
28    Fl_Text_Buffer *buf; // text buffer
29    Fl_Text_Buffer *sbuf; // style buffer
30    Fl_Text_Buffer *rbuf; // raw text buffer
31
32 private:
33    // Private class to handle parsing ESC sequences
34    // Holds all state information for parsing esc sequences,
35    // so sequences can span multiple block read(2) operations, etc.
36    //
37    class FL_EXPORT Fl_Escape_Seq {
38    public:
39        static const int maxbuf = 80;
40        static const int maxvals = 10;
41        // Return codes
42        static const int success = 0; // operation succeeded
43        static const int fail = -1; // operation failed
44        static const int completed = 1; // multi-step operation completed successfully
45    };
```

```
private:
  char esc_mode_; // escape parsing mode state
  char buf_[maxbuf]; // escape sequence being parsed
  char *bufp_; // parsing ptr into buf[]
  char *bufendp_; // end of buf[] (ptr to last valid buf char)
  char *valbufp_; // pointer to first char in buf of integer being parsed
  int vals_[maxvals]; // value array for parsing #'s in ESC[#;#;#..
  int vali_; // parsing index into vals_[, 0 if none
  int append_buf(char c);
  int append_val();

public:
  Fl_Escape_Seq();
  void reset();
  char esc_mode() const;
  void esc_mode(char val);
  int total_vals() const;
  int val(int i) const;
  bool parse_in_progress() const;
  int parse(char c);
};

private:
  int history_lines_; // max lines allowed in screen history
  bool stay_at_bottom_; // lets scroller chase last line in buffer
  // scroll management
  int lines_; // #lines in buffer (optimization: Fl_Text_Buffer slow to calc this)
  bool scrollaway_; // true when user changed vscroll away from bottom
  bool scrolling_; // true while scroll callback active
  // Fl_Text_Display vscrollbar's callback+data
  Fl_Callback *orig_vscroll_cb_
  // Fl_Callback *orig_vscroll_data_
  // String parsing vars initialized/used by append(), used by handle_backspace() etc.
  char *ntm_; // new text memory (ntm) - malloc()ed by append() for output text
  char *ntp_; // new text ptr (ntp) - points into ntm buffer
  char *nsm_; // new style memory (nsm) - malloc()ed by append() for output style
  char *nsp_; // new style ptr (nsp) - points into nsm buffer

public:
  Fl_Simple_Terminal(int X,int Y,int W,int H,const char *l=0);
  ~Fl_Simple_Terminal();
  // Terminal options
  void stay_at_bottom(bool);
  bool stay_at_bottom() const;
  void history_lines(int);
  int history_lines() const;
  void ansi(bool val);
  bool ansi() const;
  void ansi_show_unknown(bool val);
  bool ansi_show_unknown() const;
  void style_table(Fl_Text_Display::Style_Table_Entry *stable, int stable_size, int normal_style_index=0);
  const Fl_Text_Display::Style_Table_Entry *style_table() const;
  int style_table_size() const;
  void normal_style_index(int);
  int normal_style_index() const;
  void current_style_index(int);
  int current_style_index() const;
  int current_style() const;
  // Terminal text management
  void append(const char *s, int len=-1);
  void text(const char *s, int len=-1);
  const char *text() const;
  void printf(const char *fmt, ...);
  void vprintf(const char *fmt, va_list ap);
  void clear();
  void remove_lines(int start, int count);

private:
  // Methods blocking public access to the subclass
  // These are subclass methods that would give unexpected
  // results if used. By making them private, we effectively
  // "block" them.
  //
  // Generated by Doxygen
// TODO: There are probably other Fl_Text_Display methods that
// need to be blocked.

protected:

// Fltk

void draw() FL_OVERRIDE;

// Internal methods

void enforce_stay_at_bottom();
void enforce_history_lines();
void vscroll_cb2(Fl_Widget *, void*);
static void vscroll_cb(Fl_Widget*, void*);
void backspace_buffer(unsigned int count);
void handle_backspace();
void append_ansi(const char *s, int len);
void unknown_escape();

};

#endif

// Fl_Single_Window.H

// Single-buffered window header file for the Fast Light Tool Kit (FLTK).

// Copyright 1998-2015 by Bill Spitzak and others.

// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:

// Please see the following page on how to report bugs and issues:

// Please see the following page on how to report bugs and issues:

/*
file Fl_Single_Window class . */

#ifndef Fl_Single_Window_H
#define Fl_Single_Window_H

#include "Fl_Window.H"

class FL_EXPORT Fl_Single_Window : public Fl_Window {

public:

void show() FL_OVERRIDE;
void show(int a, char **b) {Fl_Window::show(a,b);}

Fl_Single_Window(int W, int H, const char *l=0);

Fl_Single_Window(int X, int Y, int W, int H, const char *l=0);

};

#endif

// Fl_Slider.H

// Slider header file for the Fast Light Tool Kit (FLTK).

// Copyright 1998-2015 by Bill Spitzak and others.

// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:

// Please see the following page on how to report bugs and issues:

/*
file Fl_Slider widget . */

#ifndef Fl_Slider_H
#define Fl_Slider_H

class FL_EXPORT Fl_Slider : public Fl_Widget {

public:

void show() FL_OVERRIDE;

void show(int a, char **b) {Fl_Widget::show(a,b);}

Fl_Slider(int W, int H, const char *l=0);

Fl_Slider(int X, int Y, int W, int H, const char *l=0);

};

#endif
#define Fl_Slider_H

#ifndef Fl_Valuator_H
#include "Fl_Valuator.H"
#endif

// values for type(), lowest bit indicate horizontal:
#define FL_VERT_SLIDER 0
#define FL_HOR_SLIDER 1
#define FL_VERT_FILL_SLIDER 2
#define FL_HOR_FILL_SLIDER 3
#define FL_VERT_NICE_SLIDER 4
#define FL_HOR_NICE_SLIDER 5

class FL_EXPORT Fl_Slider : public Fl_Valuator {
    float slider_size_; 
    uchar slider_; 
    void _Fl_Slider(); 
    void draw_bg(int, int, int, int); 

protected: 
    // these allow subclasses to put the slider in a smaller area: 
    void draw(int, int, int, int); 
    int handle(int, int, int, int, int); 
    void draw(); FL_OVERRIDE; 

generacoed by Doxygen

35.139 Fl_Spinner.H

1 // 2 // Spinner widget for the Fast Light Tool Kit (FLTK).  
4 // 5 // Copyright 1998-2022 by Bill Spitzak and others.  
6 // 7 // This library is free software. Distribution and use rights are outlined in  
8 // the file "COPYING" which should have been included with this file. If this  
9 // file is missing or damaged, see the license at:  
10 // 11 // https://www.fltk.org/COPYING.php  
12 // 13 // Please see the following page on how to report bugs and issues:  
14 // 15 // https://www.fltk.org/bugs.php  
16 // 17 */ 
18 // Fl_Spinner widget . */ 
19 #ifndef Fl_Spinner_H
20 #define Fl_Spinner_H
21 #include <FL/Enumerations.H> 
22 #include <FL/Fl_Group.H> 
23 #include <FL/Fl_Input.H> 
24 #include <FL/Fl_Repeat_Button.H> 
25 class FL_EXPORT Fl_Spinner : public Fl_Group {
26     double value_; // Current value 
27     double minimum_; // Minimum value 
28     double maximum_; // Maximum value 
29     const char *format_; // Format string for input field 
30     int wrap_; // wrap around at bounds (1/0) 

35.139 Fl_Spinner.H
private:

static void sb_cb(Fl_Widget *w, Fl_Spinner *sb); // internal callback
void update(); // update input field

protected:

// This class works like Fl_Input but ignores FL_Up and FL_Down key
// presses so they are handled by its parent, the Fl_Spinner widget.
// See STR #2989.

class FL_EXPORT Fl_Spinner_Input : public Fl_Input {
public:
Fl_Spinner_Input(int X, int Y, int W, int H)
: Fl_Input(X, Y, W, H) {}
int handle(int event) FL_OVERRIDE; // implemented in src/Fl_Spinner.cxx
};

Fl_Spinner_Input input_; // Input field for the value
Fl_Repeat_Button up_button_, // Up button
down_button_; // Down button

void draw(); FL_OVERRIDE;

public:

// Constructor
Fl_Spinner(int X, int Y, int W, int H, const char *L = 0);
// Event handling
int handle(int event) FL_OVERRIDE;
// Resize group and subwidgets
void resize(int X, int Y, int W, int H) FL_OVERRIDE;

const char *format()const { return (format_); }
void format(const char *f) { format_ = f; update(); }

double maximum()const { return (maximum_); }
void maximum(double m) { maximum_ = m; }
double minimum()const { return (minimum_); }
void minimum(double m) { minimum_ = m; }
void range(double a, double b) { minimum_ = a; maximum_ = b; }

void step(double s);

uchar type()const { return (input_.type()); }

double value()const { return (value_); }
void value(double v) { value_ = v; update(); }

Fl_Color color()const { return(input_.color()); }
void color(Fl_Color v) { input_.color(v); }

Fl_Color selection_color()const { return(input_.selection_color()); }

Fl_Color textcolor()const { return (input_.textcolor()); }
void textcolor(Fl_Color c) { input_.textcolor(c); }

Fl_Font textfont()const { return (input_.textfont()); }
void textfont(Fl_Font f) { input_.textfont(f); }

Fl_Fontsize textsize()const { return (input_.textsize()); }
void textsize(Fl_Fontsize s) { input_.textsize(s); }

// Sets the numeric representation in the input field.
// Docs see src/Fl_Spinner.cxx
void type(uchar v);

// Docs in src/Fl_Spinner.cxx
void draw();
35.140 fl_string_functions.h File Reference

Public header for FLTK's platform-agnostic string handling.
#include "Fl_Export.H"

Functions

- char * fl_strdup (const char *s)
  
  Cross platform interface to POSIX function strdup().

35.140.1 Detailed Description

Public header for FLTK's platform-agnostic string handling.

35.141 fl_string_functions.h

Go to the documentation of this file.

1 /*
2 * Platform agnostic string portability functions for the Fast Light Tool Kit (FLTK).
3 *
4 * Copyright 2020-2022 by Bill Spitzak and others.
5 *
6 * This library is free software. Distribution and use rights are outlined in
7 * the file "COPYING" which should have been included with this file. If this
8 * file is missing or damaged, see the license at:
9 * http://www.fltk.org/COPYING.php
10 *
11 * Please see the following page on how to report bugs and issues:
12 *
13 * http://www.fltk.org/bugs.php
14 */
15
16 ifndef _FL_fl_string_functions_h_
17 #define _FL_fl_string_functions_h_
18
19 #include "Fl_Export.H"
20
21 ifndef __cplusplus
22 extern "C" {
23 #define __cplusplus
24 #include "FL_Export.H"
25 #endif
26
27 #ifdef __cplusplus
28 #endif /* __cplusplus */
29 #endif
30
31 FL_EXPORT char * fl_strdup(const char *s);
32
33 #ifdef __cplusplus
34 } // __cplusplus
35 #endif
36
37 #endif /* _FL_fl_string_functions_h_ */

35.142 FI_SVG_File_Surface.H

1 //
2 // Declaration of FI_SVG_File_Surface in the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
Generated by Doxygen
#ifndef Fl_SVG_File_Surface_H
#define Fl_SVG_File_Surface_H

#include <FL/Fl_Widget_Surface.H>
#include <stdio.h>

class FL_EXPORT Fl_SVG_File_Surface : public Fl_Widget_Surface {
int width_, height_;
int (*closef_)(FILE*);

public:
Fl_SVG_File_Surface(int width, int height, FILE *svg, int (*closef)(FILE*) = NULL);
~Fl_SVG_File_Surface();
FILE *file();
void origin(int x, int y) FL_OVERRIDE;
void origin(int *x, int *y) FL_OVERRIDE;
void translate(int x, int y) FL_OVERRIDE;
void untranslate() FL_OVERRIDE;
int printable_rect(int *w, int *h) FL_OVERRIDE;
int close();
};
#endif /* Fl_SVG_File_Surface_H */

35.143 Fl_SVG_Image.H

1 // SVG Image header file for the Fast Light Tool Kit (FLTK).
2 // Copyright 2017-2022 by Bill Spitzak and others.
3 // This library is free software. Distribution and use rights are outlined in
4 // the file "COPYING" which should have been included with this file. If this
5 // file is missing or damaged, see the license at:
6 // https://www.fltk.org/COPYING.php
7 // Please see the following page on how to report bugs and issues:
8 // https://www.fltk.org/bugs.php
9 //
10 #ifndef FL_SVG_IMAGE_H
11 #define FL_SVG_IMAGE_H
12 //
13 #include <FL/Fl_Image.H>
14 //
15 struct NSVGimage;
16 //
17 class FL_EXPORT Fl_SVG_Image : public Fl_RGB_Image {
18 private:
19 typedef struct {
20 NSVGimage* svg_image;
21 int ref_count;
22 } counted_NSVGimage;
23 counted_NSVGimage* counted_svg_image_;
24 bool rasterized_;
25 int raster_w_, raster_h_;
26 bool to_desaturate_;
27 Fl_Color average_color_; 
28 float average_weight_; 
29 float svg_scaling_(int W, int H); 
30 void rasterize_(int W, int H) FL_OVERRIDE; 
31 void cache_size_(int &width, int &height) FL_OVERRIDE; 
32 void init_(const char *name, const unsigned char *filedata, size_t length); 
33 Fl_SVG_Image(const Fl_SVG_Image *source); 
34 public: 
35 bool proportional; 
36 Fl_SVG_Image(const char *filename); 
37 Fl_SVG_Image(const char *sharedname, const char *svg_data); 
38 Fl_SVG_Image(const char *sharedname, const unsigned char *svg_data, size_t length); 
39 Fl_SVG_Image(const Fl_SVG_Image *source); 
40 virtual ~Fl_SVG_Image(); 
41 Fl_Image *copy(const char *sharedname, const char *svg_data, size_t length); 
42 void resize(int width, int height); 
43 void color_average(Fl_Color c, float i) FL_OVERRIDE; 
44 void desaturate() FL_OVERRIDE; 
45 void untranslate() FL_OVERRIDE; 
46 void origin(int x, int y) FL_OVERRIDE;
47 void translate(int x, int y) FL_OVERRIDE;
48 void untranslate() FL_OVERRIDE;
49 int printable_rect(int *w, int *h) FL_OVERRIDE;
50 int close();
51 Fl_SVG_Image(const Fl_SVG_Image *source);
52 Fl_SVG_Image(const char *sharedname, const unsigned char *svg_data, size_t length);
53 Fl_SVG_Image(const char *filename);
54 Fl_SVG_Image(const Fl_SVG_Image *source);
55 virtual ~Fl_SVG_Image();
56 Fl_SVG_Image(const char *filename);
57 Fl_SVG_Image(const char *sharedname, const char *svg_data);
58 Fl_SVG_Image(const Fl_SVG_Image *source);
59 Fl_SVG_Image(const char *sharedname, const unsigned char *svg_data, size_t length);
60 Fl_SVG_Image(const Fl_SVG_Image *source);
61 Fl_SVG_Image(const char *filename);
62 Fl_SVG_Image(const Fl_SVG_Image *source);
63 Fl_SVG_Image(const char *sharedname, const unsigned char *svg_data, size_t length);
64 Fl_SVG_Image(const Fl_SVG_Image *source);
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131 Fl_SVG_Image(const Fl_SVG_
35.144 Fl_Sys_Menu_Bar.H File Reference

Definition of class Fl_Sys_Menu_Bar.

#include <FL/Fl_Menu_Bar.H>

Classes

• class Fl_Sys_Menu_Bar

A class to create and modify menus that appear on macOS in the menu bar at the top of the screen.

Variables

• Fl_Sys_Menu_Bar * fl_sys_menu_bar

The system menu bar.

35.144.1 Detailed Description

Definition of class Fl_Sys_Menu_Bar.

35.145 Fl_Sys_Menu_Bar.H

Go to the documentation of this file.

#include <FL/Fl_Menu_Bar.H>

class Fl_Sys_Menu_Bar_Driver;

class FL_EXPORT Fl_Sys_Menu_Bar : public Fl_Menu_Bar {
  static Fl_Sys_Menu_Bar_Driver *driver();
protected:
  void draw() FL_OVERRIDE;
public:
  typedef enum {
    no_window_menu = 0,
    tabbing_mode_none,
    tabbing_mode_automatic,
    tabbing_mode_preferred
  } window_menu_style_enum;

  Fl_Sys_Menu_Bar(int x, int y, int w, int h, const char *l=0);
  virtual ~Fl_Sys_Menu_Bar();

  const Fl_Menu_Item *menu()const {return Fl_Menu_::menu();}
  void menu(const Fl_Menu_Item *m);
  void update() FL_OVERRIDE;

  int add(const char * label, int shortcut, Fl_Callback*, void *user_data=0, int flags=0);
  int add(const char * label, const char* shortcut, Fl_Callback* cb, void *user_data=0, int flags=0);
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char _row_header;  // row header enabled?
char _col_header;  // col header enabled?
char _row_resize;  // row resizing enabled?
char _col_resize;  // col resizing enabled?
int _row_resize_min; // row minimum resizing height (default=1)
int _col_resize_min; // col minimum resizing width (default=1)

// OPTIMIZATION: partial row/column redrew variables
int _redraw_toprow;
int _redraw_botrow;
int _redraw_leftcol;
int _redraw_rightcol;
Fl_Color _row_header_color;
Fl_Color _col_header_color;
int _auto_drag;
int _selecting;
int _scrollbar_size;
enum {
  TABCELLNAV = 1e0
};
unsigned int flags_;

Fl_Int_Vector *_colwidths; // column widths in pixels
Fl_Int_Vector *_rowheights; // row heights in pixels

// number of columns and rows == size of corresponding vectors
int col_size(); // size of the column widths vector
int row_size(); // size of the row heights vector

Fl_Cursor _last_cursor; // last mouse cursor before changed to 'resize' cursor

// EVENT CALLBACK DATA
TableContext _callback_context; // event context
int _callback_row, _callback_col; // event row/col

// handle() state variables.
// Put here instead of local statics in handle(), so more
// than one Fl_Table can exist without crosstalk between them.
int _resizing_col;  // column being dragged
int _resizing_row;  // row being dragged
int _dragging_x;    // starting x position for horiz drag
int _dragging_y;    // starting y position for vert drag
int _last_row;      // last row we FL_PUSH'ed

// Redraw single cell
void _redraw_cell(TableContext context, int R, int C);
void _start_auto_drag();
void _stop_auto_drag();
void _auto_drag_cb();
static void _auto_drag_cb2(void *d);

protected:
enum ResizeFlag {
  RESIZE_NONE = 0,
  RESIZE_COL_LEFT = 1,
  RESIZE_COL_RIGHT = 2,
  RESIZE_ROW_ABOVE = 3,
  RESIZE_ROW_BELOW = 4
};

int table_w;
int table_h;
int toprow;
int botrow;
int leftcol;
int rightcol;

// selection
int current_row;
int current_col;
int select_row;
int select_col;

// OPTIMIZATION: Precomputed scroll positions for the toprow/leftcol
int toprow_scrollpos;
int leftcol_scrollpos;

// Data table's inner dimension
int tix;
int tiy;
int tiw;
int tih;
// Data table's outer dimension
int tox;
int toy;
int tow;
int toh;

// Table widget's inner dimension
int wix;
int wiy;
int wiw;
int wih;

Fl_Scroll *table;
Fl_Scrollbar *vscrollbar;
Fl_Scrollbar *hscrollbar;

// Fltk
int handle(int e) FL_OVERRIDE; // fltk handle() FL_OVERRIDE

// Class maintenance
void recalc_dimensions();
void table_resized(); // table resized; recalc
void get_bounds(TableContext context, // return x/y/w/h bounds for context
    int &X, int &Y, int &W, int &H);
void change_cursor(Fl_Cursor newcursor); // change mouse cursor to some other shape
TableContext cursor2rowcol(int &R, int &C, ResizeFlag &resizeflag);
int find_cell(TableContext context, // find cell's x/y/w/h given r/c
    int R, int C, int &X, int &Y, int &W, int &H);
int row_col_clamp(TableContext context, int &R, int &C);

// clamp r/c to known universe

virtual void draw_cell(TableContext context, int R=0, int C=0,
    int X=0, int Y=0, int W=0, int H=0) { (void)context; (void)R; (void)C; (void)X; (void)Y; (void)W; (void)H; }

long row_scroll_position(int row); // find scroll position of row (in pixels)
long col_scroll_position(int col); // find scroll position of col (in pixels)

int is_fltk_container() { // does table contain fltk widgets?
    return( Fl_Group::children() > 3 ); // (ie. more than box and 2 scrollbars?)
}

// draw() has to be protected per FLTK convention (was public in 1.3.x)

void draw() FL_OVERRIDE;
public:
Fl_Table(int X, int Y, int W, int H, const char *l=0);
~Fl_Table();

virtual void clear() {
    rows(0);
cols(0);
table->clear();
}

// \todo: add topline(), middleline(), bottomline()
inline void table_box(Fl_Boxtype val) { table->box(val);
}

inline Fl_Boxtype table_box( void ) {
35.146 Fl_Table.H

```c
449    return(table->box());
450 }
451 virtual void rows(int val); // set number of rows
452 inline int rows() {
453    return(_rows);
454 }
455
460 virtual void cols(int val); // set number of columns
461 inline int cols() {
462    return(_cols);
463 }
464
498 inline void visible_cells(int& r1, int& r2, int& c1, int& c2) {
499    r1 = toprow;
500    r2 = botrow;
501    c1 = leftcol;
502    c2 = rightcol;
503 }
504
509 int is_interactive_resize() {
510    return(_resizing_row != -1 | | _resizing_col != -1);
511 }
512 inline int row_resize() {
513    return(_row_resize);
514 }
516 void row_resize(int flag) { // enable row resizing
517    _row_resize = flag;
518 }
522 inline int col_resize() {
523    return(_col_resize);
524 }
526 void col_resize(int flag) { // enable col resizing
527    _col_resize = flag;
528 }
532 inline int col_resize_min() { // column minimum resizing width
533    return(_col_resize_min);
534 }
536 void col_resize_min(int val) {
537    _col_resize_min = ( val < 1 ) ? 1 : val;
538 }
541 inline int row_header() { // set/get row header enable flag
542    return(_row_header);
543 }
545 void row_header(int flag) {
546    _row_header = flag;
547    table_resized();
548    redraw();
549 }
555 inline int col_header() { // set/get col header enable flag
556    return(_col_header);
557 }
559 void col_header(int flag) {
560    _col_header = flag;
561    table_resized();
562    redraw();
563 }
568 inline int row_resize_min() { // column minimum resizing width
569    return(_row_resize_min);
570 }
574 void row_resize_min(int val) {
575    _row_resize_min = ( val < 1 ) ? 1 : val;
576 }
581 inline int col_header_height() { // set/get col header height
582    return(_col_header_h);
583 }
587 void col_header_height(int height) {
588    _col_header_h = height;
589    table_resized();
590    redraw();
591 }
597 inline void col_header_height(int height) {
598    _col_header_h = height;
599    table_resized();
600    redraw();
601 }
612 inline int col_header_height() {
613    return(_col_header_h);
614 }
619 }```

Generated by Doxygen
inline void row_header_width(int width) { // set/get row header width
    _row_header_w = width;
    table_resized();
    redraw();
}

inline int row_header_width() {
    return(_row_header_w);
}

inline void row_header_color(Fl_Color val) { // set/get row header color
    _row_header_color = val;
    redraw();
}

inline Fl_Color row_header_color() {
    return(_row_header_color);
}

inline void col_header_color(Fl_Color val) { // set/get col header color
    _col_header_color = val;
    redraw();
}

inline Fl_Color col_header_color() {
    return(_col_header_color);
}

void row_height(int row, int height); // set row height in pixels

int row_height(int row); // Returns the current height of the specified row as a value in pixels.

void col_width(int col, int width); // set a column's width in pixels

int col_width(int col); // Returns the current width of the specified column in pixels.

void row_height_all(int height) { // set all row/col heights
    for ( int r=0; r<rows(); r++ ) {
        row_height(r, height);
    }
}

void col_width_all(int width) {
    for ( int c=0; c<cols(); c++ ) {
        col_width(c, width);
    }
}

void row_position(int row); // set/get table's current scroll position

int row_position() {
    return(_row_position);
}

int col_position() {
    return(_col_position);
}

inline void top_row(int row) { // set/get top row {deprecated}
    row_position(row);
}

int is_selected(int r, int c); // selected cell

void get_selection(int &row_top, int &row_bot, int &col_left, int &col_right);

void set_selection(int row_top, int row_bot, int col_left, int col_right);

int move_cursor(int R, int C, int shiftselect); // selected cell

int move_cursor(int R, int C); // selected cell

int move_cursor(int R, int C, int shiftselect);

int move_cursor(int R, int C);

void resize(int X, int Y, int W, int H) FL_OVERRIDE; // fltk resize() FL_OVERRIDE

// This crashes sortapp() during init.

// void box(Fl_Boxtype val) {
    // Fl_Group::box(val);
// if ( table ) {
    // resize(x(), y(), w(), h());
// }

// Fl_Boxtype box(void) const {
    // return(Fl_Group::box());
// }
void init_sizes() {
    table->init_sizes();
    table->redraw();
}

void add(Fl_Widget& wgt) {
    table->add(wgt);
    if (table->children() > 2) {
        table->show();
    } else {
        table->hide();
    }
}

void add(Fl_Widget* wgt) {
    add(*wgt);
}

void insert(Fl_Widget& wgt, int n) {
    table->insert(wgt, n);
}

void insert(Fl_Widget& wgt, Fl_Widget* w2) {
    table->insert(wgt, w2);
}

void remove(Fl_Widget& wgt) {
    table->remove(wgt);
}

void begin() {
    table->begin();
}

void end() {
    table->end();
    // HACK: Avoid showing Fl_Scroll; seems to erase screen
    // causing unnecessary flicker, even if its box() is FL_NO_BOX.
    if (table->children() > 2) {
        table->show();
    } else {
        table->hide();
    }
    Fl_Group::current(Fl_Group::parent());
}

Fl_Widget* const* array() {
    return(table->array());
}

Fl_Widget* child(int n) const {
    return(table->child(n));
}

int children() const {
    return(table->children()-2); // -2: skip Fl_Scroll's h/v scrollbar widgets
}

int find(const Fl_Widget* wgt) const {
    return(table->find(wgt));
}

int find(const Fl_Widget& wgt) const {
    return(table->find(wgt));
}

// CALLBACKS

int callback_row() {
    return(_callback_row);
}

int callback_col() {
    return(_callback_col);
}

TableContext callback_context() {
    return(_callback_context);
}
```c
void do_callback(TableContext context, int row, int col) {
    _callback_context = context;
    _callback_row = row;
    _callback_col = col;
    Fl_Widget::do_callback();
}

#endif
#endif

int scrollbar_size() const {
    return(_scrollbar_size);
}

void scrollbar_size(int newSize) {
    if (newSize != _scrollbar_size) redraw();
    _scrollbar_size = newSize;
}

void tab_cell_nav(int val) {
    if (val) flags_ |= TABCELLNAV;
    else flags_ &= ~TABCELLNAV;
}

int tab_cell_nav() const {
    return(flags_ & TABCELLNAV ? 1 : 0);
}
};
#endif /*_FL_TABLE_H*/
```

35.147  **FL_Table_Row.H**

1 //
2 ifndef _FL_TABLE_ROW_H
3 #define _FL_TABLE_ROW_H
4
5 // Fl_Table_Row -- A row oriented table widget for the Fast Light Tool Kit (FLTK).
6 // A class specializing in a table of rows.
7 // Handles row-specific selection behavior.
8 // Copyright 2002 by Greg Ercolano.
9 // This library is free software. Distribution and use rights are outlined in
10 // the file "COPYING" which should have been included with this file. If this
11 // file is missing or damaged, see the license at:
12 //
13 // https://www.fltk.org/COPYING.php
14 // Please see the following page on how to report bugs and issues:
15 //
16 // https://www.fltk.org/bugs.php
17 //
18 #include <FL/Fl_Table.H>
19
class FL_EXPORT Fl_Table_Row : public Fl_Table {
public:
    enum TableRowSelectMode {
        SELECT_NONE, // no selection allowed
        SELECT_SINGLE, // single row selection
        SELECT_MULTI // multiple row selection (default)
    };

private:
    // An STL-ish vector without templates
    class FL_EXPORT CharVector {
    char *arr;
    int _size;
    void init() {
        arr = 0;
        _size = 0;
    }
    void copy(char *newarr, int newsize);
    public:
        CharVector() { // CTOR
            init();
        }
    };
```
CharVector(); // DTOR
CharVector(CharVector&o) { // COPY CTOR
    init();
    copy(o.arr, o._size);
}
CharVector operator=(CharVector&o) { // ASSIGN
    init();
    copy(o.arr, o._size);
    return(*this);
}
operator[](int x) const {
    return(arr[x]);
}
operator[](int x) {
    return(arr[x]);
}
int size() {
    return(_size);
}
void size(int count);
pop_back() {
    char tmp = arr[_size-1];
    _size--;
    return(tmp);
}
push_back(char val) {
    int x = _size;
    size(_size+1);
    arr[x] = val;
}
back() {
    return(arr[_size-1]);
};
CharVector _rowselect; // selection flag for each row
// handle() state variables.
// Put here instead of local statics in handle(), so more
// than one instance can exist without crosstalk between.
//
int _dragging_select; // dragging out a selection?
int _last_row;
int _last_y; // last event’s Y position
int _last_push_x; // last PUSH event’s X position
int _last_push_y; // last PUSH event’s Y position
TableRowSelectMode _selectmode;
protected:
int handle(int event) FL_OVERRIDE;
int find_cell(TableContext context, // find cell’s x/y/w/h given r/c
    int R, int C, int &X, int &Y, int &W, int &H) {
    return(Fl_Table::find_cell(context, R, C, X, Y, W, H));
};
public:
Fl_Table_Row(int X, int Y, int W, int H, const char *l=0) : Fl_Table(X,Y,W,H,l) {
    _dragging_select = 0;
    _last_row = -1;
    _last_y = -1;
    _last_push_x = -1;
    _last_push_y = -1;
    _selectmode = SELECT_MULTI;
};
~Fl_Table_Row() { }
void rows(int val) FL_OVERRIDE; // set number of rows
int rows() { // get number of rows
    return(Fl_Table::rows());
}
void type(TableRowSelectMode val); // set selection mode
TableRowSelectMode type()const { // get selection mode
    return(_selectmode);
}
int row_selected(int row); // is row selected? (0=no, 1=yes, -1=range err)
int select_row(int row, int flag=1); // select state for row: flag:0=off, 1=on, 2=toggle
    // returns: 0=no change, 1=changed, -1=range err
void select_all_rows(int flag=1); // all rows to a known state
void clear() FL_OVERRIDE ;
# Fl_Tabs.H

```cpp
/*
file Fl_Tabs widget . */

#ifndef Fl_Tabs_H
#define Fl_Tabs_H

#include "Fl_Group.H"

struct Fl_Menu_Item;

class FL_EXPORT Fl_Tabs : public Fl_Group {
protected:
  int overflow_type;
  int tab_offset;
  int *tab_pos;
  int tab_width;
  int *tab_flags;
  int tab_count;
  Fl_Align tab_align_;
  int has_overflow_menu;

  void check_overflow_menu();
  void handle_overflow_menu();
  void draw_overflow_menu_button();

  int on_insert(Fl_Widget *, int) FL_OVERRIDE;
  int on_move(int, int) FL_OVERRIDE;
  void on_remove(int) FL_OVERRIDE;
  void resize(int, int, int, int) FL_OVERRIDE;

  virtual void redraw_tabs();
  virtual int tab_positions(); // allocate and calculate tab positions
  virtual void clear_tab_positions();
  virtual void draw_tab(int x1, int x2, int W, int H, Fl_Widget * o, int flags, int sel);
  virtual int tab_height();
  virtual int hit_close(Fl_Widget *o, int event_x, int event_y);
  virtual int hit_overflow_menu(int event_x, int event_y);
  virtual int hit_tabs_area(int event_x, int event_y);
  virtual int handle(int) FL_OVERRIDE;
  virtual Fl_Widget *which(int event_x, int event_y);
  virtual Fl_Widget *push()const { return push_; }
  virtual Fl_Widget *push(Fl_Widget *);
  virtual Fl_Widget *pop();
  virtual int value(Fl_Widget *);
  virtual Fl_Widget *value();

public:
  Fl_Tabs(int X, int Y, int W, int H, const char *L = 0);
  virtual ~Fl_Tabs();

  int handle(int) FL_OVERRIDE;
  Fl_Widget *value();
  int value(Fl_Widget *);
  Fl_Widget *push(const { return push_; })
  int push(Fl_Widget *);

  virtual Fl_Widget *which(int event_x, int event_y);
  void client_area(int &rx, int &ry, int &rw, int &rh, int tabh=0);
};
#endif /*_FL_TABLE_ROW_H*/
```

35.148 Fl_Tabs.H
void tab_align(Fl_Align a) { tab_align_ = a; }

Fl_Align tab_align() const { return tab_align_; }

enum {
  OVERFLOW_COMPRESS = 0,
  OVERFLOW_CLIP,
  OVERFLOW_PULLDOWN,
  OVERFLOW_DRAG
};

void handle_overflow(int ov);

#endif

35.149 Fl_Terminal.H File Reference

Fl_Terminal widget.
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Scrollbar.H>
#include <FL/Fl_Rect.H>
#include <stdarg.h>

Classes

- class Fl_Terminal::CharStyle
- class Fl_Terminal::Cursor
- class Fl_Terminal::EscapeSeq
- class Fl_Terminal
  Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control.
- class Fl_Terminal::Margin
- class Fl_Terminal::PartialUtf8Buf
- class Fl_Terminal::RingBuffer
- class Fl_Terminal::Selection
- class Fl_Terminal::Utf8Char

35.149.1 Detailed Description

Fl_Terminal widget.

35.150 Fl_Terminal.H

Go to the documentation of this file.
```cpp
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Scrollbar.H>
#include <FL/Fl_Rect.H>

#include <stdarg.h> // va_list (MinGW)

class FL_EXPORT Fl_Terminal : public Fl_Group {
public:

enum RedrawStyle {
    NO_REDRAW=0,
    RATE_LIMITED,
    PER_WRITE
};

class Margin {
public:
    Margin(void) { left_ = right_ = top_ = bottom_ = 3; }
    int left(void)const { return left_; }
    int right(void)const { return right_; }
    int top(void)const { return top_; }
    int bottom(void)const { return bottom_; }
    void left(int val) { left_ = val; }
    void right(int val) { right_ = val; }
    void top(int val) { top_ = val; }
    void bottom(int val) { bottom_ = val; }
};

class CharStyle {
public:
    CharStyle();

    uchar attrib_; // bold, underline..
    uchar charflags_; // CharFlags (xterm color management)
    Fl_Color fgcolor_; // foreground color for text
    Fl_Color bgcolor_; // background color for text
    Fl_Color defaultfgcolor_; // default fg color used by ESC[0m
    Fl_Color defaultbgcolor_; // default bg color used by ESC[0m
    Fl_Font fontface_; // font face
    int fontsize_; // font size
    int fontheight_; // font height (in pixels)
    int fontdescent_; // font descent (pixels below font baseline)
    int charwidth_; // width of a fixed width ASCII character

public:
    CharStyle(bool fontsize_defer);
}
```
420    Fl_Color fgcolor(void) const;
421    Fl_Color bgcolor(void) const;
422    Fl_Color defaultfgcolor(void) const { return defaultfgcolor_; }
423    Fl_Color defaultbgcolor(void) const { return defaultbgcolor_; }
424    uchar attrib(void) const { return attrib_; }
425    Fl_Font face(void) const { return fontface_; }
426    Fl_Fontsize fontsize(void) const { return fontsize_; }
427    int height(void) const { return fontheight_; }
428    int descent(void) const { return fontdescent_; }
429    int charwidth(void) const { return charwidth_; }
430    uchar colors_bits_only(uchar inflags) const;
431    void attrib(uchar val) { attrib_ = val; }
432    void set_charflag(uchar val) { charflags_ |= val; }
433    void clr_charflag(uchar val) { charflags_ &= ~val; }
434    void fgcolor_uchar(uchar val);
435    void bgcolor_uchar(uchar val);
436    void fgcolor(int r, int g, int b) { fgcolor_ = (r«24) | (g«16) | (b«8); clr_charflag(FG_XTERM); }
437    void bgcolor(int r, int g, int b) { bgcolor_ = (r«24) | (g«16) | (b«8); clr_charflag(BG_XTERM); }
438    void fgcolor(Fl_Color val) { fgcolor_ = val; clr_charflag(FG_XTERM); }
439    void bgcolor(Fl_Color val) { bgcolor_ = val; clr_charflag(BG_XTERM); }
440    void defaultfgcolor(Fl_Color val) { defaultfgcolor_ = val; }
441    void defaultbgcolor(Fl_Color val) { defaultbgcolor_ = val; }
442    void fontface(Fl_Font val) { fontface_ = val; update(); }
443    void fontsize(Fl_Fontsize val) { fontsize_ = val; update(); }
444    void update();
445    void update_fake();
446    // SGR MODES: Set Graphics Rendition
447    void sgr_reset(void) { // e.g. ESC[0m
448        attrib(Fl_Terminal::NORMAL);
449        fgcolor(defaultfgcolor_);
450        bgcolor(defaultbgcolor_);
451    }
452    int onoff(bool flag, Attrib a) { return (flag ? (attrib_ | a) : (attrib_ & ~a)); }
453    void sgr_bold(bool val) { attrib_ = onoff(val, Fl_Terminal::BOLD); } // e.g. ESC[1m
454    void sgr_dim(bool val) { attrib_ = onoff(val, Fl_Terminal::DIM); } // e.g. ESC[2m
455    void sgr_italic(bool val) { attrib_ = onoff(val, Fl_Terminal::ITALIC); } // e.g. ESC[3m
456    void sgr_underline(bool val) { attrib_ = onoff(val, Fl_Terminal::UNDERLINE); } // e.g. ESC[4m
457    void sgr_dbl_under(bool val) { attrib_ = onoff(val, Fl_Terminal::UNDERLINE); } // e.g. ESC[21m
458    void sgr_blink(bool val) { (void)val; /* NOT IMPLEMENTED */ } // e.g. ESC[5m
459    void sgr_inverse(bool val) { attrib_ = onoff(val, Fl_Terminal::INVERSE); } // e.g. ESC[7m
460    void sgr_strike(bool val) { attrib_ = onoff(val, Fl_Terminal::STRIKEOUT); } // e.g. ESC[9m
461    }
462
463 protected:
464    // Cursor Class
465    // Cursor Class
466    // Cursor Class
467    // Class to manage the terminal’s cursor position, color, etc.
468    // Class to manage the terminal’s cursor position, color, etc.
469    // Class to manage the terminal’s cursor position, color, etc.
470    // Class to manage the terminal’s cursor position, color, etc.
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472    // Class to manage the terminal’s cursor position, color, etc.
473    // Class to manage the terminal’s cursor position, color, etc.
474    public:
475    Cursor(void) { }
476    void col(int val) { col_ = val >= 0 ? val : 0; }
477    void row(int val) { row_ = val >= 0 ? val : 0; }
478    void h(int val) { h_ = val; }
479    void fgcolor(uchar val) { fgcolor_ = (uchar) val; }
480    void bgcolor(uchar val) { bgcolor_ = (uchar) val; }
481    void col(Fl_Color val) { col_ = val >= 0 ? val : 0; }
482    void row(Fl_Color val) { row_ = val >= 0 ? val : 0; }
483    void h(Fl_Color val) { h_ = val; }
484    void fgcolor(Fl_Color val) { fgcolor_ = val; }
485    void bgcolor(Fl_Color val) { bgcolor_ = val; }
486    int left(void) { return col_ < 0 ? (0 - col_) : 0; }
487    int right(void) { return col_ + 1; }
488    int up(void) { return row_ - 1; }
489    int down(void) { return row_ + 1; }
490    bool is_rowcol(int drow, int dcol) const;
491    void scroll(int n);
// Includes fg/bg color, attributes (BOLD, UNDERLINE..)

class FL_EXPORT Utf8Char {
  static const int max_utf8_ = 4; // RFC 3629 paraphrased: In UTF-8, chars are encoded with 1 to 4 octets
  char text_[max_utf8_]; // memory for actual ASCII or UTF-8 byte contents
  uchar len_; // length of bytes in text_[] buffer; 1 for ASCII, >1 for UTF-8
  uchar attrib_; // attribute bits for this char {bold, underline..}
  uchar charflags_; // CharFlags (xterm colors management)
  FL_Color fgcolor_; // fltk fg color {supports 8color or 24bit color set w/ESC[37;<r>;<g>;<b>m)
  FL_Color bgcolor_; // fltk bg color {supports 8color or 24bit color set w/ESC[47;<r>;<g>;<b>m)

  // Private methods
  void text_utf8_(const char *text, int len);
  public:
    // Public methods
  Utf8Char(void); // ctor
  Utf8Char(const Utf8Char& o); // copy ctor
  ~Utf8Char(void); // dtor
  Utf8Char& operator=(const Utf8Char& o); // assignment
  inline int max_utf8()const { return max_utf8_; }
  void text_utf8(const char *text, int len, const CharStyle& style);
  void text_ascii(char c, const CharStyle& style);
  void fl_font_set(const CharStyle& style) const;

  // Return the UTF-8 text string for this character. Use length() to get number of bytes in string, which will be 1 for ASCII chars.
  const char * text_utf8(void)const { return text_; }

  // Return the attribute for this char
  uchar attrib(void)const { return attrib_; }
  uchar charflags(void)const { return charflags_; }
  Fl_Color fgcolor(void) const;
  Fl_Color bgcolor(void) const;

  // Return the length of this character in bytes (UTF-8 can be multibyte..)
  int length(void)const { return int(len_); }

  double pwidth(void) const;
  int pwidth_int(void) const;

  // Clear the character to a 'space'
  void clear(const CharStyle& style) { text_ascii(' ', style); }

  // The 'offset' concept allows the 'history' and 'display' to be scrolled indefinitely. The 'offset' is applied to all the row accesses, and are clamped to within their bounds.
  bool is_char(char c)const { return *text_ == c; }

  // Manages ring with indexed row/col and "history" vs. "display" concepts.
  class FL_EXPORT RingBuffer {

    // paranoia
    Utf8Char *ring_chars_; // the ring UTF-8 char buffer
    int ring_rows_; // #rows in ring total
    int ring_cols_; // #columns in ring hist/disp
    int nchars_; // #chars in ring (ring_rows*ring_cols)
    int hist_rows_; // #rows in history
    int hist_use_; // #rows in use by history
    int disp_rows_; // #rows in display
    int offset_; // index offset (used for 'scrolling')

    private:
      void new_copy(int drows, int dcols, int hrows, const CharStyle& style);
      void write_row(FILE *fp, Utf8Char *u8c, int cols) const;

    public:
      void clear(void);

  };

  // Methods to access ring
  // The 'offset' concept allows the 'history' and 'display'
  // to be scrolled indefinitely. The 'offset' is applied
  // to all the row accesses, and are clamped to within their bounds.

  // For 'raw' access to the ring (without the offset concept),
  // use the ring_chars() method, and walk from 0 - ring_rows().

};
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// _____________
// | | <- hist_srow() <- ring_srow()
// | H i s t |
// | |
// |_____________| <- hist_erow()
// | | <- disp_srow()
// | D i s p |
// | |
// |_____________| <- disp_erow() <- ring_erow()
//
// ring_cols()
// hist_cols()
// disp_cols()

inline int ring_rows(void)const { return ring_rows_; }
inline int ring_cols(void)const { return ring_cols_; }
inline int ring_srow(void)const { return(0); }
inline int ring_erow(void)const { return(ring_rows_ - 1); }
inline int hist_rows(void)const { return hist_rows_; }
inline int hist_cols(void)const { return ring_cols_; }
inline int hist_srow(void)const { return((offset_ + 0) % ring_rows_); }
inline int hist_erow(void)const { return((offset_ + hist_rows_ - 1) % ring_rows_); }
inline int disp_rows(void)const { return disp_rows_; }
inline int disp_cols(void)const { return disp_cols_; }
inline int disp_srow(void)const { return((offset_ + hist_rows_) % ring_rows_); }
inline int disp_erow(void)const { return((offset_ + hist_rows_ + disp_rows_ - 1) % ring_rows_); }
inline int offset(void)const { return offset_; }

inline int hist_use(void)const { return hist_use_; }
inline void hist_use(int val) { hist_use_ = val; }
inline int hist_use_srow(void)const { return((offset_ + hist_rows_ - hist_use_) % ring_rows_); }

inline Utf8Char *ring_chars(void) { return ring_chars_; } // access ring buffer directly
inline Utf8Char *ring_chars(void)const { return ring_chars_; } // access ring buffer directly

bool is_hist_ring_row(int grow) const;
bool is_disp_ring_row(int grow) const;
//DEBUG void show_ring_info(void) const;
void move_disp_row(int src_row, int dst_row);
void clear_disp_row(int drow, const CharStyle& style);
void scroll(int rows, const CharStyle& style);

const Utf8Char * u8c_ring_row(int row) const;
const Utf8Char * u8c_hist_row(int hrow) const;
const Utf8Char * u8c_hist_use_row(int hurow) const;
const Utf8Char * u8c_disp_row(int drow) const;

void create(int drows, int dcols, int hrows);
void resize(int drows, int dcols, int hrows, const CharStyle& style);
void change_disp_rows(int drows, const CharStyle& style);
void change_disp_cols(int dcols, const CharStyle& style);

// Selection Class ///////////////////////////////////////////////////
// Class to manage mouse selection

class FL_EXPORT Selection {
  int srow_, scol_, erow_, ecol_; // selection start/end. NOTE: start *might* be > end
  int push_row_, push_col_; // global row/col for last FL_PUSH
  Fl_Color selectionbgcolor_; // selection background color
  Fl_Color selectionfgcolor_; // selection foreground color
  int state_; // 0=none, 1=started, 2=extended, 3=done
  bool is_selection_; // false: no selection
public:
  Selection(void);
  int srow(void)const { return srow_; }
  int scol(void)const { return scol_; }
  int erow(void)const { return erow_; }
  int ecol(void)const { return ecol_; }
  void push_clear() { push_row_ = push_col_ = -1; }
  void push_rowcol(int row, int col) { push_row_ = row; push_col_ = col; }
  void start_push() { start(push_row_, push_col_); }
  bool dragged_off(int row, int col) { return (push_row_ != row) || (push_col_ != col); }
  void selectionfgcolor(Fl_Color val) { selectionfgcolor_ = val; }
  void selectionbgcolor(Fl_Color val) { selectionbgcolor_ = val; }
  Fl_Color selectionfgcolor(void)const { return selectionfgcolor_; }
  Fl_Color selectionbgcolor(void)const { return selectionbgcolor_; }

};

// Selection Class //////////////////////////////////////////////////////
// Class to manage mouse selection
//
//FL_EXPORT Selection;

int srow_, scol_, erow_, ecol_; // selection start/end. NOTE: start *might* be > end
int push_row_, push_col_; // global row/col for last FL_PUSH
Fl_Color selectionbgcolor_; // selection background color
Fl_Color selectionfgcolor_; // selection foreground color
int state_; // 0=none, 1=started, 2=extended, 3=done
bool is_selection_; // false: no selection
public:
  Selection(void);
  int srow(void)const { return srow_; }
  int scol(void)const { return scol_; }
  int erow(void)const { return erow_; }
  int ecol(void)const { return ecol_; }
  void push_clear() { push_row_ = push_col_ = -1; }
  void push_rowcol(int row, int col) { push_row_ = row; push_col_ = col; }
  void start_push() { start(push_row_, push_col_); }
  bool dragged_off(int row, int col) { return (push_row_ != row) || (push_col_ != col); }
  void selectionfgcolor(Fl_Color val) { selectionfgcolor_ = val; }
  void selectionbgcolor(Fl_Color val) { selectionbgcolor_ = val; }
  Fl_Color selectionfgcolor(void)const { return selectionfgcolor_; }
  Fl_Color selectionbgcolor(void)const { return selectionbgcolor_; }

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bool is_selection(void) const { return is_selection_; }
bool get_selection(int &srow, int &scol, int &erow, int &ecol) const; // guarantees return (start < end)
bool start(int row, int col);
void extend(int row, int col);
void end(void);
void select(int srow, int scol, int erow, int ecol);
bool clear(void);
int state(void) const { return state_; }
void scroll(int nrows);
};

class FL_EXPORT EscapeSeq {
public:
// EscapeSeq Constants
// Maximums
static const int maxbuff = 80; // character buffer
static const int maxvals = 20; // integer value buffer
// Return codes
static const int success = 0; // operation succeeded
static const int fail = -1; // operation failed
static const int completed = 1; // multi-step operation completed successfully
private:
char esc_mode_; // escape parsing mode state
char csi_; // This is an ESC[.. sequence (Ctrl Seq Introducer)
char *buffp_; // escape sequence being parsed
char *buffendp_; // pointer to first char in buff of integer being parsed
int vals_[maxvals]; // value array for parsing #'s in ESC[#;#;#..
int vali_; // parsing index into vals_, 0 if none
int save_row_, save_col_; // used by ESC[s/u for save/restore

public:
EscapeSeq(void);
void reset(void);
int append_val(void);
int append_buff(char c);
int esc_mode(void) const;
void esc_mode(char val);
int total_vals(void) const;
int val(int i) const;
int defvalmax(int dval, int max) const;
bool parse_in_progress(void) const;
bool is_csi(void) const;
int parse(char c);
void save_cursor(int row, int col);
void restore_cursor(int &row, int &col);
};

class FL_EXPORT PartialUtf8Buf {
char buf_[10]; // buffer partial UTF-8 encoded char
int buflen_; // length of buffered UTF-8 encoded char
int clen_; // final byte length of a UTF-8 char

public:
void clear(void) { buflen_ = clen_ = 0; } // clear the buffer
PartialUtf8Buf(void) { clear(); } // Ctor
// Is byte 'c' in the middle of a UTF-8 encoded byte sequence?
bool is_continuation(char c) {
// ASCII: 0xxxxxxx
// UTF8(2): 110xxxxx 10xxxxxx
// UTF8(3): 1110xxxx 10xxxxxx 10xxxxxx
// UTF8(4): 11110xx 10xxxxxx 10xxxxxx 10xxxxxx
// UTF8(5): 111110xx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx
// Start byte Continuation bytes
// (c & 0xc0) == 0x80
// (c & 0xc0) == 0x80
// Access buffer
const char * buf(void) const { return buf_; }
int buflen(void) const { return buflen_; }

// Append bytes of a partial UTF-8 string to the buffer.

// Returns:
// - true if done OK. Use is_complete() to see if a complete char received.
// - false if buffer overrun occurred, class is clear()ed.

bool append(const char* p, int len) {
    if (len <= 0) return true; // ignore silly requests: say we did but dont
    if (buflen_ + len >= int(sizeof(buf_))) // overrun check
        clear(); return false; // clear self, return false
    if (!buflen_) clen_ = fl_utf8len(*p); // first byte? save char len for later
    while (len > 0) { buf_[buflen_++] = *p++; len--; } // append byte to buffer
    return true;
}

bool is_complete(void) const { return (buflen_ && (buflen_ == clen_)); }

Fl_SCROLLBAR scrollbar; // vertical scrollbar (value: rows above disp_chars[])
static void scrollbar_cb(Fl_Widget*, void*); // scrollbar manipulation
static void autoscroll_timer_cb(void*); // mouse drag autoscroll
void autoscroll_timer_cb2(void);
static void redraw_timer_cb(void*); // redraw rate limiting timer
void redraw_timer_cb2(void);

// Screen management
protected:
const CharStyle& current_style(void) const;
void current_style(const CharStyle& sty);
private:
int x_to_glob_col(int X, int grow, int &gcol) const;
int xy_to_glob_rowcol(int X, int Y, int &grow, int &gcol) const;
protected:
int w_to_col(int W) const;
int h_to_row(int H) const;
// API: Display clear operations
void clear_sod(void);
void clear_eod(void);
void clear_eol(void);
void clear_sol(void);
void clear_line(int row);
void clear_line(void);

const Utf8Char * walk_selection(const Utf8Char *u8c, int &row, int &col) const;
bool get_selection(int &srow,int &scol,int &erow,int &ecol) const;
bool is_selection(void) const;
bool is_inside_selection(int row, int col) const;
private:
bool is_hist_ring_row(int grow) const;
bool is_disp_ring_row(int grow) const;
protected:
int selection_text_len(void) const;
const char * selection_text(void) const;
protected:
void cursor_row(int row);
void cursor_col(int col);
public:
int cursor_row(void) const;
int cursor_col(void) const;
protected:
void cursor_up(int count=1, bool do_scroll=false);
void cursor_down(int count=1, bool do_scroll=false);
void cursor_left(int count=1);
void cursor_right(int count=1, bool do_scroll=false);
void cursor_eol(void);
void cursor_sol(void);
void cursor_cr(void);
void cursor_crlf(int count=1);
void cursor_tab_right(int count=1);
void cursor_tab_left(int count=1);
void save_cursor(void);
void restore_cursor(void);
// Output translation
public:
void output_translate(Fl_Terminal::OutFlags val);
Fl_Terminal::OutFlags output_translate(void) const;
private:
void handle_lf(void);
void handle_cr(void);
// Printing
void handle_ctl(char c);
bool is_printable(char c);
bool is_ctl(char c);
void handle_BGR(void);
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943 void handle_DECRA(void);
944 void handle_escseq(char c);
945 // --
946 void display_modified(void);
947 void display_modified_clear(void);
948 void clear_char_at_disp(int drow, int dcol);
949 const Utf8Char* utf8_char_at_disp(int drow, int dcol) const;
950 const Utf8Char* utf8_char_at_glob(int grow, int gcol) const;
951 void repeat_char(char c, int rep);
952 void utf8_cache_clear(void);
953 void utf8_cache_flush(void);
954 // API: Character display output
955 public:
956 void putchar(const char *text, int len, int drow, int dcol);
957 void putchar(char c, int drow, int dcol);
958 void print_char(const char *text, int len=-1);
959 void print_char(char c);
960 // API: String display output
961 public:
962 void append_utf8(const char *buf, int len=-1);
963 void append_ascii(const char *s);
964 void append(const char *s, int len=-1);
965 protected:
966 int handle_unknown_char(void);
967 // Drawing
968 void draw_row_bg(int grow, int X, int Y) const;
969 void draw_row(int grow, int Y) const;
970 void draw_buff(int Y) const;
971 private:
972 void handle_selection_autoscroll(void);
973 int handle_selection(int e);
974 public:
975 // FLTK: draw(), resize(), handle()
976 void draw(void) FL_OVERRIDE;
977 void resize(int X, int Y, int W, int H) FL_OVERRIDE;
978 int handle(int e) FL_OVERRIDE;
979
980 protected:
981 // Internal short names
982 // Don't make these public, but allow internals and
983 // derived classes to maintain brevity.
984 //
985 inline int ring_rows(void)const { return ring_.ring_rows(); }
986 inline int ring_cols(void)const { return ring_.ring_cols(); }
987 inline int ring_srow(void)const { return ring_.ring_srow(); }
988 inline int ring_erow(void)const { return ring_.ring_erow(); }
989 inline int hist_rows(void)const { return ring_.hist_rows(); }
990 inline int hist_cols(void)const { return ring_.hist_cols(); }
991 inline int hist_srow(void)const { return ring_.hist_srow(); }
992 inline int hist_erow(void)const { return ring_.hist_erow(); }
993 inline int disp_rows(void)const { return ring_.disp_rows(); }
994 inline int disp_cols(void)const { return ring_.disp_cols(); }
995 inline int disp_srow(void)const { return ring_.disp_srow(); }
996 inline int disp_erow(void)const { return ring_.disp_erow(); }
997 inline int offset(void)const { return ring_.offset(); }
998 // TODO: CLEAN UP WHAT'S PUBLIC, AND WHAT SHOULD BE 'PROTECTED' AND 'PRIVATE'
999 // Some of the public stuff should, quite simply, "not be".
1000 */
1001 public:
1002 int scrollbar_size(void) const;
1003 void scrollbar_size(int val);
1004 int scrollbar_actual_size(void) const;
1005 int history_rows(void) const;
1006 void history_rows(int val);
1007 int history_use(void) const;
1008 void history_use(int val);
1009 // API: Box
1010 int margin_left(void)const { return margin_.left(); }
1011 void margin_left(int val);
1012 int margin_right(void)const { return margin_.right(); }
1013 void margin_right(int val);
1014 int margin_top(void)const { return margin_.top(); }
1015 void margin_top(int val);
1016 int margin_bottom(void)const { return margin_.bottom(); }
1017 void margin_bottom(int val);

1058 // API: Text font/size/color
1059 void textfont(Fl_Font val);
1060 void fontsize(Fl_Fontsize val);
1061 void textcolor(Fl_Color val);
1062 void color(Fl_Color val);
1063 void textbgcolor(Fl_Color val);
1064 void textfgcolor_default(Fl_Color val);
1065 void textbgcolor_default(Fl_Color val);
1066 void textbgcolor_default(Fl_Color val);
1067 Fl_Font textfont(void)const { return current_style_->fontface(); }  
1068 Fl_Fontsize fontsize(void)const { return current_style_->fontsize(); }  
1069 Fl_Color textcolor(void)const { return Fl_Group::color(); }  
1070 Fl_Color textbgcolor(void)const { return current_style_->bgcolor(); }  
1071 Fl_Color textfgcolor(void)const { return current_style_->fgcolor(); }  
1072 Fl_Color textbgcolor_default(void)const { return current_style_->defaultbgcolor(); }  
1073 Fl_Color textfgcolor_default(void)const { return current_style_->defaultfgcolor(); }  
1074 Fl_Color textbgcolor_xterm(uchar val);  
1075 void selectionfgcolor(Fl_Color val);  
1076 void selectionbgcolor(Fl_Color val);  
1077 void selectionfgcolor(Fl_Color val);  
1078 void selectionbgcolor(Fl_Color val);  
1079 // API: Text attrib
1080 void textattrib(uchar val);
1081 void selectionfgcolor(Fl_Color val);  
1082 void selectionbgcolor(Fl_Color val);  
1083 // API: Redraw style/rate
1084 Fl_Fontsize textsize(void)const { return current_style_->fontsize(); }  
1085 Fl_Font textfont(void)const { return Fl_Group::fontface(); }  
1086 Fl_Color textcolor(void)const { return Fl_Group::color(); }  
1087 Fl_Color textbgcolor(void)const { return current_style_->bgcolor(); }  
1088 float redraw_rate(void)const;  
1089 void redraw_rate(float val);
1090 Fl_Fontsize redraw_style(void)const;
1091 void redraw_style(Fl_Fontsize val);
1092 // API: Text attrib
1093 void textattrib(uchar val);
1094 void selectionfgcolor(Fl_Color val);  
1095 void selectionbgcolor(Fl_Color val);  
1096 Fl_Fontsize redraw_style(void)const;
1097 void redraw_style(Fl_Fontsize val);
1098 private:
1099 bool is_redraw_style(Fl_Fontsize val) { return redraw_style_ == val; }  
1100 float redraw_rate(void)const;  
1101 void redraw_rate(float val);
1102 float redraw_rate(Fl_Fontsize val);
1103 float redraw_rate(Fl_Fontsize val);
1104 bool show_unknown(void)const;
1105 void show_unknown(bool val);
1106 // API: ANSI sequences
1107 bool ansi(void)const;
1108 void ansi(bool val);
1109 // Fl Simple Terminal API compatibility
1110 int history_lines(void)const;
1111 void history_lines(int val);
1112 void history_lines(int val);
1113 // API: printf()  
1114 void printf(const char *fmt, ...);  
1115 void vprintf(const char *fmt, va_list ap);  
1116 // Ctor
1117 Fl_Terminal(int X, int Y, int W, int H, const char *L=0);  
1118 Fl_Terminal(int X, int Y, int W, int H, const char *L=0, int rows, int cols, int hist);  
1119 Fl_Terminal(int X, int Y, int W, int H, const char *L=0, int rows, int cols, int hist);  
1120 // Dtor
1121 ~Fl_Terminal(void);
1122 // Debugging features
1123 //DEBUG void show_ring_info() const { ring_.show_ring_info(); }  
1124 //DEBUG void write_row(FILE *fp, Utf8Char *u8c, int cols) const;
1125 //DEBUG void show_buffers(RingBuffer *a, RingBuffer *b=0) const;
1126 #endif

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1 //
2 // Header file for Fl_Text_Buffer class.
3 //
4 // Copyright 2001-2023 by Bill Spitzak and others.
5 // Original code Copyright Mark Edel.  Permission to distribute under
6 // the LGPL for the FLTK library granted by Mark Edel.
7 //
8 // This library is free software. Distribution and use rights are outlined in
9 // the file "COPYING" which should have been included with this file. If this
10 // file is missing or damaged, see the license at:
11 //
12 // https://www.fltk.org/COPYING.php
13 //
14 // Please see the following page on how to report bugs and issues:
15 //
16 // https://www.fltk.org/bugs.php
17 //
18 //
19 #ifdef FL_TEXT_BUFFER_H
20 Fl_Text_Buffer, Fl_Text_Selection widget . */
21 #ifndef FL_TEXT_BUFFER_H
22 #define FL_TEXT_BUFFER_H
23 #include <stdarg.h> / * va_list */
24 #include "fl_attr.h" / * Doxygen can't find <FL/fl_attr.h> */
25 #endif
26

Generated by Doxygen
#ifndef ASSERT_UTF8
#define IS_UTF8_ALIGNED(a) if (a && *a) assert(fl_utf8len(*(a))>0);
#define IS_UTF8_ALIGNED2(a, b) if (b>=0 && b<a->length()) assert(fl_utf8len(a->byte_at(b))>0);
false
#endif
/
"character size" is the size of a UTF-8 character in bytes
"character width" is the width of a Unicode character in pixels
"column" was originally defined as a character offset from the left margin.
It was identical to the byte offset. In UTF-8, we have neither a byte offset
nor truly fixed width fonts (\textasteriskcentered). Column could be a pixel value multiplied with
an average character width (which is a bearable approximation).
* in Unicode, there are no fixed width fonts! Even if the ASCII characters may
happen to be all the same width in pixels, Chinese characters surely are not.
There are plenty of exceptions, like ligatures, that make special handling of
"fixed" character widths a nightmare. I decided to remove all references to
fixed fonts and see "columns" as a multiple of the average width of a
character in the main font.
- Matthias
*/

/* Maximum length in characters of a tab or control character expansion
of a single buffer character */
#define FL_TEXT_MAX_EXP_CHAR_LEN 20

#include "Fl_Export.H"

class Fl_Text_Undo_Action_List;
class Fl_Text_Undo_Action;

class FL_EXPORT Fl_Text_Selection {
   friend class Fl_Text_Buffer;
public:
   void set(int startpos, int endpos);
   void update(int pos, int nDeleted, int nInserted);
   int start()const { return mSelected ? mStart : 0; }
   int end()const { return mSelected ? mEnd : 0; }
   bool selected()const { return mSelected; }
   void selected(bool b) { mSelected = b; }
   int length()const { return mSelected ? mEnd - mStart : 0; }
   int includes(int pos) const;

   int position(int *startpos, int *endpos) const { return selected(startpos, endpos); }

   protected:
   int mStart;
   int mEnd;
   bool mSelected;
};
typedef void (*Fl_Text_Modify_Cb)(int pos, int nInserted, int nDeleted,
   int nRestyled, const char * deletedText,
   void* cbArg);
typedef void (*Fl_Text_Predelete_Cb)(int pos, int nDeleted, void* cbArg);

class FL_EXPORT Fl_Text_Buffer {
public:
Generated by Doxygen
Fl_Text_Buffer(int requestedSize = 0, int preferredGapSize = 1024);

~Fl_Text_Buffer();

int length() const { return mLength; }

char* text() const;

char* text_range(int start, int end) const;

unsigned int char_at(int pos) const;

byte_at(int pos) const;

const char* address(int pos) const
{
    return (pos < mGapStart) ? mBuf+pos : mBuf+pos+mGapEnd-mGapStart;
}

char* address(int pos)
{
    return (pos < mGapStart) ? mBuf+pos : mBuf+pos+mGapEnd-mGapStart;
}

void insert(int pos, const char* text, int insertedLength = -1);

void append(const char* t, int addedLength = -1) { insert(length(), t, addedLength); }

void vprintf(const char* fmt, va_list ap);

void printf(const char* fmt, ...);

void remove(int start, int end);

void replace(int start, int end, const char* text, int insertedLength = -1);

void copy(Fl_Text_Buffer* fromBuf, int fromStart, int fromEnd, int toPos);

int undo(int* cp = 0);

bool can_undo() const;

int redo(int* cp = 0);

bool can_redo() const;

void canUndo(char flag = 1);

int insertfile(const char* file, int pos, int buflen = 128*1024);

int appendfile(const char* file, int buflen = 128*1024)
{
    return insertfile(file, length(), buflen);
}

int loadfile(const char* file, int buflen = 128*1024)
{
    select(0, length()); remove_selection(); return appendfile(file, buflen);
}

int outputfile(const char* file, int start, int end, int buflen = 128*1024);

int savefile(const char* file, int buflen = 128*1024)
{
    return outputfile(file, 0, length(), buflen);
}

int tab_distance() const { return mTabDist; }

void tab_distance(int tabDist);

void select(int start, int end);

int selected() const { return mPrimary.selected(); }

void unselect();

int secondary_selected() { return mSecondary.selected(); }

void secondary_unselect();

int secondary_selection_position(int* start, int* end);

char* secondary_selection_text();
void remove_secondary_selection();
void replace_secondary_selection(const char* text);
void highlight(int start, int end);
int highlight() { return mHighlight.selected(); }
void unhighlight();
int highlight_position(int* start, int* end);
char* highlight_text();
void add_modify_callback(Fl_Text_Modify_Cb bufModifiedCB, void* cbArg);
void remove_modify_callback(Fl_Text_Modify_Cb bufModifiedCB, void* cbArg);
void call_modify_callbacks() { call_modify_callbacks(0, 0, 0, 0, 0); }
void add_predelete_callback(Fl_Text_Predelete_Cb bufPredelCB, void* cbArg);
void remove_predelete_callback(Fl_Text_Predelete_Cb predelCB, void* cbArg);
void call_predelete callbacks() { call_predelete callbacks(0, 0); }
char* line_text(int pos) const;
int line_start(int pos) const;
int line_end(int pos) const;
int word_start(int pos) const;
int word_end(int pos) const;
int count_displayed_characters(int lineStartPos, int targetPos) const;
int skip_displayed_characters(int lineStartPos, int nChars);
int count_lines(int startPos, int endPos) const;
int skip_lines(int startPos, int nLines);
int rewind_lines(int startPos, int nLines);
int findchar_forward(int startPos, unsigned searchChar, int* foundPos) const;
int findchar_backward(int startPos, unsigned int searchChar, int* foundPos) const;
int search_forward(int startPos, const char* searchString, int* foundPos,
int matchCase = 0) const;
int search_backward(int startPos, const char* searchString, int* foundPos,
int matchCase = 0) const;
const Fl_Text_Selection* primary_selection() const { return &mPrimary; }
Fl_Text_Selection* primary_selection() { return &mPrimary; }
const Fl_Text_Selection* secondary_selection() const { return &mSecondary; }
const Fl_Text_Selection* highlight_selection() const { return &mHighlight; }
int prev_char(int ix) const;
int prev_char_clipped(int ix) const;
int next_char(int ix) const;
int next_char_clipped(int ix) const;
int utf8_align(int) const;
int input_file_was_transcoded;
static const char* file_encoding_warning_message;
void (*transcoding_warning_action)(Fl_Text_Buffer*);
bool is_word_separator(int pos) const;
protected:
void call_modify_callbacks(int pos, int nDeleted, int nInserted,
int nRestyled, const char* deletedText) const;
void call_predelete callbacks(int pos, int nDeleted) const;
int insert_(int pos, const char* text, int insertLength = -1);
void remove_(int start, int end);

void redisplay_selection(Fl_Text_Selection* oldSelection, Fl_Text_Selection* newSelection) const;

void move_gap(int pos);

void reallocate_with_gap(int newGapStart, int newGapLen);

char* selection_text_(Fl_Text_Selection* sel) const;

void remove_selection_(Fl_Text_Selection* sel);

void replace_selection_(Fl_Text_Selection* sel, const char* text);

void update_selections(int pos, int nDeleted, int nInserted);

int apply_undo(Fl_Text_Undo_Action* action, int* cursorPos);

Fl_Text_Selection mPrimary;
Fl_Text_Selection mSecondary;
Fl_Text_Selection mHighlight;
int mLength;
char* mBuf;
int mGapStart;
int mGapEnd;
// The hardware tab distance used by all displays for this buffer, and used in computing offsets for rectangular selection operations.
int mTabDist;
int mModifyProcs;
Fl_Text_Modify_Cb* mModifyProcs;
void** mCbArgs;
int mPredeleteProcs;
Fl_Text_Predelete_Cb* mPredeleteProcs;
void** mPredeleteCbArgs;
int mCursorPosHint;
char mCanUndo;
int mOffsetSize;
Fl_Text_Undo_Action* mUndo;
Fl_Text_Undo_Action_List* mUndoList;
Fl_Text_Undo_Action_List* mRedoList;
};

#endif

35.152 Fl_Text_Display.H

1 //
2 // Header file for Fl_Text_Display class.
3 //
4 // Copyright 2001-2023 by Bill Spitzak and others.
5 // Original code Copyright Mark Edel. Permission to distribute under
6 // the LGPL for the FLTK library granted by Mark Edel.
7 //
8 // This library is free software. Distribution and use rights are outlined in
9 // file "COPYING" which should have been included with this file. If this
10 // file is missing or damaged, see the license at:
11 //
12 // https://www.fltk.org/COPYING.php
13 //
14 // Please see the following page on how to report bugs and issues:
15 //
16 // https://www.fltk.org/bugs.php
17 //
18 /* \file
19 Fl_Text_Display widget . */
20 ifndef FL_TEXT_DISPLAY_H
21 define FL_TEXT_DISPLAY_H
22
23 #include <FL/Fl.H> // Fl::scrollbar_size()
24 #include "fl_draw.H"
25 #include "Fl_Group.H"
26 #include "Fl_Widget.H"
27 #include "Fl_Scrollbar.H"
28 #include "Fl_Text_Buffer.H"
29 #include "Fl_Text_Undo_Action.H"
30 #include "Fl_Text_Undo_Action_List.H"
31
32 class FL_EXPORT Fl_Text_Display: public Fl_Group {
33 public:
34
35 enum {
36 NORMAL_CURSOR,
enum { 
  CURSOR_POS,
  CHARACTER_POS
};

enum {
  DRAG_NONE = -2,
  DRAG_START_DND = -1,
  DRAG_CHAR = 0,
  DRAG_WORD = 1,
  DRAG_LINE = 2
};

enum {
  WRAP_NONE,
  WRAP_AT_COLUMN,
  WRAP_AT_PIXEL,
  WRAP_AT_BOUNDS
};

friend int fl_text_drag_prepare(int pos, int key, Fl_Text_Display* d);
friend void fl_text_drag_me(int pos, Fl_Text_Display* d);

typedef void (*Unfinished_Style_Cb)(int, void *);

struct Style_Table_Entry {
  Fl_Color color;
  Fl_Font font;
  Fl_Fontsize size;
  unsigned attr;
  Fl_Color bgcolor;
};

enum {
  ATTR_BGCOLOR = 0x0001,
  ATTR_BGCOLOR_EXT_ = 0x0002,
  ATTR_BGCOLOR_EXT = 0x0003,
  ATTR_UNDERLINE = 0x0004,
  ATTR_GRAMMAR = 0x0008,
  ATTR_SPELLING = 0x000C,
  ATTR_STRIKE_THROUGH = 0x0010,
  ATTR_LINES_MASK = 0x001C
};

Fl_Text_Display(int X, int Y, int W, int H, const char *l = 0);
~Fl_Text_Display();

int handle(int e) FL_OVERRIDE;

void buffer(Fl_Text_Buffer * buf);
void buffer(Fl_Text_Buffer& buf) { buffer(&buf); }
Fl_Text_Buffer * buffer()const { return mBuffer; }
Fl_Text_Buffer * style_buffer()const { return mStyleBuffer; }

void redisplay_range(int start, int end);
void scroll(int toplineNum, int horizOffset);
void insert(const char * text);
void overstrike(const char * text);
void insert_position(int newPos);

int insert_position()const { return mCursorPos; }
int position_to_xy(int pos, int * x, int* y) const;
int in_selection(int x, int y) const;
void show_insert_position();

int move_right();
int move_left();
int move_up();
int move_down();
int count_lines(int start, int end, bool pos_is_line_start) const;
int line_start(int pos) const;
int line_end(int startPos, bool startPosIsLineStart) const;
int skip_lines(int startPos, int nLines, bool startPosIsLineStart);
int rewind_lines(int startPos, int nLines);
void show_cursor(int b = 1);
void hide_cursor() { show_cursor(0); }
void cursor_style(int style);
int cursor_style() const { return mCursorStyle; }

Fl_Colour cursor_color() const { return mCursor Colour; }
void cursor_color(Fl_Colour n) { mCursor Colour = n; }

int scrollbar_width() const {
  return scrollbar_width_ ? scrollbar_width_ : Fl::scrollbar_size();
}
void scrollbar_width(int width) {
  Fl::scrollbar_size(width);
  scrollbar_width_ = 0;
}
int scrollbar_size() const {
  return scrollbar_width_;
}
void scrollbar_size(int newSize) {
  scrollbar_width_ = newSize;
}

Fl_Align scrollbar_align() const { return scrollbar_align_; }
void scrollbar_align(Fl_Align a) { scrollbar_align_ = a; }
int word_start(int pos) const { return buffer()->word_start(pos); }
int word_end(int pos) const { return buffer()->word_end(pos); }

int position_style(int lineStartPos, int lineLen, int lineIndex) const;

int shortcut() const { return shortcut_; }
void shortcut(int s) { shortcut_ = s; }

Fl_Font textfont() const { return textfont_; }
void textfont(Fl_Font s) {
  textfont_ = s;
  mColumnScale = 0;
}

Fl_Fontsize textsize() const { return textsize_; }
void textsize(Fl_Fontsize s) {
  textsize_ = s;
  mColumnScale = 0;
}

Fl_Colour textcolor() const { return textcolor_; }
void textcolor(Fl_Colour n) {
  textcolor_ = n;
}

void grammar_underline_color(Fl_Colour color) {
  grammar_underline_color_ = color;
}
void spelling_underline_color(Fl_Colour color) {
  spelling_underline_color_ = color;
}
void secondary_selection_color(Fl_Colour color) {
  secondary_selection_color_ = color;
}

int wrapped_column(int row, int column) const;
int wrapped_row(int row) const;
void wrap_mode(int wrap, int wrap_margin);

virtual void recalc_display();
void resize(int X, int Y, int W, int H) FL_OVERRIDE;

void linenumber_width(int width);
int linenumber_width() const;
void linenumber_font(Fl_Font val);
456  FL_Font linenumber_font() const;
457  void linenumber_size(const FL_Fontsize val);
458  FL_Fontsize linenumber_size() const;
459  void linenumber_fgcolor(const FL_Color val);
460  FL_Color linenumber_fgcolor() const;
461  void linenumberbgcolor(const FL_Color val);
462  FL_Color linenumberbgcolor() const;
463  void linenumber_align(const FL_Align val);
464  FL_Align linenumber_align() const;
465  void linenumber_format(const char * val);
466  const char * linenumber_format() const;
467
468  protected:
469  // Most (all?) of this stuff should only be called from resize() or
470  // draw().
471  // Anything with "vline" indicates thats it deals with currently
472  // visible lines.
473  void draw() FL_OVERRIDE;
474  void draw_text(int X, int Y, int W, int H);
475  void draw_range(int start, int end);
476  void draw_cursor(int, int);
477  void draw_string(int style, int x, int y, int toX, const char *string,
478                                  int nChars) const;
479  void draw_vline(int visLineNum, int leftClip, int rightClip,
480                                  int leftCharIndex, int rightCharIndex);
481  int find_x(const char *s, int len, int style, int x) const;
482  enum {
483    DRAW_LINE,
484    FIND_INDEX,
485    FIND_INDEX_FROM_ZERO,
486    GET_WIDTH,
487    FIND_CURSOR_INDEX // STR #2788
488  };
489  int handle_vline(int mode,
490                                  int lineStart, int len, int leftChar, int rightChar,
491                                  int topClip, int bottomClip,
492                                  int leftClip, int rightClip) const;
493  int handle_rmb(int readonly);
494  void clear_rect(int style, int x, int y, int width, int height) const;
495  void display_insert();
496  void offset_line_starts(int newTopLineNum);
497  void calc_line_starts(int startLine, int endLine);
498  void update_line_starts(int pos, int charsInserted, int charsDeleted,
499                                                                        int linesInserted, int linesDeleted, int *scrolled);
500  void calc_last_char();
501  int position_to_line(int pos, int * lineNum) const;
502  double string_width(const char * string, int length, int style) const;
503  static void scroll_timer_cb(void *);
504  static void buffer_predelete_cb(int pos, int nDeleted, void * cbArg);  
505  static void buffer_modified_cb(int pos, int nInserted, int nDeleted,
506                                    int nRestyled, const char * deletedText,
507                                    void * cbArg);
508  static void h_scrollbar_cb(Fl_Scrollbar * w, Fl_Text_Display* d);
509  static void v_scrollbar_cb(Fl_Scrollbar * w, Fl_Text_Display* d);
510  void update_v_scrollbar();
511  void update_h_scrollbar();
512  int measure_vline(int visLineNum) const;
513  int longest_vline() const;
514  int empty_vlines() const;
515  int vline_length(int visLineNum) const;
516  int xy_to_position(int x, int y, int PosType = CHARACTER_POS) const;  
517  int xy_to_rowcol(int x, int y, int PosType = CHARACTER_POS) const;
518  void maintain_absolute_top_line_number(int state);
519  int get_absolute_top_line_number() const;
520  void absolute_top_line_number(int oldFirstChar);
521  int maintaining_absolute_top_line_number() const;
522  void reset_absolute_top_line_number();
int position_to_linecol(int pos, int * lineNum, int * column) const;

void extend_range_for_styles(int * start, int * end);

void find_wrap_range(const char * deletedText, int pos, int nInserted, int nDeleted, int *modRangeStart, int *modRangeEnd, int maxLines, bool startPosIsLineStart, int *linesInserted, int *linesDeleted);

void measure_deleted_lines(int pos, int nDeleted);

void find_line_end(int pos, bool startPosIsLineStart, int *lineEnd, int *nextLineStart) const;

double measure_proportional_character(const char *s, int colNum, int pos) const;

int wrap_uses_character(int lineEndPos) const;

int damage_range1_start, damage_range1_end;

int damage_range2_start, damage_range2_end;

int mCursorPos;

int mCursorOn;

int mCursorOldY; /* Y pos. of cursor for blanking */

int mCursorToHint; /* Tells the buffer modified callback where to move the cursor, to reduce the number of redraw calls */

int mCursorStyle; /* One of enum cursorStyles above */

int mCursorPreferredXPos; /* Pixel position for vert. cursor movement */

int mNVisibleLines; /* # of visible (displayed) lines. This is also the size of the mLineStarts[] array. */

int mBNullLines; /* # of newlines in the buffer */

int mFirstChar, mLastChar; /* Buffer positions of first and last displayed character (lastChar points beyond the end of the buffer) */

int mContinuousWrap; /* Wrap long lines when displaying */

int mWrapMarginPix; /* Margin in # of pixels for wrapping in continuousWrap mode */

int mLineStarts; /* Array of the size mNVisibleLines. This array only keeps track of lines within the display area. Each entry contains the starting character offset from the beginning of the text buffer */

int mTopLineNum; /* Line number of top displayed line of file (first line of file is 1) */

int mAbsTopLineNum; /* In continuous wrap mode, the line number of the top line if the text were not wrapped (note that this is only maintained as needed). */

int mNeedAbsTopLineNum; /*Externally settable flag to continue maintaining absTopLineNum even if mContinuousWrap is set to false. */

int mHorizOffset; /* Horizontal scroll pos. in pixels */

int mHorizOffsetHint; /* Horizontal scroll pos. in pixels */

int mNLinesDeleted; /* Number of lines deleted during buffer modification (only used when resynchronization is suppressed) */

int mModifyingTabDistance; /*Whether tab distance is being modified XXX: UNUSED */

mutable double mColumnScale; /* Width in pixels of an average character. This value is calculated as needed (lazy eval); it needs to be mutable so that it can be calculated within a method marked as "const" */
#ifndef FL_TEXT_EDITOR_H
#define FL_TEXT_EDITOR_H

#include "Fl_Text_Display.H"

#define FL_TEXT_EDITOR_ANY_STATE (-1L)

class FL_EXPORT Fl_Text_Editor : public Fl_Text_Display {
public:
    typedef int (*Key_Func)(int key, Fl_Text_Editor* editor);

    struct Key_Binding {
        int key;
        int state;
        Key_Func function;
        Key_Binding* next;
    };

    Fl_Text_Editor(int X, int Y, int W, int H, const char* l = 0);
    ~Fl_Text_Editor() { remove_all_key_bindings(); }
    int handle(int e) FL_OVERRIDE;

    void insert_mode(int b) { insert_mode_ = b; }
    int insert_mode() { return insert_mode_; }
    void tab_nav(int val);
    int tab_nav() const;
    void add_key_binding(int key, int state, Key_Func f, Key_Binding** list);
    void remove_all_key_bindings();
};
#endif
void add_key_binding(int key, int state, Key_Func f)
    { add_key_binding(key, state, f, &key_bindings); }
void remove_key_binding(int key, int state, Key_Binding ** list);
void remove_key_binding(int key, int state)
    { remove_key_binding(key, state, &key_bindings); }
void remove_all_key_bindings(Key_Binding ** list);
void remove_all_key_bindings() { remove_all_key_bindings(&key_bindings); }
void add_default_key_bindings(Key_Binding ** list);
Key_Func bound_key_function(int key, int state, Key_Binding* list) const;
void default_key_function(Key_Func f) { default_key_function_ = f; }

// functions for the built in default bindings
static int kf_default(int c, Fl_Text_Editor* e);
static int kf_ignore(int c, Fl_Text_Editor* e);
static int kf_backspace(int c, Fl_Text_Editor* e);
static int kf_enter(int c, Fl_Text_Editor* e);
static int kf_move(int c, Fl_Text_Editor* e);
static int kf_shift_move(int c, Fl_Text_Editor* e);
static int kf_right_move(int c, Fl_Text_Editor* e);
static int kf_ctrl_move(int c, Fl_Text_Editor* e);
static int kf_c_s_move(int c, Fl_Text_Editor* e);
static int kf_meta_move(int c, Fl_Text_Editor* e);
static int kf_tab_move(int c, Fl_Text_Editor* e);
static int kf_home(int c, Fl_Text_Editor* e);
static int kf_end(int c, Fl_Text_Editor* e);
static int kf_left(int c, Fl_Text_Editor* e);
static int kf_page_up(int c, Fl_Text_Editor* e);
static int kf_page_down(int c, Fl_Text_Editor* e);
static int kf_insert(int c, Fl_Text_Editor* e);
static int kf_delete(int c, Fl_Text_Editor* e);
static int kf_copy(int c, Fl_Text_Editor* e);
static int kf_paste(int c, Fl_Text_Editor* e);
static int kf_select_all(int c, Fl_Text_Editor* e);
static int kf_undo(int c, Fl_Text_Editor* e);
static int kf_redo(int c, Fl_Text_Editor* e);

protected:
    int handle_key();
    void maybe_do_callback(Fl_Callback_Reason reason = FL_REASON_CHANGED);

#ifndef FL_DOXYGEN
    int insert_mode_;
    Key_Binding* key_bindings;
#endif

static Key_Binding* global_key_bindings;
#ifndef FL_DOXYGEN
    Key_Func default_key_function_; 
#endif

35.154 Fl_Tile.H

// Tile header file for the Fast Light Tool Kit (FLTK).
// Copyright 1998-2023 by Bill Spitzak and others.
// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

#define Fl_Tile_H

include "Fl_Group.H"

The Fl_Tile class lets you resize its children by dragging
class FL_EXPORT Fl_Tile : public Fl_Group {

public:
  int handle(int event) FL_OVERRIDE;
  Fl_Tile(int X, int Y, int W, int H, const char *L=0);
  ~Fl_Tile() FL_OVERRIDE;
  void resize(int X, int Y, int W, int H) FL_OVERRIDE;
  virtual void move_intersection(int oldx, int oldy, int newx, int newy);
  virtual void drag_intersection(int oldx, int oldy, int newx, int newy);
  FL_DEPRECATED("in 1.4.0 - use move_intersection(p) instead",
    void position(int oldx, int oldy, int newx, int newy)) { move_intersection(oldx, oldy, newx, newy); }
  void position(int x, int y) ( Fl_Group::position(x, y); )
  void size_range(int index, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF);
  void size_range(Fl_Widget *w, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF);
  void init_size_range(int default_min_w = -1, int default_min_h = -1);

protected:
  int cursor_;    
  Fl_Cursor *cursors_; 
  Fl_Cursor cursor(int n) { return cursors_[n]; } 
  typdef struct { int minw, minh, maxw, maxh; } Size_Range;
  Size_Range *size_range_;     
  int size_range_size_, size_range_capacity_; 
  int default_min_w_, default_min_h_; 
  void request_shrink_l(int old_l, int &new_l, Fl_Rect *final_size);
  void request_shrink_r(int old_r, int &new_r, Fl_Rect *final_size);
  void request_shrink_t(int old_t, int &new_t, Fl_Rect *final_size);
  void request_shrink_b(int old_b, int &new_b, Fl_Rect *final_size);
  void request_grow_l(int old_l, int &new_l, Fl_Rect *final_size);
  void request_grow_r(int old_r, int &new_r, Fl_Rect *final_size);
  void request_grow_t(int old_t, int &new_t, Fl_Rect *final_size);
  void request_grow_b(int old_b, int &new_b, Fl_Rect *final_size);

int on_insert(Fl_Widget *, int) FL_OVERRIDE;
int on_move(int, int) FL_OVERRIDE;
void on_remove(int) FL_OVERRIDE;

};
File Documentation

35.156 Fl_Timer.H

1 //
2 // Timer header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 /* file
18 Fl_Timer widget. */
19
20 ifndef Fl_Timer_H
21 define Fl_Timer_H
22
23 ifndef Fl_Widget_H
24 include "Fl_Widget.H"
25 endif
26
27 // values for type();
28 define FL_NORMAL_TIMER 0
29 define FL_VALUE_TIMER 1
30 define FL_HIDDEN_TIMER 2
31
32 class FL_EXPORT Fl_Timer : public Fl_Widget {
33 static void stepcb(void *);
34 void step();
35 char on, direction_
36 double delay, total;
37 long lastsec, lastusec;
38 protected:
39 void draw() FL_OVERRIDE;
40 public:
41 int handle(int) FL_OVERRIDE;
42 Fl_Timer(uchar t, int x, int y, int w, int h, const char *l);
43 ~Fl_Timer();
44 void value(double);
45 double value()const { return delay>0.0?delay:0.0; }
46 char direction()const { return direction_; }
47 void direction(char d) { direction_ = d; }
48 char suspended()const { return 'on'; }
49 void suspended(char d);
50 };}
51
52 ifndef Fl_Image copy(int W, int H) const FL_OVERRIDE;
53 Fl_Image *copy() const {
54 return Fl_Image::copy();
55 }
56
57 void color_average(Fl_Color c, float i) FL_OVERRIDE;
58 void desaturate() FL_OVERRIDE;
59 void draw(int X, int Y, int W, int H, int cx = 0, int cy = 0) FL_OVERRIDE;
60 void draw(int X, int Y) { draw(X, Y, w(), h(), 0, 0); }
61 Fl_Image *image() { return image_; }
62 }
63
64 endif // !Fl_Tiled_Image_H

35.157 Fl_Toggle_Button.H

1 //
2 // Toggle button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php

Generated by Doxygen
Fl_Toggle_Light_Button.H

11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //    https://www.fltk.org/bugs.php
15 //
16
17 /* file
18 Fl_Toggle_Button widget. */
19
20 ifndef Fl_Toggle_Button_H
21 define Fl_Toggle_Button_H
22
23 #include "Fl_Button.H"
24
25 class FL_EXPORT Fl_Toggle_Button : public Fl_Button {
26     public:
27         Fl_Toggle_Button(int X, int Y, int W, int H, const char *l=0);
28     };
29
30 endif

Fl_Toggle_Light_Button.H

1 //
2 // Toggle light button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
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8 // file is missing or damaged, see the license at:
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10 //    https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //    https://www.fltk.org/bugs.php
15 //
16 // provided for back-compatibility only
17
18 #ifndef Fl_Toggle_Light_Button
19 #include "Fl_Light_Button.H"
20 #define Fl_Toggle_Light_Button Fl_Light_Button
21 #endif

Fl_Toggle_Round_Button.H

1 //
2 // Toggle round button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //    https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //    https://www.fltk.org/bugs.php
15 //
16 // provided for back-compatibility only
17
18 #ifndef Fl_Toggle_Round_Button
19 #include "Fl_Round_Button.H"
20 #define Fl_Toggle_Round_Button Fl_Round_Button
21 #endif

Fl_Tooltip.H

1 //
2 // Tooltip header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
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---

```c
/* Fl_Tooltip widget. */

#ifndef Fl_Tooltip_H
#define Fl_Tooltip_H

#include <FL/Fl.H>
#include <FL/Fl_Widget.H>

class FL_EXPORT Fl_Tooltip {
    friend class Fl_TooltipBox;

    public:
static float delay() { return delay_; }
static void delay(float f) { delay_ = f; }
static float hideDelay() { return hidedelay_; }
static void hideDelay(float f) { hidedelay_ = f; }
static float hoverDelay() { return hoverdelay_; }
static void hoverDelay(float f) { hoverdelay_ = f; }
static int enabled() { return Fl::option(Fl::OPTION_SHOW_TOOLTIPS); }
static void enable(int b = 1) { Fl::option(Fl::OPTION_SHOW_TOOLTIPS, (b!=0)); }
static void disable() { enable(0); }
static void ( *enter)(Fl_Widget* w);
static void enter_area(Fl_Widget * w, int X, int Y, int W, int H, const char* tip);
static void ( *exit)(Fl_Widget *w);
static Fl_Widget * current() {return widget_;}
static void current(Fl_Widget *);

static Fl_Font font() { return font_; }
static void font(Fl_Font i) { font_ = i; }
static Fl_Fontsize size() { return (size_ == -1 ? FL_NORMAL_SIZE : size_); }
static void size(Fl_Fontsize s) { size_ = s; }
static Fl_Color color() { return color_; }
static void color(Fl_Color c) { color_ = c; }
static Fl_Color textcolor() { return textcolor_; }
static void textcolor(Fl_Color c) { textcolor_ = c; }
static int margin_width() { return margin_width_; }
static void margin_width(int v) { margin_width_ = v; }
static int margin_height() { return margin_height_; }
static void margin_height(int v) { margin_height_ = v; }
static int wrap_width() { return wrap_width_; }
static void wrap_width(int v) { wrap_width_ = v; }
static Fl_Window * current_window(void);

// These should not be public, but Fl_Widget::tooltip() needs them...
friend void Fl_Widget::tooltip(const char *);
friend void Fl_Widget::copy_tooltip(const char *);
static void enter_(Fl_Widget * w);
static void exit_(Fl_Widget *w);
static void set_enter_exit_once_();

private:
static float delay_;     
static float hideDelay_;  
static float hoverDelay_; 
static Fl_Color color_;   
static Fl_Font color_;    
static Fl_Fontsize size_; 
static Fl_Font size_;     
static Fl_Color textcolor_; 
static Fl_Font textcolor_; 
static Fl_Widget * widget_; 
static int margin_width_; 
static int margin_height_; 
static int wrap_width_;   
static int draw_symbols_; // 1 = draw @-symbols in tooltips, 0 = no
};
#endif
```

---

35.161 Fl_Tree.H File Reference

This file contains the definitions of the Fl_Tree class.
Classes

- `class Fl_Tree`

Tree widget.

Enumerations

- `enum Fl_Tree_Reason`

```c
FL_TREE_REASON_NONE = FL_REASON_UNKNOWN , FL_TREE_REASON_SELECTED = FL_REASON_SELECTED, 
FL_TREE_REASON_DESELECTED = FL_REASON_DESELECTED , FL_TREE_REASON_RESELECTED = FL_REASON_RESELECTED, 
FL_TREE_REASON_OPENED = FL_REASON_OPENED , FL_TREE_REASON_CLOSED = FL_REASON_CLOSED , 
FL_TREE_REASON_DRAGGED = FL_REASON_DRAGGED
```

The reason the callback was invoked.

### 35.161.1 Detailed Description

This file contains the definitions of the `Fl_Tree` class.

### 35.161.2 Enumeration Type Documentation

#### 35.161.2.1 Fl_Tree_Reason

```c
enum Fl_Tree_Reason
```

The reason the callback was invoked.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_TREE_REASON_NONE</td>
<td>unknown reason</td>
</tr>
<tr>
<td>FL_TREE_REASON_SELECTED</td>
<td>an item was selected</td>
</tr>
<tr>
<td>FL_TREE_REASON_DESELECTED</td>
<td>an item was de-selected</td>
</tr>
<tr>
<td>FL_TREE_REASON_RESELECTED</td>
<td>an item was re-selected (double-clicked). See Fl_Tree_Item_Reselect_Mode to enable this.</td>
</tr>
<tr>
<td>FL_TREE_REASON_OPENED</td>
<td>an item was opened</td>
</tr>
<tr>
<td>FL_TREE_REASON_CLOSED</td>
<td>an item was closed</td>
</tr>
<tr>
<td>FL_TREE_REASON_DRAGGED</td>
<td>an item was dragged into a new place</td>
</tr>
</tbody>
</table>

### 35.162 Fl_Tree.H

Go to the documentation of this file.

```c
//
1
2
3 #ifndef FL_TREE_H
4 #define FL_TREE_H
5
6 #include <FL/Fl.H>
7 #include <FL/Fl_Group.H>
8 #include <FL/Fl_Scrollbar.H>
```

Generated by Doxygen
/* FL/Fl_Tree.H

Fl_Tree -- This file is part of the Fl_Tree widget for FLTK
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---

enum Fl_Tree_REASON {
    FL_TREE_REASON_NONE = FL_REASON_UNKNOWN,
    FL_TREE_REASON.Selected = FL_REASON_SELECTED,
    FL_TREE_REASON.DeSELECTED = FL_REASON_DESELECTED,
    FL_TREE_REASON.ReSELECTED = FL_REASON_RESELECTED,
    FL_TREE_REASON.OPENED = FL_TREE_REASON.OPENED,
    FL_TREE_REASON.CLOSED = FL_TREE_REASON.CLOSED,
    FL_TREE_REASON.DRAGGED = FL_TREE_REASON.DRAGGED
};

class FL_EXPORT Fl_Tree : public Fl_Group {
    friend class Fl_Tree_Item;
    Fl_Tree_Item * _root; // can be null!
    Fl_Tree_Item * _item_focus; // item that has focus box
    Fl_Tree_Item * _callback_item; // item invoked during callback (can be NULL)
    Fl_Tree_REASON _callback_reason; // reason for the callback
    Fl_Tree_Prefs _prefs; // all the tree's settings
    int _lastselect; // last selected item
    char _lastpushed; // FL_PUSH occurred on: 0=nothing, 1=open/close,
                     // usericon, 3=label
    void fix_scrollbar_order();

protected:
    Fl_Scrollbar * _vscroll;
    Fl_Scrollbar * _hscroll;
    int _tox,_toy,_tow,_toh;
    int _tix,_tiy,_tiw,_tih;
    int _tree_w;
    int _tree_h;
    void item_clicked(Fl_Tree_Item * item);
    void do_callback_for_item(Fl_Tree_Item * item, Fl_Tree_REASON reason);

public:
    Fl_Tree(int X, int Y, int W, int H, const char *L=0);
    ~Fl_Tree();
    int handle(int e) FL_OVERRIDE;
    void show_self();
    void resize(int,int,int,int) FL_OVERRIDE;

    // root methods
    void root_label(const char *new_label);
    Fl_Tree_Item * root();
    void root(Fl_Tree_Item *newitem);
    const Fl_Tree_Prefs& prefs()const { return _prefs; }

    // Item creation/removal methods
    Fl_Tree_Item * add(const char *path, Fl_Tree_Item *newitem=0);
    Fl_Tree_Item * add(Fl_Tree_Item *parent_item, const char *name);
    Fl_Tree_Item * insert_above(Fl_Tree_Item *above, const char *name);
    Fl_Tree_Item * insert(Fl_Tree_Item *item, const char *name, int pos);
    int remove(Fl_Tree_Item *item);
    void clear();
    void clear_children(Fl_Tree_Item *item);

    // Item lookup methods
    const Fl_Tree_Item * find_item(const char *path);
    const Fl_Tree_Item *find_item(const char *path) const;

Generated by Doxygen
int itempathname(char *pathname, int pathnameLen, const Fl_Tree_Item *item) const;
const Fl_Tree_Item * find_clicked(int yonly=0) const;
Fl_Tree_Item * first();
Fl_Tree_Item * first_visible(); // deprecated in ABI 10303
Fl_Tree_Item * first_visible_item();
Fl_Tree_Item * last();
Fl_Tree_Item * last_visible(); // deprecated in ABI 10303
Fl_Tree_Item * next_visible_item(Fl_Tree_Item *start, int dir); // made public in 1.3.3 ABI
Fl_Tree_Item * first_selected_item();
Fl_Tree_Item * last_selected_item();
Fl_Tree_Item * next_item(Fl_Tree_Item *item, int dir=FL_Down, bool visible=false);
Fl_Tree_Item * next_selected_item(Fl_Tree_Item *item=0, int dir=FL_Down);
int get_selected_items(Fl_Tree_Item_Array &items);

// Item open/close methods
int open(Fl_Tree_Item *item, int docallback=1);
int open(const char *path, int docallback=1);
void open_toggle(Fl_Tree_Item *item, int docallback=1);
int close(Fl_Tree_Item *item, int docallback=1);
int close(const char *path, int docallback=1);
int is_open(Fl_Tree_Item *item) const;
int is_open(const char *path) const;
int is_close(Fl_Tree_Item *item) const;
int is_close(const char *path) const;

// Item selection methods
int select(Fl_Tree_Item *item, int docallback=1);
int select(const char *path, int docallback=1);
void select_toggle(Fl_Tree_Item *item, int docallback=1);
int deselect(Fl_Tree_Item *item, int docallback=1);
int deselect(const char *path, int docallback=1);
int deselect_all(Fl_Tree_Item *item=0, int docallback=1);
int select_only(Fl_Tree_Item *selitem, int docallback=1);
int select_all(Fl_Tree_Item *item=0, int docallback=1);
int extend_selection_dir(Fl_Tree_Item *from, Fl_Tree_Item *to, int dir, int val, bool visible);
int extend_selection(Fl_Tree_Item *from, Fl_Tree_Item *to, int val=1, bool visible=false);
void set_item_focus(Fl_Tree_Item *item);
Fl_Tree_Item *get_item_focus() const;
int is_selected(Fl_Tree_Item *item) const;
int is_selected(const char *path);

// Item attribute related methods
Fl_Font item_labelfont() const;
void item_labelfont(Fl_Font val);
Fl_Fontsize item_labelsize() const;
void item_labelsize(Fl_Fontsize val);
Fl_Color item_labelfgcolor(void) const;
void item_labelfgcolor(Fl_Color val);
Fl_Color item_labelbgcolor(void) const;
void item_labelbgcolor(Fl_Color val);
Fl_Color connectorcolor() const;
void connectorcolor(Fl_Color val);
int marginleft(int * const);
void marginleft(int val);
int margintop() const;
void margintop(int val);
int marginbottom() const;
void marginbottom(int val);
int linespacing() const;
void linespacing(int val);
int openchild_marginbottom() const;
void openchild_marginbottom(int val);
int usericonmarginleft() const;
void usericonmarginleft(int val);
int labelmarginleft() const;
void labelmarginleft(int val);
int widgetmarginleft() const;
void widgetmarginleft(int val);
int connectorwidth() const;
void connectorwidth(int val);
int itemmarginleft() const;
void itemmarginleft(int val);
int itemmargintop() const;
void itemmargintop(int val);
int itemmarginbottom(int val);
int itemlinespacing(int val);
int openchilditemmarginbottom(int val);
int usericonitemmarginleft(int val);
int labelitemmarginleft(int val);
int widgetitemmarginleft(int val);
int itemconnectorwidth(int val);
int itemconnectorwidth(int val);
int Fl_Image:: usericon() const;
void Fl_image(Fl_image *val);
Fl_IPC:: openicon(Fl_Imp *val);
Fl_IPC:: openicon(Fl_Imp *val);
Fl_IPC:: closeicon() const;
void closeicon(Fl_Image *val);
int showcollapse() const;
void showcollapse(int val);
int showroot() const;
void showroot(int val);
Fl_Tree_Connector connectorstyle() const;
void connectorstyle(Fl_Tree_Connector val);
Fl_Tree_Sort sortorder() const;
void sortorder(Fl_Tree_Sort val);
Fl_Boxtype selectbox() const;
void selectbox(Fl_Boxtype val);
Fl_Tree_Select selectmode() const;
void selectmode(Fl_Tree_Select val);
Fl_Tree_Item_Reselect_Mode item_reselect_mode() const;
void item_reselect_mode(Fl_Tree_Item_Reselect_Mode mode);
Fl_Tree_Item_Draw_Mode item_draw_mode() const;
void item_draw_mode(Fl_Tree_Item_Draw_Mode mode);
void item_draw_mode(int mode);
void calc_dimensions();
void calc_tree();
void recalc_tree();
int displayed(Fl_Tree_Item *item);
void show_item(Fl_Tree_Item *item, int yoff);
void show_item(Fl_Tree_Item *item);
void show_item_top(Fl_Tree_Item *item);
void show_item_middle(Fl_Tree_Item *item);
void show_item_bottom(Fl_Tree_Item *item);
void display(Fl_Tree_Item *item);
int vposition() const;
void vposition(int pos);
int hposition() const;
void hposition(int pos);
int is_scrollbar(Fl_Widget *w);
int scrollbar_size() const;
void scrollbar_size(int size);
int is_vscroll_visible() const;
int is_hscroll_visible() const;

// callback related
void callback_item(Fl_Tree_Item *item);
Fl_Tree_Item * callback_item();
void callback_reason(Fl_Tree_Reason reason);
Fl_Tree_Reason callback_reason() const;

void load(class Fl_Preferences&);
};

#endif /*FL_TREE_H*/

35.163 Fl_Tree_Item.H File Reference

This file contains the definitions for Fl_Tree_Item.

35.164 Fl_Tree_Item.H

Go to the documentation of this file.
```cpp
//
#ifndef FL_TREE_ITEM_H
#define FL_TREE_ITEM_H

#include <FL/Fl.H>
#include <FL/Fl_Widget.H>
#include <FL/Fl_Image.H>
#include <FL/fl_draw.H>

#include <FL/Fl_Tree_Item_Array.H>
#include <FL/Fl_Tree_Prefs.H>

// Fl_Tree -- This file is part of the Fl_Tree widget for FLTK
// Copyright (C) 2009-2010 by Greg Ercolano.
//
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// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
//
// https://www.fltk.org/COPYING.php
//
// Please see the following page on how to report bugs and issues:
//
// https://www.fltk.org/bugs.php

class Fl_Tree;

class FL_EXPORT Fl_Tree_Item {

    Fl_Tree * _tree; // parent tree
    const char * _label; // label (memory managed)
    Fl_Font _labelfont; // label's font face
    Fl_Fontsize _labelsize; // label's font size
    Fl_Color _labelfgcolor; // label's fg color
    Fl_Color _labelbgcolor; // label's bg color (0xffffffff is 'transparent')

    enum Fl_Tree_Item_Flags {
        OPEN = 1<<0,
        VISIBLE = 1<<1,
        ACTIVE = 1<<2,
        SELECTED = 1<<3
    }

    unsigned short _flags; // misc flags
    int _xywh[4]; // xywh of this widget (if visible)

    Fl_Widget * _widget; // item's label widget (optional)
    Fl_Image * _usericon; // item's user-specific icon (optional)
    Fl_Image * _userdeicon; // deactivated usericon
    Fl_Tree_Item_Array _children; // array of child items
    Fl_Tree_Item * _parent; // parent item (=0 if root)
    void * _userdata; // user data that can be associated with an item
    Fl_Tree_Item * _prev_sibling; // previous sibling (same level)
    Fl_Tree_Item * _next_sibling; // next sibling (same level)

    protected:

    void _Init(const Fl_Tree_Prefs &prefs, Fl_Tree * tree);
    void show_widgets();
    void hide_widgets();
    void draw_vertical_connector(int x, int y1, int y2, const Fl_Tree_Prefs &prefs);
    void draw_horizontal_connector(int x1, int x2, int y, const Fl_Tree_Prefs &prefs);
    void recalc_tree();
    int calc_item_height(const Fl_Tree_Prefs &prefs) const;
    Fl_Color drawfgcolor() const;
    Fl_Color drawbgcolor() const;

    public:

    Fl_Tree_Item(const Fl_Tree_Prefs &prefs); // CTOR -- backwards compatible
    Fl_Tree_Item(Fl_Tree * tree); // CTOR -- ABI 1.3.3+
    virtual ~Fl_Tree_Item(); // DTOR -- ABI 1.3.3+
    Fl_Tree_Item(const Fl_Tree_Item *o); // COPY CTOR

    int x()const { return(_xywh[0]); }
    int y()const { return(_xywh[1]); }
    int w()const { return(_xywh[2]); }
    int h()const { return(_xywh[3]); }

    int label_x()const { return(_label_xywh[0]); }
    int label_y()const { return(_label_xywh[1]); }
    int label_w()const { return(_label_xywh[2]); }
    int label_h()const { return(_label_xywh[3]); }

    virtual int draw_item_content(int render);
    void draw(int X, int &Y, int W, Fl_Tree_Item *itemfocus, int &tree_item_xmax, int lastchild=1, int render=1);
    void show_self(const char *indent = "") const;
    const char *label() const;
    void label(const char *val);

    Fl_Tree_Item(const Fl_Tree_Item *i); // COPY CTOR

    virtual int draw_item_content(int render);
    void draw(int X, int &Y, int W, Fl_Tree_Item *itemfocus, int &tree_item_xmax, int lastchild=1, int render=1);
    void show_self(const char *indent = "") const;
    const char *label() const;

    Generated by Doxygen
```
inline void user_data( void * data ) { _userdata = data; }
inline void * user_data()const { return _userdata; }

void labelfont(Fl_Font val) {
    _labelfont = val;
    recalc_tree(); // may change tree geometry
}

Fl_Font labelfont()const {
    return(_labelfont);
}

void labelsize(Fl_Fontsize val) {
    _labelsiz = val;
    recalc_tree(); // may change tree geometry
}

Fl_Fontsize labelsize()const {
    return(_labelsiz);
}

void labelfgcolor(Fl_Color val) {
    _labelfgcolor = val;
}

Fl_Color labelfgcolor()const {
    return(_labelfgcolor);
}

void labelcolor(Fl_Color val) {
    _labelcolor = val;
}

Fl_Color labelcolor()const {
    return(_labelcolor);
}

void labelbgcolor(Fl_Color val) {
    _labelbgcolor = val;
}

Fl_Color labelbgcolor()const {
    return(_labelbgcolor);
}

void widget(Fl_Widget *val) {
    _widget = val;
    recalc_tree(); // may change tree geometry
}

Fl_Widget *widget()const {
    return(_widget);
}

int children()const {
    return(_children.total());
}

const Fl_Tree_Item *child(int index) {
    return(_children[index]);
}

const Fl_Tree_Item *child(int t) const;
int has_children()const {
    return(children());
}

int find_child(const char *name);
int find_child(Fl_Tree_Item *item);
int remove_child(Fl_Tree_Item *item);
int remove_child(const char *new_label);
void clear_children();
void swap_children(int ax, int bx);
int swap_children(Fl_Tree_Item *a, Fl_Tree_Item *b);
int swap_children(Fl_Tree_Item *item, char **arr);
const Fl_Tree_Item *find_child_item(const char *name) const;
Fl_Tree_Item *find_child_item(const char *name);
const Fl_Tree_Item *find_child_item(char **arr) const;
Fl_Tree_Item *find_child_item(char **arr);
const Fl_Tree_Item *find_item(char **arr) const;
Fl_Tree_Item *find_item(char **arr);

// Adding items
Fl_Tree_Item *add(const Fl_Tree_Prefs &prefs,
    const char *new_label,
    int pos=0);
Fl_Tree_Item *add(const Fl_Tree_Prefs &prefs,
    char **arr);
Fl_Tree_Item *replace(Fl_Tree_Item *new_item);
Fl_Tree_Item *replace_child(Fl_Tree_Item *olditem, Fl_Tree_Item *newitem);
Fl_Tree_Item *insert(const Fl_Tree_Prefs &prefs,
    const char *new_label, int pos=0);
int move_below(Fl_Tree_Item *item);
int move_into(Fl_Tree_Item *item, int pos=0);
int depth() const;
Fl_Tree_Item *next();
Fl_Tree_Item *next_sibling();
Fl_Tree_Item *prev();
Fl_Tree_Item *prev_sibling();
void update_prev_next(int index);
Fl_Tree_Item *next_displayed(Fl_Tree_Prefs &prefs); // deprecated
Fl_Tree_Item *prev_displayed(Fl_Tree_Prefs &prefs); // deprecated
Fl_Tree_Item *next_visible(Fl_Tree_Prefs &prefs);
Fl_Tree_Item *prev_visible(Fl_Tree_Prefs &prefs);
Fl_Tree_Item *parent() {
    return(_parent);
}
const Fl_Tree_Item *parent() const {
    return(_parent);
}
void parent(Fl_Tree_Item *val) {
    _parent = val;
}
const Fl_Tree_Prefs& prefs() const;
const Fl_Tree *tree() const {
    return(_tree);
}
Fl_Tree *tree() {
    return(_tree);
}
// State
void open();
void close();
int is_open() const {
    return(is_flag(OPEN));
}
int is_close() const {
    return(is_flag(OPEN) ? 0 : 1);
}
void open_toggle() {
    is_open() ? close() : open(); // handles calling recalc_tree()
}
void select(int val=1) {
    set_flag(SELECTED, val);
}
void select_toggle() {
    if (is_selected()) {
        deselect(); // deselect if selected
    } else {
        select(1); // select if deselected
    }
}
int select_all() {
    int count = 0;
    if (! is_selected()) {
        select(1);
        ++count;
    }
    for (int t=0; t<children(); t++) {
        count += child(t)->select_all();
    }
    return(count);
}
void deselect() {
    set_flag(SELECTED, 0);
}
int deselect_all() {
    int count = 0;
    if (is_selected()) {
        deselect();
        ++count;
    }
    for (int t=0; t<children(); t++) {
        count += child(t)->deselect_all();
    }
    return(count);
}
char is_selected() const {
    return(is_flag(SELECTED));
}
void activate(int val=1) {
    set_flag(ACTIVE, val);
    if (_widget && val != (int)_widget->active()) {
        if (val) {
            _widget->activate();
        } else {
            _widget->deactivate();
        }
    }
}
_widget->redraw();
}
void deactivate() {
 activate(0);
}

void is_activated()const {
 return(is_flag(ACTIVE));
}
char is_active()const {
 return(is_activated());
}
int visible()const {
 return(is_visible());
}
int visible_r() const;

void usericon(Fl_Image *val) {
 _usericon = val;
 recalctree(); // may change tree geometry
}
Fl_Image *usericon()const {
 return(_usericon);
}
void userdeicon(Fl_Image * val) {
 _userdeicon = val;
}
Fl_Image * userdeicon()const {
 return _userdeicon;
}

// Events
const Fl_Tree_Item * find_clicked(const Fl_Tree_Prefs &prefs, int yonly=0) const;
Fl_Tree_Item * find_clicked(const Fl_Tree_Prefs &prefs, int yonly=0);
int event_on_item(const Fl_Tree_Prefs &prefs) const;
int event_on_collapse_icon(const Fl_Tree_Prefs &prefs) const;
int event_on_user_icon(const Fl_Tree_Prefs &prefs) const;
int event_on_label(const Fl_Tree_Prefs &prefs) const;
int is_root()const {
 return(_parent==0?1:0);
}

// Protected methods
// TODO: move these to top ‘protected:’ section
protected:
inline void set_flag(unsigned short flag,int val) {
 if ( flag==OPEN || flag==VISIBLE ) {
 recalctree(); // may change tree geometry
 }

 if ( val ) _flags |= flag; else _flags &= ~flag;
}

inline int is_flag(unsigned short val)const {
 return(_flags & val ? 1 : 0);
}

};
#endif /*FL_TREE_ITEM_H*/

35.165 Fl_Tree_Item_Array.H File Reference

This file defines a class that manages an array of Fl_Tree_Item pointers.
#include <FL/FL.H>
#include "FL_Export.H"

Classes

- class Fl_Tree_Item_Array

  Manages an array of Fl_Tree_Item pointers.

35.165.1 Detailed Description

This file defines a class that manages an array of Fl_Tree_Item pointers.
35.166 Fl_Tree_Item_Array.H

Go to the documentation of this file.

class FL_EXPORT Fl_Tree_Item_Array {
    Fl_Tree_Item **_items; // items array
    int _total; // #items in array
    int _size; // #items *allocated* for array
    int _chunksize; // #items to enlarge mem allocation
    enum {
        MANAGE_ITEM = 1
    }
    char _flags; // flags to control behavior
    void enlarge(int count);
public:
    Fl_Tree_Item_Array(int new_chunksize = 10); // CTOR
    ~Fl_Tree_Item_Array(); // DTOR
    Fl_Tree_Item_Array(const Fl_Tree_Item_Array *o); // COPY CTOR
    Fl_Tree_Item *operator[](int i) {
        return(_items[i]);
    }
    const Fl_Tree_Item *operator[](int i)const {
        return(_items[i]);
    }
    int total()const {
        return(_total);
    }
    void swap(int ax, int bx);
    int move(int to, int from);
    int deparent(int pos);
    int reparent(Fl_Tree_Item *item, Fl_Tree_Item *newparent, int pos);
    void clear();
    void add(Fl_Tree_Item *val);
    void insert(int pos, Fl_Tree_Item *new_item);
    void replace(int pos, Fl_Tree_Item *new_item);
    void remove(int index);
    int remove(Fl_Tree_Item *item);
    void manage_item_destroy(int val) {
        if ( val ) _flags |= MANAGE_ITEM; else _flags &= ~MANAGE_ITEM;
    }
    int manage_item_destroy()const {
        return _flags & MANAGE_ITEM ? 1 : 0;
    }
};

35.167 Fl_Tree_Prefs.H File Reference

This file contains the definitions for Fl_Tree's preferences.

#include <FL/Fl.H>

Generated by Doxygen
Classes

- class Fl_Tree_Prefs
  
  Tree widget's preferences.

Typedefs

- typedef void() Fl_Tree_Item_Draw_Callback(Fl_Tree_Item *, void *)

Enumerations

- enum Fl_Tree_Connector { FL_TREE_CONNECTOR_NONE =0 , FL_TREE_CONNECTOR_DOTTED =1 , FL_TREE_CONNECTOR_SOLID =2 }
  
  Defines the style of connection lines between items.

- enum Fl_Tree_Item_Draw_Mode { FL_TREE_ITEM_DRAW_DEFAULT =0 , FL_TREE_ITEM_DRAW_LABEL_AND_WIDGET =1 , FL_TREE_ITEM_HEIGHT_FROM_WIDGET =2 }
  
  Bit flags that control how item's labels and widget()s are drawn in the tree via item_draw_mode().

- enum Fl_Tree_Item_Reselect_Mode { FL_TREE_SELECTABLE_ONCE =0 , FL_TREE_SELECTABLE_ALWAYS =1 }
  
  Defines the ways an item can be (re) selected via item_reselect_mode().

- enum Fl_Tree_Select { FL_TREE_SELECT_NONE =0 , FL_TREE_SELECT_SINGLE =1 , FL_TREE_SELECT_MULTI =2 , FL_TREE_SELECT_SINGLE_DRAGGABLE =3 }
  
  Tree selection style.

- enum Fl_Tree_Sort { FL_TREE_SORT_NONE =0 , FL_TREE_SORT_ASCENDING =1 , FL_TREE_SORT_DESCENDING =2 }
  
  Sort order options for items added to the tree.

35.167.1 Detailed Description

This file contains the definitions for Fl_Tree's preferences.

```c
Fl_Tree_Prefs

Fl_Tree

|_____ Fl_Tree_Item
```

35.167.2 Enumeration Type Documentation

35.167.2.1 Fl_Tree_Connector

```c
enum Fl_Tree_Connector
```

Defines the style of connection lines between items.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_TREE_CONNECTOR_NONE</td>
<td>Use no lines connecting items.</td>
</tr>
<tr>
<td>FL_TREE_CONNECTOR_DOTTED</td>
<td>Use dotted lines connecting items (default)</td>
</tr>
<tr>
<td>FL_TREE_CONNECTOR_SOLID</td>
<td>Use solid lines connecting items.</td>
</tr>
</tbody>
</table>

35.167.2.2 Fl_Tree_Item_Draw_Mode

```c
enum Fl_Tree_Item_Draw_Mode
```

Bit flags that control how item's labels and widget()s are drawn in the tree via item_draw_mode().
### 35.167.2.3 Fl_Tree_Item_Reselect_Mode

enum Fl_Tree_Item_Reselect_Mode

Defines the ways an item can be (re) selected via item_reselect_mode().

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_TREE_SELECTABLE_ONCE</td>
<td>Item can only be selected once (default)</td>
</tr>
<tr>
<td>FL_TREE_SELECTABLE_ALWAYS</td>
<td>Enables FL_TREE_REASON_RESELECTED events for callbacks</td>
</tr>
</tbody>
</table>

### 35.167.2.4 Fl_Tree_Select

enum Fl_Tree_Select

Tree selection style.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_TREE_SELECT_NONE</td>
<td>Nothing selected when items are clicked.</td>
</tr>
<tr>
<td>FL_TREE_SELECT_SINGLE</td>
<td>Single item selected when item is clicked (default)</td>
</tr>
<tr>
<td>FL_TREE_SELECT_MULTI</td>
<td>Multiple items can be selected by clicking with SHIFT, CTRL or mouse drags.</td>
</tr>
<tr>
<td>FL_TREE_SELECT_SINGLE_DRAGGABLE</td>
<td>Single items may be selected, and they may be reordered by mouse drag.</td>
</tr>
</tbody>
</table>

### 35.167.2.5 Fl_Tree_Sort

enum Fl_Tree_Sort

Sort order options for items added to the tree.

<table>
<thead>
<tr>
<th>Enumerator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL_TREE_SORT_NONE</td>
<td>No sorting; items are added in the order defined (default).</td>
</tr>
<tr>
<td>FL_TREE_SORT_ASCENDING</td>
<td>Add items in ascending sort order.</td>
</tr>
<tr>
<td>FL_TREE_SORT_DESCENDING</td>
<td>Add items in descending sort order.</td>
</tr>
</tbody>
</table>

### 35.168 Fl_Tree_Prefs.H

Go to the documentation of this file.
4 include <FL/Fl.H>  // needed for ABI version features (via Enumerations.H)
5 6 // FL/Fl_Tree_Prefs.H
8 // Fl_Tree_Prefs -- This file is part of the Fl_Tree widget for FLTK
10 // Copyright (C) 2009-2010 by Greg Ercolano.
12 // This library is free software. Distribution and use rights are outlined in
14 // the file "COPYING" which should have been included with this file.  If this
16 // file is missing or damaged, see the license at:
18 // https://www.fltk.org/COPYING.php
20 // Please see the following page on how to report bugs and issues:
22 // https://www.fltk.org/bugs.php
24 //
25 //
27 enum Fl_Tree_Sort {
28     FL_TREE_SORT_NONE=0,
29     FL_TREE_SORT_ASCENDING=1,
30     FL_TREE_SORT_DESCENDING=2
31     };
33 enum Fl_Tree_Connector {
34     FL_TREE_CONNECTOR_NONE=0,
35     FL_TREE_CONNECTOR_DOTTED=1,
36     FL_TREE_CONNECTOR_SOLID=2
37     };
39 enum Fl_Tree_Select {
40     FL_TREE_SELECT_NONE=0,
41     FL_TREE_SELECT_SINGLE=1,
42     FL_TREE_SELECT_MULTI=2,
43     FL_TREE_SELECT_SINGLE_DRAGGABLE=3
45     };
47 enum Fl_Tree_Item_Reselect_Mode {
48     FL_TREE_SELECTABLE_ONCE=0,
49     FL_TREE_SELECTABLE_ALWAYS
50     };
52 enum Fl_Tree_Item_Draw_Mode {
53     FL_TREE_ITEM_DRAW_DEFAULT=0,
54     FL_TREE_ITEM_DRAW_LABEL_AND_WIDGET=1,
55     FL_TREE_ITEM_HEIGHT_FROM_WIDGET=2
57     };
59 class Fl_Tree_Item;
60 typedef void (Fl_Tree_Item_Draw_Callback)(Fl_Tree_Item*, void*);
61
62 class FL_EXPORT Fl_Tree_Prefs {
63     Fl_Font _labelfont; // label's font face
64     Fl_Fontsize _labelsize; // label's font size
65     int _margintop; // --
66     int _marginleft; // |- tree's controllable margins
67     int _marginbottom; // --
68     int _openchild_marginbottom; // extra space below an open child tree
69     int _userinfo_marginleft; // space to left of user icon (if any)
70     int _labelmarginleft; // space to left of label
71     int _widgetmarginleft; // space to left of widget
72     int _connectorwidth; // vertical space between lines
73     int _linespacing; // vertical space between lines
74     Fl_Color _labelfgcolor; // label's foreground color
75     Fl_Color _labelbgcolor; // label's background color
76     Fl_Color _connectorcolor; // connector dotted line color
77     Fl_Api _tree_connectors; // connector line style
78     Fl_Api _openimage; // the 'open' icon [+]
79     Fl_Api _closedimage; // the 'close' icon [-]
80     Fl_Api _userimage; // user's own icon
81     Fl_Api _openimage; // deactivated 'open' icon
82     Fl_Api _closedimage; // deactivated 'close' icon
83     Fl_Api _userinfoimage; // deactivated user icon
84     char _showcollapse; // 1=show collapse icons, 0=don't
85     char _showroot; // show the root item as part of the tree
86     Fl_Api _sortorder; // none, ascending, descending, etc.
87     Fl_Api _selectbox; // selection box type
88     Fl_Api _select_smode; // selection mode
89     Fl_Api _itemresselectmode; // controls item selection callback() behavior
90     Fl_Api _itemdrawmode; // controls how items draw label + widget()
91     Fl_Api _itemdrawcallback; // callback to handle drawing items (0=None)
92     void _itemdrawuserdata; // data for drawing items (0=None)
93     public:
94     Fl_Tree_Prefs();
95 
96     Fl_Api _itemdraw_callback
97             (Fl_Tree_Item*, void*);
98     Fl_Api _itemdraw_userdata;
```cpp
// Labels
inline Fl_Font item_labelfont()const { return(_labelfont); }
inline void item_labelfont(Fl_Font val) { _labelfont = val; }
inline Fl_Fontsize item_labelsize()const { return(_labelsizex); }
inline void item_labelsize(Fl_Fontsize val) { _labelsizex = val; }
inline Fl_Color item_labelbgcolor(Fl_Color val) { _labelbgcolor = val; }
inline Fl_Color item_labelbgcolor()const {
    return _labelbgcolor;
}
inline void item_labelbgcolor(Fl_Color val) {
    _labelbgcolor = val;
}

// Obsolete names - for 1.3.0 backwards compat
inline Fl_Font labelfont()const { return(_labelfont); }
inline void labelfont(Fl_Font val) { _labelfont = val; }
inline Fl_Fontsize labelsize()const { return(_labelsizex); }
inline void labelsize(Fl_Fontsize val) { _labelsizex = val; }
inline Fl_Color labelfgcolor()const { return(_labelfgcolor); }
inline void labelfgcolor(Fl_Color val) { _labelfgcolor = val; }
inline Fl_Color labelbgcolor()const { return(item_labelbgcolor()); }
inline void labelbgcolor(Fl_Color val) { item_labelbgcolor(val); }

// Margins
inline int marginleft()const {
    return(_marginleft);
}
inline void marginleft(int val) {
    _marginleft = val;
}
inline int margintop()const {
    return(_margintop);
}
inline void margintop(int val) {
    _margintop = val;
}
inline int marginbottom()const {
    return(_marginbottom);
}
inline void marginbottom(int val) {
    _marginbottom = val;
}
inline int openchild_marginbottom()const {
    return(_openchild_marginbottom);
}
inline void openchild_marginbottom(int val) {
    _openchild_marginbottom = val;
}
inline int usericonmarginleft()const {
    return(_usericonmarginleft);
}
inline void usericonmarginleft(int val) {
    _usericonmarginleft = val;
}
inline int labelmarginleft()const {
    return(_labelmarginleft);
}
inline void labelmarginleft(int val) {
    _labelmarginleft = val;
}
inline int widgetmarginleft()const {
    return(_widgetmarginleft);
}
inline void widgetmarginleft(int val) {
    _widgetmarginleft = val;
}
inline int linespacing()const {
    return(_linespacing);
}
inline void linespacing(int val) {
    _linespacing = val;
}

// Colors and Styles
inline Fl_Color connectorcolor()const {
    return(_connectorcolor);
}
inline void connectorcolor(Fl_Color val) {
    _connectorcolor = val;
}
inline Fl_Tree_Connector connectorstyle()const {
    return(_connectorstyle);
}
inline void connectorstyle(Fl_Tree_Connector val) {
```

Generated by Doxygen
`_connectorstyle = val;`  
`inline void connectorstyle(int val) {`  
`  _connectorstyle = Fl_Tree_Connector(val);`  
`}`  
`inline int connectorwidth() const {`  
`  return(_connectorwidth);`  
`}`  
`inline void connectorwidth(int val) {`  
`  _connectorwidth = val;`  
`}`  

`// Icons`  
`inline Fl_Image *openicon() const {`  
`  return(_openimage);`  
`}`  
`void openicon(Fl_Image *val);`  
`inline Fl_Image *closeicon() const {`  
`  return(_closeimage);`  
`}`  
`void closeicon(Fl_Image *val);`  
`inline Fl_Image *usericon() const {`  
`  return(_userimage);`  
`}  
`inline void usericon(Fl_Image *val) {`  
`  _userimage = val;`  
`  // Update deactivated version of icon..`  
`  if ( _userdeimage ) delete _userdeimage;`  
`  if ( _userimage ) {`  
`    _userdeimage = _userimage->copy();`  
`    _userdeimage->inactive();`  
`  } else {`  
`    _userdeimage = 0;`  
`  }`  
`}`  
`inline Fl_Image *opendeicon() const {`  
`  return _opendeimage;`  
`}`  
`inline Fl_Image *closedeicon() const {`  
`  return _closedeimage;`  
`}`  
`inline Fl_Image *userdeicon() const {`  
`  return _userdeimage;`  
`}`  

`// Options`  
`inline char showcollapse() const {`  
`  return(_showcollapse);`  
`}`  
`inline void showcollapse(int val) {`  
`  _showcollapse = val;`  
`}`  
`inline Fl_Tree_Sort sortorder() const {`  
`  return(_sortorder);`  
`}`  
`inline void sortorder(Fl_Tree_Sort val) {`  
`  _sortorder = val;`  
`}`  
`inline Fl_Boxtype selectbox() const {`  
`  return(_selectbox);`  
`}`  
`inline void selectbox(Fl_Boxtype val) {`  
`  _selectbox = val;`  
`}`  
`inline int showroot() const {`  
`  return(int(_showroot));`  
`}`  
`inline void showroot(int val) {`  
`  _showroot = char(val);`  
`}`  
`inline Fl_Tree_Select selectmode() const {`  
`  return(_selectmode);`  
`}`  
`inline void selectmode(Fl_Tree_Select val) {`  
`  _selectmode = val;`  
`  Fl_Tree_Item_Reselect_Mode item_reselect_mode() const {`  
`  return _itemreselectmode;`  
`}`  
`void item_reselect_mode(Fl_Tree_Item_Reselect_Mode mode) {`  
`  _itemreselectmode = mode;`  
`}`  
`inline Fl_Tree_Item_Draw_Mode item_draw_mode() const {`  
`  return(_itemdrawmode);`  
`}`  
`inline void item_draw_mode(Fl_Tree_Item_Draw_Mode val) {`
35.169 fl_types.h File Reference

This file contains simple "C"-style type definitions.
#include "fl_attr.h"

Typedefs

Miscellaneous

- typedef unsigned int Fl_Shortcut
  16-bit Unicode character + 8-bit indicator for keyboard flags.
- typedef unsigned char uchar
  unsigned char
- typedef unsigned long ulong
  unsigned long

35.169.1 Detailed Description

This file contains simple "C"-style type definitions.

35.169.2 Typedef Documentation

35.169.2.1 Fl_Shortcut

typedef unsigned int Fl_Shortcut
16-bit Unicode character + 8-bit indicator for keyboard flags.

Note

This should be 24-bit Unicode character + 8-bit indicator for keyboard flags. The upper 8 bits are currently unused but reserved.

Due to compatibility issues this type and all FLTK shortcuts can only be used with 16-bit Unicode characters (U+0000 .. U+FFFF) and not with the full range of unicode characters (U+0000 .. U+10FFFF). This is caused by the bit flags FL_SHIFT, FL_CTRL, FL_ALT, and FL_META being all in the range 0x010000 .. 0x400000.

Todo

Discuss and decide whether we can "shift" these special keyboard flags to the upper byte to enable full 21-bit Unicode characters (U+0000 .. U+10FFFF) plus the keyboard indicator bits as this was originally intended. This would be possible if we could rely on all programs being coded with symbolic names and not hard coded bit values.
35.170 fl_types.h

Go to the documentation of this file.

1 /*
2 * Simple "C"-style types for the Fast Light Tool Kit (FLTK).
3 *
4 * Copyright 1998-2020 by Bill Spitzak and others.
5 *
6 * This library is free software. Distribution and use rights are outlined in
7 * the file "COPYING" which should have been included with this file. If this
8 * file is missing or damaged, see the license at:
9 *
10 * https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 * https://www.fltk.org/bugs.php
15 */
16
21 #ifndef FL_TYPES_H
22 #define FL_TYPES_H
23
24 #include "fl_attr.h"
25 /* group: Miscellaneous */
28
30 typedef unsigned char uchar;
32 typedef unsigned long ulong;
33
55 typedef unsigned int Fl_Shortcut;
56 /* group: Miscellaneous */
58
59 #endif

35.171 fl_utf8.h File Reference

header for Unicode and UTF-8 character handling
#include "fl_Export.H"
#include "fl_types.h"
#include <stdio.h>
#include <sys/stat.h>

Functions

- int fl_access (const char *f, int mode)
  Cross-platform function to test a files access() with a UTF-8 encoded name or value.
- int fl_chdir (const char *path)
  Cross-platform function to change the current working directory, given as a UTF-8 encoded string.
- int fl_chmod (const char *f, int mode)
  Cross-platform function to set a files mode() with a UTF-8 encoded name or value.
- int fl_close_fd (int fd)
  Cross-platform function to close a file descriptor.
- int fl_execvp (const char *file, char **const argv)
  Cross-platform function to open files with a UTF-8 encoded name.
- FILE * fl_fopen (const char *f, const char *mode)
  Cross-platform function to get the current working directory as a UTF-8 encoded value.
- char * fl_getcwd (char *buf, int len)
  Cross-platform function to get environment variables with a UTF-8 encoded name or value.
- char * fl_getenv (const char *v)
  Cross-platform function to recursively create a path in the file system.
- void fl_make_path_for_file (const char *path)
  Cross-platform function to create a path for the file in the file system.
- int fl_mkdir (const char *f, int mode)
Cross-platform function to create a directory with a UTF-8 encoded name.

• unsigned int fl_nonspace (unsigned int ucs)
  Returns true if the Unicode character ucs is non-spacing.

• int fl_open (const char *fname, int oflags,...)
  Cross-platform function to open files with a UTF-8 encoded name.

• int fl_open_ext (const char *fname, int binary, int oflags,...)
  Cross-platform function to open files with a UTF-8 encoded name.

• int fl_putenv (const char *var)
  Cross-platform function to write environment variables with a UTF-8 encoded name or value.

• int fl_rename (const char *f, const char *n)
  Cross-platform function to rename a filesystem object using UTF-8 encoded names.

• int fl_rmdir (const char *f)
  Cross-platform function to remove a directory with a UTF-8 encoded name.

• int fl_stat (const char *f, struct stat *b)
  Cross-platform function to stat() a file using a UTF-8 encoded name or value.

• int fl_system (const char *cmd)
  Cross-platform function to run a system command with a UTF-8 encoded string.

• int fl_tolower (unsigned int ucs)
  Returns the Unicode lower case value of ucs.

• int fl_toupper (unsigned int ucs)
  Returns the Unicode upper case value of ucs.

• unsigned fl_ucs_to_Utf16 (const unsigned ucs, unsigned short *dst, const unsigned dstlen)
  Convert a single 32-bit Unicode codepoint into an array of 16-bit characters.

• int fl_unlink (const char *fname)
  Cross-platform function to unlink() (that is, delete) a file using a UTF-8 encoded filename.

• char * fl_utf2mbcs (const char *s)
  Converts UTF-8 string s to a local multi-byte character string.

• const char * fl_utf8back (const char *p, const char *start, const char *end)
  Move p backward until it points to the start of a UTF-8 character.

• int fl_utf8bytes (unsigned ucs)
  Returns the number of bytes needed to encode the given UCS4 character in UTF-8.

• unsigned fl_utf8decode (const char *p, const char *end, int *len)
  Decode a single UTF-8 encoded character starting at p.

• int fl_utf8encode (unsigned ucs, char *buf)
  Write the UTF-8 encoding of ucs into buf and return the number of bytes written.

• unsigned fl_utf8from_mb (char *dst, unsigned dstlen, const char *src, unsigned srclen)
  Convert a filename from the locale-specific multibyte encoding used by Windows to UTF-8 as used by FLTK.

• unsigned fl_utf8fromwc (char *dst, unsigned dstlen, const wchar_t *src, unsigned srclen)
  Turn "wide characters" as returned by some system calls (especially on Windows) into UTF-8.

• const char * fl_utf8from (char *p, const char *start, const char *end)
  Move p forward until it points to the start of a UTF-8 character.

• int fl_utf8len (char c)
  Returns the byte length of the UTF-8 sequence with first byte c, or -1 if c is not valid.

• int fl_utf8len1 (char c)
  Returns the byte length of the UTF-8 sequence with first byte c, or 1 if c is not valid.

• int fl_utf8locale ()
  Return true if the "locale" seems to indicate that UTF-8 encoding is used.

• int fl_utf8strlen (const char *text, int len)
  Return the length in bytes of a UTF-8 string.
• int fl_utf8test (const char *src, unsigned srclen)
  Examines the first srclen bytes in src and returns a verdict on whether it is UTF-8 or not.
• unsigned fl_utf8to_mb (const char *src, unsigned srclen, char *dst, unsigned dstlen)
  Convert the UTF-8 used by FLTK to the locale-specific encoding used for filenames (and sometimes used for data in files).
• unsigned fl_utf8toa (const char *src, unsigned srclen, char *dst, unsigned dstlen)
  Convert a UTF-8 sequence into an array of 1-byte characters.
• unsigned fl_utf8toUtf16 (const char *src, unsigned srclen, unsigned short *dst, unsigned dstlen)
  Convert a UTF-8 sequence into an array of 16-bit characters.
• unsigned fl_utf8toWc (const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen)
  Converts a UTF-8 string into a wide character string.
• int fl_utf_nb_char (const unsigned char *buf, int len)
  Returns the number of Unicode chars in the UTF-8 string.
• int fl_utf_strcascmp (const char *s1, const char *s2)
  UTF-8 aware strcascmp - converts to Unicode and tests.
• int fl_utf_strnscascmp (const char *s1, const char *s2, int n)
  UTF-8 aware strnscascmp - converts to lower case Unicode and tests.
• int fl_utf_tolower (const unsigned char *str, int len, char *buf)
  Converts the string str to its lower case equivalent into buf.
• int fl_utf_toupper (const unsigned char *str, int len, char *buf)
  Converts the string str to its upper case equivalent into buf.
• int fl_wcwidth (const char *src)
  extended wrapper around fl_wcwidth(unsigned int ucs) function.
• int fl_wcwidth_ (unsigned int ucs)
  Wrapper to adapt Markus Kuhn’s implementation of wcwidth() for FLTK.

35.171.1 Detailed Description
header for Unicode and UTF-8 character handling

35.172 fl_utf8.h
Go to the documentation of this file.

/*
 * Author: Jean-Marc Lienher ( http://oksid.ch )
 * Copyright 2000-2010 by O’ksi’D.
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 * file is missing or damaged, see the license at:
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 * https://www.fltk.org/bugs.php
 */

#ifndef _HAVE_FL_UTF8_HDR_
#define _HAVE_FL_UTF8_HDR_

#include "Fl_Export.H"
#include "fl_types.h"
#include <stdio.h>  // FILE *fl_fopen()
#include <sys/stat.h>  // struct stat
#endif

#ifdef __cplusplus
extern "C" {
#endif

Generated by Doxygen
FL_EXPORT int fl_utf8bytes(unsigned ucs);

/* OD: returns the byte length of the first UTF-8 sequence (returns -1 if not valid) */
FL_EXPORT int fl_utf8len(char c);

/* OD: returns the byte length of the first UTF-8 char sequence (returns +1 if not valid) */
FL_EXPORT int fl_utf8len1(char c);

/* OD: returns the number of Unicode chars in the UTF-8 string */
FL_EXPORT int fl_utf8strlen(const char *text, int len);

/* OD: returns the number of Unicode bytes used */
FL_EXPORT int fl_utf_nb_char(const unsigned char *buf, int len);

/* F2: Convert the next UTF-8 char-sequence into a Unicode value (and say how many bytes were used) */
FL_EXPORT unsigned fl_utf8decode(const char* p, const char* end, int* len);

/* F2: Encode a Unicode value into a UTF-8 sequence, return the number of bytes used */
FL_EXPORT int fl_utf8encode(unsigned ucs, char* buf);

/* F2: Move forward to the next valid UTF-8 sequence start between start and end */
FL_EXPORT const char* fl_utf8fwd(const char* p, const char* start, const char* end);

/* F2: Move backward to the previous valid UTF-8 sequence start */
FL_EXPORT const char* fl_utf8back(const char* p, const char* start, const char* end);

/* XX: Convert a single 32-bit Unicode value into UTF16 */
FL_EXPORT unsigned fl_ucs_to_Utf16(const unsigned ucs, unsigned short *dst, const unsigned dstlen);

/* F2: Convert a UTF-8 string into UTF16 */
FL_EXPORT unsigned fl_utf8toUtf16(const char* src, unsigned srclen, unsigned short* dst, unsigned dstlen);

/* F2: Convert a UTF-8 string into a wide character string - makes UTF16 on win32, "UCS4" elsewhere */
FL_EXPORT unsigned fl_utf8towc(const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen);

/* F2: Convert a UTF-8 string into ASCII, eliding untranslatable glyphs */
FL_EXPORT unsigned fl_utf8toa (const char *src, unsigned srclen, char *dst, unsigned dstlen);

/* F2: Convert 8859-1 string to UTF-8 */
FL_EXPORT unsigned fl_utf8froma (char *dst, unsigned dstlen, const char *src, unsigned srclen);

/* F2: Return true if the current O/S locale is UTF-8 */
FL_EXPORT int fl_utf8locale(void);

/* XX: return width of "raw" ucs character in columns. */
FL_EXPORT int fl_wcwidth_(unsigned int ucs);

/* XX: return width of UTF-8 character string in columns. */
FL_EXPORT int fl_wcwidth(const char *src);

/* OD: Return true if the character is non-spacing */
FL_EXPORT unsigned int fl_nonspacing(unsigned int ucs);

/* OD: Convert a UTF-8 string to a local multi-byte encoding - mainly for win32? */
FL_EXPORT unsigned fl_utf8to_mb(const char *src, unsigned srcrlen, char *dst, unsigned dstlen);

/* OD: Attempt to convert a string in the current locale to UTF-8 */
FL_EXPORT char *fl_unicode_toUtf8(const char *s, unsigned int codepage);

#ifdef _WIN32
/* these two Windows-only functions are kept for API compatibility */
FL_EXPORT char* fl_utf8_to_locale(const char *s, int len, unsigned int codepage);
FL_EXPORT char* fl_locale_to_utf8(const char *s, int len, unsigned int codepage);
#endif /* _WIN32 */

Generated by Doxygen
The following functions are intended to provide portable, UTF-8 aware versions of standard functions:

- **OD: UTF-8 aware strncasecmp - converts to lower case Unicode and tests**
  ```c
  FL_EXPORT int fl_utf_strncasecmp(const char *s1, const char *s2, int n);
  ```

- **OD: UTF-8 aware strcasecmp - converts to Unicode and tests**
  ```c
  FL_EXPORT int fl_utf_strcasecmp(const char *s1, const char *s2);
  ```

- **OD: return the Unicode lower case value of ucs**
  ```c
  FL_EXPORT int fl_tolower(unsigned int ucs);
  ```

- **OD: return the Unicode upper case value of ucs**
  ```c
  FL_EXPORT int fl_toupper(unsigned int ucs);
  ```

- **OD: converts the UTF-8 string to the lower case equivalent**
  ```c
  FL_EXPORT int fl_utf_tolower(const unsigned char *str, int len, char *buf);
  ```

- **OD: converts the UTF-8 string to the upper case equivalent**
  ```c
  FL_EXPORT int fl_utf_toupper(const unsigned char *str, int len, char *buf);
  ```

- **OD: Portable UTF-8 aware chmod wrapper**
  ```c
  FL_EXPORT int fl_chmod(const char* f, int mode);
  ```

- **OD: Portable UTF-8 aware access wrapper**
  ```c
  FL_EXPORT int fl_access(const char* f, int mode);
  ```

- **OD: Portable UTF-8 aware stat wrapper**
  ```c
  FL_EXPORT int fl_stat(const char *path, struct stat *buffer);
  ```

- **OD: Portable UTF-8 aware getcwd wrapper**
  ```c
  FL_EXPORT char *fl_getcwd(char *buf, int len);
  ```

- **Portable UTF-8 aware chdir wrapper**
  ```c
  FL_EXPORT int fl_chdir(const char *path);
  ```

- **OD: Portable UTF-8 aware fopen wrapper**
  ```c
  FL_EXPORT FILE *fl_fopen(const char *f, const char *mode);
  ```

- **OD: Portable UTF-8 aware system wrapper**
  ```c
  FL_EXPORT int fl_system(const char* f);
  ```

- **OD: Portable UTF-8 aware execvp wrapper**
  ```c
  FL_EXPORT int fl_execvp(const char *file, char *const *argv);
  ```

- **Portable UTF-8 aware open wrapper**
  ```c
  FL_EXPORT int fl_open(const char *fname, int oflags, ...);
  ```

- **OD: Portable UTF-8 aware open_ext wrapper**
  ```c
  FL_EXPORT int fl_open_ext(const char *fname, int binary, int oflags, ...);
  ```

- **Portable wrapper around unix-style close() function**
  ```c
  FL_EXPORT int fl_close_fd(int fd);
  ```

- **OD: Portable UTF-8 aware unlink wrapper**
  ```c
  FL_EXPORT int fl_unlink(const char *fname);
  ```

- **OD: Portable UTF-8 aware rmdir wrapper**
  ```c
  FL_EXPORT int fl_rmdir(const char* f);
  ```

- **OD: Portable UTF-8 aware getenv wrapper**
  ```c
  FL_EXPORT char* fl_getenv(const char *name);
  ```

- **Portable UTF-8 aware putenv wrapper**
  ```c
  FL_EXPORT int fl_putenv(const char *var);
  ```

- **OD: Portable UTF-8 aware mkdir wrapper**
  ```c
  FL_EXPORT int fl_mkdir(const char* f, int mode);
  ```

- **OD: Portable UTF-8 aware rename wrapper**
  ```c
  FL_EXPORT int fl_rename(const char* f, const char *t);
  ```

- **OD: Given a full pathname, this will create the directory path needed to hold the file named**
  ```c
  FL_EXPORT void fl_make_path_for_file( const char *path );
  ```

- **OD: recursively create a path in the file system**
  ```c
  FL_EXPORT char fl_make_path( const char *path );
  ```

- `#ifndef __cplusplus`
  ```c
  }
  ```
- `#endif /* __cplusplus */`

Generated by Doxygen
# Fl_Valuator.H

Valuator header file for the Fast Light Tool Kit (FLTK).

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https://www.fltk.org/bugs.php

class FL_EXPORT Fl_Valuator : public Fl_Widget {
  
  double value_;  
  double previous_value_;  
  double min, max; // truncates to this range *after* rounding  
  double A; int B; // rounds to multiples of A/B, or no rounding if A is zero
  
  protected:
    int horizontal()const {return type()& FL_HORIZONTAL;}  
    Fl_Valuator(int X, int Y, int W, int H, const char * L);  
    double previous_value()const {return previous_value_;}  
    void handle_push() {previous_value_ = value_;}  
    double softclamp(double);  
    void handle_drag(double newvalue);  
    void handle_release(); // use drag() value  
    virtual void value_damage(); // cause damage() due to value() changing  
    void set_value(double v) {value_ = v;}  
  
  public:
    
    void bounds(double a, double b) {min=a; max=b;}  
    double minimum()const {return min;}  
    void minimum(double a) {min = a;}  
    double maximum()const {return max;}  
    void maximum(double a) {max = a;}  
    void range(double a, double b) {min = a; max = b;}  
    void step(int a, int b) {A = a; B = b;}  
    void step(int s);  
    double step()const {return A/B;}  
    void precision(int digits);  
    
    double value()const {return value_;}  
    int value(double);  
    
    virtual int format(char *);  
    double round(double); // round to nearest multiple of step  
    double clamp(double); // keep in range  
    double increment(double, int); // add n*step to value
};
2 // Value input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* file
18 Fl_Value_Input widget . */
19
20 ifndef Fl_Value_Input_H
21 #define Fl_Value_Input_H
22
23 #include "Fl_Valuator.H"
24 #include "Fl_Input.H"
25
56 class FL_EXPORT Fl_Value_Input : public Fl_Valuator {
57 public:
58    /* This is the encapsulated Fl_input attribute to which
59      this class delegates the value font, color and shortcut */
60    Fl_Input input;
61 private:
62    char soft_;
63 static void input_cb(Fl_Widget *, void *);
64 void value_damage() FL_OVERRIDE; // cause damage() due to value() changing
65 public:
66    int handle(int) FL_OVERRIDE;
67 protected:
68    void draw() FL_OVERRIDE;
69 public:
70    void resize(int, int, int, int) FL_OVERRIDE;
71    Fl_Value_Input(int x, int y, int w, int h, const char *l = 0);
72    ~Fl_Value_Input();
73    void soft(char s) {soft_ = s;}
74    char soft() const {return soft_;
75    void shortcut(char s) {input.shortcut(s);
76    int shortcut() const {return input.shortcut();}
77    Fl_Font textfont() const {return input.textfont();}
78    void textfont(Fl_Font) {input.textfont();}
79    Fl_Fontsize textsize() const {return input.textsize();}
80    void textsize(Fl_Fontsize) {input.textsize();}
81    Fl_Color textcolor() const {return input.textcolor();}
82    void textcolor(Fl_Color n) {input.textcolor(n);}
83    Fl_Color cursor_color() const {return input.cursor_color();}
84    void cursor_color(Fl_Color n) {input.cursor_color(n);}
85    Fl_Value_Output.H
35.175 Fl_Value_Output.H

#include "Fl_Valuator.H"
#endif

class FL_EXPORT Fl_Value_Output : public Fl_Valuator {
    Fl_Font textfont_;  
    Fl_Fontsize textsize_;  
    uchar soft_;  
    Fl_Color textcolor_; 

protected:
    void draw() FL_OVERRIDE;

public:
    int handle(int) FL_OVERRIDE;
    Fl_Value_Output(int x,int y,int w,int h,const char *l=0);

    void soft(uchar s) {soft_ = s;}
    uchar soft()const {return soft_;}

    Fl_Font textfont()const {return textfont_;}
    void textfont(Fl_Font s) {textfont_ = s;}

    Fl_Fontsize textsize()const {return textsize_;}
    void textsize(Fl_Fontsize s) {textsize_ = s;}

    Fl_Color textcolor()const {return textcolor_;}
    void textcolor(Fl_Color s) {textcolor_ = s;}
};

#endif

---

35.176 Fl_Value_Slider.H

1 //
2 // Value Slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
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7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 //
17 /*
18 file Fl_Value_Slider widget . */
19
20 ifndef Fl_Value_Slider_H
21 define Fl_Value_Slider_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Value_Slider : public Fl_Slider {
26    Fl_Font textfont_;  
27    Fl_Fontsize textsize_;  
28    Fl_Color textcolor_;  
29    short value_width_;  
30    short value_height_; 

31 protected:
32    void draw() FL_OVERRIDE;
33
34 public:
35    int handle(int) FL_OVERRIDE;
36    Fl_Value_Slider(int x, int y, int w, int h, const char *l = 0);
37
38    void textfont(Fl_Font s) {textfont_ = s;}
39    Fl_Font textfont()const {return textfont_;}
40
41    void textsize(Fl_Fontsize s) {textsize_ = s;}
42    Fl_Fontsize textsize()const {return textsize_;}
43
44    void textcolor(Fl_Color s) {textcolor_ = s;}
45    Fl_Color textcolor()const {return textcolor_;}
46
47    void value_width(int s) {
48        if (s > w() - 10)
49            s = w() - 10;
50        if (s < 10)


```c
s = 10;
value_width_ = (short)s;
}

int value_width()const { return (value_width_); }

void value_height(int s) {
if (s > h() - 10)
s = h() - 10;
if (s < 10)
s = 10;
value_height_ = (short)s;
}
int value_height()const { return (value_height_); }
```

```cpp
#endif
```

### 35.177 Fl_Widget.H File Reference

**Fl_Widget** and **Fl_Label** classes.

```cpp
#include "Fl.H"
```

#### Classes

- **class Fl_Callback_User_Data**
  
  A class prototype that allows for additional data in callbacks.

- **struct Fl_Label**
  
  This struct stores all information for a text or mixed graphics label.

- **class Fl_Widget**
  
  **Fl_Widget** is the base class for all widgets in FLTK.

#### Macros

- **#define FL_RESERVED_TYPE 100**
  
  Reserved type numbers (necessary for my cheapo RTTI) start here.

#### Typedefs

- **typedef void() Fl_Callback(Fl_Widget *, void *)**
  
  Default callback type definition for all fltk widgets (by far the most used)

- **typedef void() Fl_Callback0(Fl_Widget *)**
  
  One parameter callback type definition passing only the widget.

- **typedef void() Fl_Callback1(Fl_Widget *, long)**
  
  Callback type definition passing the widget and a long data value.

- **typedef Fl_Callback Fl_Callback_p**
  
  Default callback type pointer definition for all fltk widgets.

### 35.177.1 Detailed Description

**Fl_Widget** and **Fl_Label** classes.

### 35.177.2 Macro Definition Documentation

#### 35.177.2.1 FL_RESERVED_TYPE

```cpp
#define FL_RESERVED_TYPE 100
```

Reserved type numbers (necessary for my cheapo RTTI) start here.

Grep the header files for "RESERVED_TYPE" to find the next available number.
Go to the documentation of this file.

// Widget header file for the Fast Light Tool Kit (FLTK).
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//
// Please see the following page on how to report bugs and issues:
//
// https://www.fltk.org/bugs.php

#ifndef Fl_Widget_H
#define Fl_Widget_H

#include "Fl.H"

class Fl_Widget;
class Fl_Window;
class Fl_Group;
class Fl_Image;

typedef void (Fl_Callback )(Fl_Widget*, void*);
typedef Fl_Callback* Fl_Callback_p; // needed for BORLAND
typedef void (Fl_Callback0)(Fl_Widget*);
typedef void (Fl_Callback1)(Fl_Widget*, long);

struct FL_EXPORT Fl_Label {
    const char * value;
    Fl_Image * image;
    Fl_Image * deimage;
    Fl_Font font;
    Fl_Fontsize size;
    Fl_Color color;
    Fl_Align align_; 
    uchar type;
    void draw(int,int,int,int, Fl_Align) const;
    void measure(int &w, int &h) const;
};

class Fl_Callback_User_Data {
    public:
    virtual ~Fl_Callback_User_Data() { }
};

class FL_EXPORT Fl_Widget {
    friend class Fl_Group;
    Fl_Group* parent_;
    Fl_Callback* callback_; 
    void* user_data_;
    int x_,y_,w_,h_; 
    Fl_Label label_;
    unsigned int flags_; 
    Fl_Color color_; 
    Fl_Color color2_; 
    uchar type_; 
    uchar damage_; 
    uchar box_; 
    uchar when_; 
    const char *tooltip_; 

    Fl_Widget(const Fl_Widget &);
    Fl_Widget& operator=(const Fl_Widget &);

    protected:
    Fl_Widget(int x, int y, int w, int h, const char *label=0L);
    int x(int v) {x_ = v;}
    void y(int v) {y_ = v;}
    void w(int v) {w_ = v;}
    void h(int v) {h_ = v;}
    unsigned int flags_;const [return flags_]
    void set_flag(unsigned int c) {flags_ |= c;}

};

Generated by Doxygen
void clear_flag(unsigned int c) {flags_ &= ~c;}

enum {
  INACTIVE = 1«0,
  INVISIBLE = 1«1,
  OUTPUT = 1«2,
  NOBORDER = 1«3,
  FORCE_POSITION = 1«4,
  NON_MODAL = 1«5,
  SHORTCUT_LABEL = 1«6,
  CHANGED = 1«7,
  OVERRIDE = 1«8,
  VISIBLE_FOCUS = 1«9,
  COPIED_LABEL = 1«10,
  CLIP_CHILDREN = 1«11,
  MENU_WINDOW = 1«12,
  TOOLIP_WINDOW = 1«13,
  MODAL = 1«14,
  NO_OVERLAY = 1«15,
  GROUP_RELATIVE = 1«16,
  FULLSCREEN = 1«17,
  COPIED_TOOLIP = 1«18,
  INACTIVE = 1«0,
  INVISIBLE = 1«1,
  OUTPUT = 1«2,
  NOBORDER = 1«3,
  FORCE_POSITION = 1«4,
  NON_MODAL = 1«5,
  SHORTCUT_LABEL = 1«6,
  CHANGED = 1«7,
  OVERRIDE = 1«8,
  VISIBLE_FOCUS = 1«9,
  COPIED_LABEL = 1«10,
  CLIP_CHILDREN = 1«11,
  MENU_WINDOW = 1«12,
  TOOLIP_WINDOW = 1«13,
  MODAL = 1«14,
  NO_OVERLAY = 1«15,
  GROUP_RELATIVE = 1«16,
  FULLSCREEN = 1«17,
  COPIED_TOOLIP = 1«18,
  FULLSCREEN = 1«18,
  MAC_USE_ACCENTS_MENU = 1«19,
  NEEDS_KEYBOARD = 1«20,
  IMAGE_BOUND = 1«21,
  DEIMAGE_BOUND = 1«22,
  AUTO_DELETE_USER_DATA = 1«23,
  MAXIMIZED = 1«24,
  // Note to devs: add new FLTK core flags above this line (up to 1«28).

  // Three more flags, reserved for user code
  USERFLAG1 = 1«25,
  USERFLAG2 = 1«26,
  USERFLAG3 = 1«27,

};

void draw_box() const;
void draw_box(Fl_Boxtype t, Fl_Color c) const;
void draw_box(Fl_Boxtype t, int x, int y, int w, int h, Fl_Color c) const;
void draw_backdrop() const;

void draw_focus() const {
  draw_focus(box(), x(), y(), w(), h(), color());
}

void draw_box(Fl_Boxtype t, int X, int Y, int W, int H) const {
  draw_box(t, X, Y, W, H, color());
}

// See documentation in Fl_Widget.cxx
void draw_focus(Fl_Boxtype t, int x, int y, int w, int h, Fl_Color bg) const;

void draw_label() const;
void draw_label(int, int, int, int) const;

public:
  virtual ~Fl_Widget();
  virtual void draw() = 0;
  virtual int handle(int event);

  int is_label_copied() const { return ((flags_ & COPIED_LABEL) ? 1 : 0); }

  void needs_keyboard(bool needs) {
    if (needs) set_flag(NEEDS_KEYBOARD);
    else clear_flag(NEEDS_KEYBOARD);
  }

  bool needs_keyboard() const {
    return (flags_ & NEEDS_KEYBOARD);
  }

  Fl_Group* parent() const { return parent_; }

  void parent(Fl_Group* p) { parent_ = p; } // for hacks only, use Fl_Group::add()

  uchar type() const { return type_; }

  void type(uchar t) { type_ = t; }

  int x() const { return x_; }

  int y() const { return y_; }

  int w() const { return w_; }
35.178 Fl_Widget.H

```c
int h() const { return h_; }
virtual void resize(int x, int y, int w, int h);
int damage_resize(int x, int y, int w, int h);
void position(int X, int Y) { resize(X, Y, w_, h_); }
void size(int W, int H) { resize(X_, Y_, W, H); }
Fl_Align align() const { return label_.align_; }
void align(Fl_Align alignment) { label_.align_ = alignment; }

Fl_Boxtype box() const { return (Fl_Boxtype)box_; }
void box(Fl_Boxtype new_box) { box_ = new_box; }

Fl_Color color() const { return color_; }
void color(Fl_Color bg) { color_ = bg; }

Fl_Color selection_color() const { return color2_; }
void selection_color(Fl_Color a) { color2_ = a; }
void color(Fl_Color bg, Fl_Color sel) { color_ = bg; color2_ = sel; }
const char * label() const { return label_.value; }
void label(const char *text);
void copy_label(const char *new_label);
void label(Fl_Labeltype a, const char *b) { label_.type = a; label_.value = b; }

Fl_Labeltype labeltype() const { return (Fl_Labeltype)label_.type; }
void labeltype(Fl_Labeltype a) { label_.type = a; }

Fl_Color labelcolor() const { return label_.color; }
void labelcolor(Fl_Color c) { label_.color = c; }

Fl_Font labelfont() const { return label_.font; }
void labelfont(Fl_Font f) { label_.font = f; }

Fl_Fontsize labelsize() const { return label_.size; }
void labelsize(Fl_Fontsize pix) { label_.size = pix; }

Fl_Image* image() { return label_.image; }
const Fl_Image* image() const { return label_.image; }
void image(Fl_Image* img);
void image(Fl_Image& img);
void bind_image(Fl_Image* img);
int image_bound() const { return ((flags_ & IMAGE_BOUND) ? 1 : 0); }

const char *tooltip() const { return tooltip_; }
void tooltip(const char *text); // see Fl_Tooltip
void copy_tooltip(const char *text); // see Fl_Tooltip

Fl_Callback* callback() const { return callback_; }
```

Generated by Doxygen
void callback(Fl_Callback * cb, void* p) {
    callback_ = cb;
    user_data(p);
}

void callback(Fl_Callback * cb, Fl_Callback_User_Data* p, bool auto_free) {
    callback_ = cb;
    user_data(p, auto_free);
}

void callback(Fl_Callback * cb, Fl_Callback0* cb) {
    callback_ = (Fl_Callback *)(fl_intptr_t)(cb);
}

void callback(Fl_Callback1* cb, long p = 0) {
    callback_ = (Fl_Callback *)(fl_intptr_t)(cb);
    user_data((void *)(fl_intptr_t)p);
}

void user_data()const {return user_data_;}

void user_data(void* v);

void user_data(Fl_Callback_User_Data * v, bool auto_free);

long argument()const {return (long)(fl_intptr_t)user_data_;

void argument(long v) {user_data((void *)(fl_intptr_t)v);}

Fl_When when()const {return (Fl_When)when_;

void when(uchar i) {when_ = i;}

unsigned int visible()const {return !(flags_&INVISIBLE);

int visible_r() const;

virtual void show();

virtual void hide();

void set_visible() {flags_ &= ~INVISIBLE;}

void clear_visible() {flags_ |= INVISIBLE;}

unsigned int active()const {return !(flags_&INACTIVE);

int active_r() const;

void activate();

void deactivate();

unsigned int output()const {return (flags_&OUTPUT);

void set_output() {flags_ |= OUTPUT;}

void clear_output() {flags_ &= ~OUTPUT;}

unsigned int takesevents()const {return !(flags_&(INACTIVE|INVISIBLE|OUTPUT));

unsigned int changed()const {return flags_ & CHANGED;

void set_changed() {flags_ |= CHANGED;}

void clear_changed() {flags_ &= ~CHANGED;}

unsigned int takesfocus()const {return flags_ & VISIBLE_FOCUS;

int take_focus();

void set_visible_focus() {flags_ |= VISIBLE_FOCUS;}

void clear_visible_focus() {flags_ &= ~VISIBLE_FOCUS;}

void visible_focus(int v) { if (v) set_visible_focus(); else clear_visible_focus();

unsigned int visible_focus() const { return flags_&VISIBLE_FOCUS;

static void default_callback(Fl_Widget *widget, void *data);

void do_callback(Fl_Callback_Reason reason=FL_REASON_UNKNOWN) {do_callback(this, user_data_,

Generated by Doxygen
void do_callback(Fl_Widget *widget, long arg, Fl_Callback_Reason reason=FL_REASON_UNKNOWN) {
    do_callback(widget, (void *)(fl_intptr_t)arg, reason);
}

void do_callback(Fl_Widget *widget, void *arg = 0, Fl_Callback_Reason reason=FL_REASON_UNKNOWN);

/* Internal use only. */
int test_shortcut();

/* Internal use only. */
static unsigned int label_shortcut(const char *t);

/* Internal use only. */
static int test_shortcut(const char *, const bool require_alt = false);

/* Internal use only. */
void _set_fullscreen() {flags_ |= FULLSCREEN;}

void _clear_fullscreen() {flags_ &= ~FULLSCREEN;}

int contains(const Fl_Widget *w) const;

int inside(const Fl_Widget *wgt) const {return wgt ? wgt->contains(this) : 0;}

void redraw();

void redraw_label();

uchar damage() const {return damage_;}

void clear_damage(uchar c = 0) {damage_ = c;}

void damage(uchar c);

void damage(uchar c, int x, int y, int w, int h);

void draw_label(int, int, int, int, Fl_Align) const;

void measure_label(int &ww, int &hh) const {label_.measure(ww, hh);}

Fl_Window *window() const;

Fl_Window *top_window() const;

virtual Fl_Group *as_group() { return NULL; }

virtual Fl_Group const *as_group() const { return NULL; }

virtual Fl_Window *as_window() { return 0; }

virtual Fl_Window const *as_window() const { return NULL; }

virtual class Fl_Gl_Window *as_gl_window() { return NULL; }

virtual class Fl_Gl_Window const *as_gl_window() const { return NULL; }

int use_accents_menu() { return flags() & MAC_USE_ACCENTS_MENU; }

Fl_Color color2() const {return (Fl_Color)color2_;}

void color2(unsigned a) {color2_ = a;}

void shortcut_label(int value) {
    if (value)
        set_flag(SHORTCUT_LABEL);
    else
        clear_flag(SHORTCUT_LABEL);
}

int shortcut_label() const { return flags_ & SHORTCUT_LABEL; }

#define FL_RESERVED_TYPE 100

#endif
```c
#ifndef Fl_Widget_Surface_h
#define Fl_Widget_Surface_h

#include <FL/Fl_Device.H>
#include <FL/Fl_Window.H>

class FL_EXPORT Fl_Widget_Surface : public Fl_Surface_Device {
private:
    void traverse(Fl_Widget *widget); // finds subwindows of widget and prints them
protected:
    int x_offset;
    int y_offset;
public:
    Fl_Widget_Surface(Fl_Graphics_Driver *d);
    virtual void translate(int x, int y);
    virtual void untranslate();
    void draw(Fl_Widget * widget, int delta_x = 0, int delta_y = 0);
    void draw_decorated_window(Fl_Window *win, int x_offset = 0, int y_offset = 0);
    void print_window_part(Fl_Window *win, int x, int y, int w, int h, int delta_x = 0, int delta_y = 0);
    virtual int printable_rect(int *w, int *h);
    virtual void origin(int x, int y);
    virtual void origin(int *x, int *y);
};

#endif /* Fl_Widget_Surface_h */
```

35.180 Fl_Window.H File Reference

Fl_Window widget.
#include <FL/Fl.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Bitmap.H>

Classes

- class Fl_Window

  This widget produces an actual window.

Macros

- #define FL_DOUBLE_WINDOW 0xF1
do double window type id
- #define FL_WINDOW 0xF0
  window type id: all subclasses have type() \(\geq\) this

35.180.1 Detailed Description

Fl_Window widget.

35.181 Fl_Window.H

Go to the documentation of this file.
```
#ifndef Fl_Window_H
#define Fl_Window_H

#include <FL/Fl.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Bitmap.H>

#define FL_WINDOW 0xF0
#define FL_DOUBLE_WINDOW 0xF1

class Fl_X;
class Fl_Window_Driver;
class Fl_RGB_Image;
class Fl_Double_Window;

class FL_EXPORT Fl_Window : public Fl_Group {
friend class Fl_X;
friend class Fl_Window_Driver;
private:
static char *default_xclass_; // default xclass for the window
static char show_next_window_iconic_; // 1 means create next window in iconic form
int no_fullscreen_x;
int no_fullscreen_y;
int no_fullscreen_w;
int no_fullscreen_h;
int fullscreen_screen_top;
int fullscreen_screen_bottom;
int fullscreen_screen_left;
int fullscreen_screen_right;

// TODO: it would make sense to merge the use of Fl_X and Fl_Window_Driver, maybe simply by deriving Fl_Window_Driver from Fl_X. However, there are a lot of historic kludges.
// TODO: for some platforms around Fl_X.
Fl_X *flx_; // points at the system-specific stuff, but exists only after the window is mapped
Fl_Window_Driver *pWindowDriver; // points at the system-specific stuff at window creation time

const char* iconlabel_; // label for the window icon
char* xclass_; // window class

// private size_range stuff:
int minw_, minh_, maxw_, maxh_; // minimum and maximum width and height
int dw_, dh_, aspect_; // width and height aspect ratio
uchar size_range_set_; // true (1) if size_range() has been set or calculated

// cursor stuff
Fl_Cursor cursor_default;

void _Fl_Window(); // constructor innards

// unimplemented copy ctor and assignment operator
Fl_Window(const Fl_Window&);
Fl_Window& operator=(const Fl_Window&);

void is_maximized_(bool b);

protected:
static Fl_Window *current_; // current Fl_Window
void draw() FL_OVERRIDE;
virtual void flush();

void force_position(int force) {
if (force) set_flag(FORCE_POSITION);
clear_flag(FORCE_POSITION);
}

int force_position() const { return ((flags() & FORCE_POSITION)?1:0); }

void free_icons();

void default_size_range(); // calculate size_range() if not set explicitly
int is_resizable(); // calculate size_range() and return whether this is resizable

public:
static Fl_Window *current_; // current Fl_Window
void draw() FL_OVERRIDE;
virtual void flush();

void force_position(int force) {
if (force) set_flag(FORCE_POSITION);
clear_flag(FORCE_POSITION);
}

int force_position() const { return ((flags() & FORCE_POSITION)?1:0); }

void free_icons();

void default_size_range(); // calculate size_range() if not set explicitly
int is_resizable(); // calculate size_range() and return whether this is resizable

int handle(int) FL_OVERRIDE;

void resize(int X, int Y, int W, int H) FL_OVERRIDE;
void border(int b);

void clear_border() { set_flag(NOBORDER); }

unsigned int border() const { return !(flags() & NOBORDER); }
void set_override() {set_flag(NOBORDER|OVERRIDE);}
unsigned int override() const { return flags() & OVERRIDE; }
void set_modal() {set_flag(MODAL);}
unsigned int modal() const { return flags() & MODAL; }
void set_non_modal() {set_flag(NON_MODAL);}
unsigned int non_modal() const { return flags() & (NON_MODAL|MODAL); }
void clear_modal_states() {clear_flag(NON_MODAL | MODAL);}
void set_menu_window() {set_flag(MENU_WINDOW);}
unsigned int menu_window() const { return flags() & MENU_WINDOW; }
void set_tooltip_window() { set_flag(TOOLTIP_WINDOW); clear_flag(MENU_WINDOW); }
unsigned int tooltip_window() const { return flags() & TOOLTIP_WINDOW; }
void hotspot(int x, int y, int offscreen = 0);
void hotspot(const Fl_Widget * p, int offscreen = 0) {hotspot(&p,offscreen);}
void clear_modal_states() {clear_flag(FORCE_POSITION);}
void size_range(int minw, int minh, int maxw=0, int maxh=0, int dw=0, int dh=0, int aspect=0);
const char * label() const {return Fl_Widget::label();}
const char * iconlabel() const {return iconlabel_;
void label(const char * label, const char* iconlabel); // platform dependent
void copy_label(const char * a);
static void default_xclass(const char *);
static const char * default_xclass();
const char * xclass() const {return xclass_;
void xclass(const char * c);
static void default_icon(const Fl_RGB_Image *);
static void default_icons(const Fl_RGB_Image *[ ], int); void icon(const Fl_RGB_Image *);
void icons(const Fl_RGB_Image *[ ], int); #if defined(_WIN32) || defined(FL_DOXYGEN)
typedef struct HICON__ * HICON;
static void default_icons(HICON big_icon, HICON small_icon);
#endif // defined(_WIN32) || defined(FL_DOXYGEN)
void icons(HICON big_icon, HICON small_icon);
static void default_icons(HICON big_icon, HICON small_icon);
endif // defined(_WIN32) || defined(FL_DOXYGEN)
*/ for legacy compatibility */
const void * icon() const { return icon_; }
void icon(const void * ic);
void x_root() const { return x_root_; }
int y_root() const { return y_root_; }
static Fl_Window * current();
void make_current();
void cursor(Fl_Cursor);
void cursor(const Fl_RGB_Image *, int, int);
void default_cursor(Fl_Cursor);
// for legacy compatibility */
void fullscreen();
void fullscreen_off();
void fullscreen_off(int X, int Y, int W, int H);
unsigned int fullscreen_active() const { return flags() & FULLSCREEN; }
void fullscreen_screens(int top, int bottom, int left, int right);
void maximize();
void un_maximize();
unsigned int maximize_active() const { return flags() & MAXIMIZED; }
public:
void iconize();
int x_root() const { return x_root_; }
int y_root() const { return y_root_; }
static Fl_Window * current();
void make_current();
void cursor(Fl_Cursor);
void cursor(const Fl_RGB_Image *, int, int);
void default_cursor(Fl_Cursor);
555   void cursor(Fl_Cursor c, Fl_Color, Fl_Color=FL_WHITE);
556   void default_cursor(Fl_Cursor c, Fl_Color, Fl_Color=FL_WHITE);
557   static void default_callback(Fl_Window*, void* v);
558   int decorated_w() const;
559   int decorated_h() const;
581   // Note: Doxygen docs in Fl_Widget.H to avoid redundancy.
582   virtual class Fl_Overlay_Window *as_overlay_window() const FL_OVERRIDE { return this; }
583   virtual class Fl_Double_Window *as_double_window() {return 0L;}
589   int decorated_w() const;
590   int decorated_h() const;
594   virtual class Fl_Double_Window *as_double_window() {return 0L;}
595   void shape(const Fl_Image* img);
596   void shape(const Fl_Image& b);
598   const Fl_Image *shape();
599   void draw_backdrop();
600   int screen_num();
601   void screen_num(int screen_num);
602   static bool is_a_rescale();
603   fl_uintptr_t os_id();
612   static void show_next_window_iconic(char stat) {
613     show_next_window_iconic_ = stat ? 1 : 0;
614   }
623   static char show_next_window_iconic() {
624     return show_next_window_iconic_
625   };
626 #endif

35.182 Fl_Wizard.H

1 //
2 // Fl_Wizard widget definitions.
3 //
4 // Copyright 1999-2010 by Easy Software Products.
5 // Copyright 2011-2020 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 // https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 // https://www.fltk.org/bugs.php
16 //
17 //
18 /* file
19 Fl_Wizard widget . */
20 //
21 //
22 // Include necessary header files...
23 //
24 #ifndef _Fl_Wizard_H_
25 #define _Fl_Wizard_H_
27 #include <FL/Fl_Group.H>
29 class FL_EXPORT Fl_Wizard : public Fl_Group {
31   Fl_Widget *value_;  
32   protected:
33     void draw();
34 public:
35     Fl_Wizard(int, int, int, int, const char * a = 0);
36     void next();
37     void prev();
38     Fl_Widget *value();
39     void value(Fl_Widget *);
# Fl_XBM_Image.H

```cpp
#include "Fl_Bitmap.H"

class FL_EXPORT Fl_XBM_Image : public Fl_Bitmap {
    public:
        Fl_XBM_Image(const char * filename);
};
```

## Fl_XPM_Image.H

```cpp
#include "Fl_Pixmap.H"

class FL_EXPORT Fl_XPM_Image : public Fl_Pixmap {
    public:
        Fl_XPM_Image(const char * filename);
};
```

## forms.H

```cpp
#include "Fl_Pixmap.H"

class FL_EXPORT Fl_XPM_Image : public Fl_Pixmap {
    public:
        Fl_XPM_Image(const char * filename);
};
```
#ifndef __FORMS_H__
#define __FORMS_H__

#include "Fl.H"
#include "Fl_Group.H"
#include "Fl_Window.H"
#include "fl_draw.H"

typedef Fl_Widget FL_OBJECT;
typedef Fl_Window FL_FORM;

#define FL_ON 1
#define FL_OK 1
#define FL_VALID 1
#define FL_PREEMPT 1
#define FL_AUTO 2
#define FL_WHEN_NEEDED FL_AUTO
#define FL_OFF 0
#define FL_NONE 0
#define FL_CANCEL 0
#define FL_INVALID 0
#define FL_IGNORE -1

// Random constants & symbols defined by forms.h file:

#define FL_LCOL FL_BLACK
#define FL_COL1 FL_GRAY
#define FL_MCOL FL_LIGHT1
#define FL_LEFT_BCOL FL_LIGHT3 // 53 is better match
#define FL_TOP_BCOL FL_LIGHT2 // 51
#define FL_BOTTOM_BCOL FL_DARK2 // 40
#define FL_RIGHT_BCOL FL_DARK3 // 36
#define FL_INACTIVE FL_INACTIVE_COLOR
#define FL_INACTIVE_COL FL_INACTIVE_COLOR
#define FL_FREE_COL1 FL_FREE_COLOR
#define FL_FREE_COL2 ((Fl_Color)(FL_FREE_COLOR+1))
#define FL_FREE_COL3 ((Fl_Color)(FL_FREE_COLOR+2))
#define FL_FREE_COL4 ((Fl_Color)(FL_FREE_COLOR+3))
#define FL_FREE_COL5 ((Fl_Color)(FL_FREE_COLOR+4))
#define FL_FREE_COL6 ((Fl_Color)(FL_FREE_COLOR+5))
#define FL_FREE_COL7 ((Fl_Color)(FL_FREE_COLOR+6))
#define FL_FREE_COL8 ((Fl_Color)(FL_FREE_COLOR+7))
#define FL_FREE_COL9 ((Fl_Color)(FL_FREE_COLOR+8))
#define FL_FREE_COL10 ((Fl_Color)(FL_FREE_COLOR+9))
#define FL_FREE_COL11 ((Fl_Color)(FL_FREE_COLOR+10))
#define FL_FREE_COL12 ((Fl_Color)(FL_FREE_COLOR+11))
#define FL_FREE_COL13 ((Fl_Color)(FL_FREE_COLOR+12))
#define FL_FREE_COL14 ((Fl_Color)(FL_FREE_COLOR+13))
#define FL_FREE_COL15 ((Fl_Color)(FL_FREE_COLOR+14))
#define FL_FREE_COL16 ((Fl_Color)(FL_FREE_COLOR+15))
#define FL_TOMATO ((Fl_Color)(131))
#define FL_INDIANRED ((Fl_Color)(164))
#define FL_SLATEBLUE ((Fl_Color)(195))
#define FL_DARKGOLD ((Fl_Color)(84))
#define FL_PALEGREEN ((Fl_Color)(157))
#define FL_ORCHID ((Fl_Color)(189))
#define FL_DARKCYAN ((Fl_Color)(189))
#define FL_DARKTOMATO ((Fl_Color)(113))
#define FL_WHEAT ((Fl_Color)(174))

#define FL_ALIGN_BESIDE FL_ALIGN_INSIDE
#define FL_PUP_TOGGLE 2 // FL_MENU_TOGGLE
#define FL_PUP_INACTIVE 1 // FL_MENU_INACTIVE
#define FL_NO_FRAME FL_NO_BOX
#define FL_ROUNDED3D_UPBOX FL_ROUND_UP_BOX

// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
//
// https://www.fltk.org/COPYING.php
//
// Please see the following page on how to report bugs and issues:
//
// https://www.fltk.org/bugs.php
//
// Random constants & symbols defined by forms.h file:

#define FL_LEFT_BCOL FL_LIGHT3 // 53 is better match
#define FL_TOP_BCOL FL_LIGHT2 // 51
#define FL_BOTTOM_BCOL FL_DARK2 // 40
#define FL_RIGHT_BCOL FL_DARK3 // 36
#define FL_INACTIVE FL_INACTIVE_COLOR
#define FL_INACTIVE.COL FL_INACTIVE_COLOR
#define FL_FREE_COL1 FL_FREE_COLOR
#define FL_FREE_COL2 ((Fl_Color)(FL_FREE_COLOR+1))
#define FL_FREE_COL3 ((Fl_Color)(FL_FREE_COLOR+2))
#define FL_FREE_COL4 ((Fl_Color)(FL_FREE_COLOR+3))
#define FL_FREE_COL5 ((Fl_Color)(FL_FREE_COLOR+4))
#define FL_FREE_COL6 ((Fl_Color)(FL_FREE_COLOR+5))
#define FL_FREE_COL7 ((Fl_Color)(FL_FREE_COLOR+6))
#define FL_FREE_COL8 ((Fl_Color)(FL_FREE_COLOR+7))
#define FL_FREE_COL9 ((Fl_Color)(FL_FREE_COLOR+8))
#define FL_FREE_COL10 ((Fl_Color)(FL_FREE_COLOR+9))
#define FL_FREE_COL11 ((Fl_Color)(FL_FREE_COLOR+10))
#define FL_FREE_COL12 ((Fl_Color)(FL_FREE_COLOR+11))
#define FL_FREE_COL13 ((Fl_Color)(FL_FREE_COLOR+12))
#define FL_FREE_COL14 ((Fl_Color)(FL_FREE_COLOR+13))
#define FL_FREE_COL15 ((Fl_Color)(FL_FREE_COLOR+14))
#define FL_FREE_COL16 ((Fl_Color)(FL_FREE_COLOR+15))
#define FL_TOMATO ((Fl_Color)(131))
#define FL_INDIANRED ((Fl_Color)(164))
#define FL_SLATEBLUE ((Fl_Color)(195))
#define FL_DARKGOLD ((Fl_Color)(84))
#define FL_PALEGREEN ((Fl_Color)(157))
#define FL_ORCHID ((Fl_Color)(203))
#define FL_DARKCYAN ((Fl_Color)(189))
#define FL_DARKTOMATO ((Fl_Color)(113))
#define FL_WHEAT ((Fl_Color)(174))
#define FL_ALIGN_BESIDE FL_ALIGN_INSIDE
#define FL_PUP_TOGGLE 2 // FL_MENU_TOGGLE
#define FL_PUP_INACTIVE 1 // FL_MENU_INACTIVE
#define FL_NO_FRAME FL_NO_BOX
#define FL_ROUNDED3D_UPBOX FL_ROUND_UP_BOX

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#define FL_ROUNDED3D_DOWNBOX FL_ROUND_DOWN_BOX
#define FL_OVAL3D_UPBOX FL_ROUND_UP_BOX
#define FL_OVAL3D_DOWNBOX FL_ROUND_DOWN_BOX
#define FL_MBUTTON1 1
#define FL_LEFTMOUSE 1
#define FL_MBUTTON2 2
#define FL_MIDDLEMOUSE 2
#define FL_MBUTTON3 3
#define FL_RIGHTMOUSE 3
#define FL_MBUTTON4 4
#define FL_MBUTTON5 5
#define FL_INVALID_STYLE 255
#define FL_NORMAL_STYLE FL_HELVETICA
#define FL_BOLD_STYLE FL_HELVETICA_BOLD
#define FL_ITALIC_STYLE FL_HELVETICA_ITALIC
#define FL_BOLDITALIC_STYLE FL_HELVETICA_BOLD_ITALIC
#define FL_FIXED_STYLE FL_COURIER
#define FL_FIXEDBOLD_STYLE FL_COURIER_BOLD
#define FL_FIXEDITALIC_STYLE FL_COURIER_ITALIC
#define FL_FIXEDBOLDITALIC_STYLE FL_COURIER_BOLD_ITALIC
#define FL_TIMES_STYLE FL_TIMES
#define FL_TIMESBOLD_STYLE FL_TIMES_BOLD
#define FL_TIMESITALIC_STYLE FL_TIMES_ITALIC
#define FL_TIMESBOLDITALIC_STYLE FL_TIMES_BOLD_ITALIC
#define FL_SHADOW_STYLE (FL_SHADOW_LABEL«8)
#define FL_ENGRAVED_STYLE (FL_ENGRAVED_LABEL«8)
#define FL_EMBOSSED_STYLE (FL_EMBOSSED_LABEL«8)
#define FL_TINY_SIZE 8
#define FL_SMALL_SIZE 11 // 10
#define FL_NORMAL_SIZE 14 // 12
#define FL_MEDIUM_SIZE 18 // 14
#define FL_LARGE_SIZE 24 // 18
#define FL_HUGE_SIZE 32 // 24
#define FL_DEFAULT_SIZE FL_SMALL_SIZE
#define FL_TINY_FONT FL_TINY_SIZE
#define FL_SMALL_FONT FL_SMALL_SIZE
#define FL_NORMAL_FONT FL_NORMAL_SIZE
#define FL_MEDIUM_FONT FL_MEDIUM_SIZE
#define FL_LARGE_FONT FL_LARGE_SIZE
#define FL_HUGE_FONT FL_HUGE_SIZE
#define FL_DEFAULT_FONT FL_SMALL_FONT
#define FL_RETURN_END_CHANGED FL_WHEN_RELEASE
#define FL_RETURN_CHANGED FL_WHEN_CHANGED
#define FL_RETURN_END FL_WHEN_RELEASE_ALWAYS
#define FL_RETURN_ALWAYS (FL_WHEN_CHANGED|FL_WHEN_NOT_CHANGED)
#define FL_BOUND_WIDTH 3
#define FL_CMD_OPT void
extern FL_EXPORT void fl_initialize(int*, char*[], const char*, FL_CMD_OPT*, int);
inline void fl_finish() {}

#define FL_SHADOW_LABEL «8)
#define FL_ENGRAVED_LABEL «8)
#define FL_EMBOSSED_LABEL «8)

inline void fl_add_io_callback(int fd, short w, FL_IO_CALLBACK cb, void* v)
inline void fl_remove_io_callback(int fd, short, FL_IO_CALLBACK)
inline void fl_add_timeout(long msec, void (*cb)(void*), void* v)
inline void fl_remove_timeout(int)
inline void fl_set_idle_callback(void (*cb)())
inline void fl_freeze_object(Fl_Widget*)

typedef int FL_Coord;
typedef int FL_COLOR;
typedef int FL_Coord;
typedef int FL_COLOR;
typedef void (*FL_IO_CALLBACK) (FL_SOCKET, void*);
Fl::add_fd(fd, w, cb, v);
Fl::remove_fd(fd); // removes all the callbacks!
Fl::add_timeout(msec *.001, cb, v);
Fl::remove_timeout(fd);
Fl::set_idle(cb);
void fl_do_forms(void);
void fl_check_forms();

inline void fl_add_timeout(long msec, void (*cb)(void*), void* v)
inline void fl_remove_timeout(int) { }
inline void fl_set_idle_callback(void (*cb)()) { Fl::set_idle(cb); }
inline void fl_freeze_object(Fl_Widget*) { }
inline void fl_set_idle_callback(void (*cb)()) { Fl::set_idle(cb); }
inline void fl_freeze_object(Fl_Widget*) { }

void fl_do_forms(void);
void fl_check_forms();
inline void fl_do_only_forms(void) {return fl_do_forms();}
inline void fl_check_only_forms(void) {return fl_check_forms();}

// because of new redraw behavior, these are no-ops:
inline void fl_freeze_object(Fl_Widget*) { }

Generated by Doxygen
inline void fl_unfreeze_object(Fl_Widget*) {}
inline void fl_unfreeze_form(Fl_Window*) {}
inline void fl_unfreeze_all_forms() {}
inline void fl_unfreeze_all_forms() {}

inline void fl_unfreeze_object(Fl_Widget*) {Fl::focus(o);}
inline void fl_freeze_form(Fl_Window*) {}  
inline void fl_unfreeze_form(Fl_Window*) {}  
inline void fl_freeze_all_forms() {}
inline void fl_unfreeze_all_forms() {}  

inline void fl_set_focus_object(Fl_Window*, Fl_Widget* o) {Fl::focus(o);}
inline void fl_reset_focus_object(Fl_Widget* o) {Fl::focus(o);}
#define fl_set_object_focus fl_set_focus_object

// void fl_set_form_atclose(Fl_Window*w,int (*cb)(Fl_Window*,void*),void* v)
// void fl_set_atclose(int (*cb)(Fl_Window*,void*),void*)
// fl_set_form_atactivate/atdeactivate not implemented!

// Fl_Widget:

inline void fl_set_object_boxtype(Fl_Widget* o, Fl_Boxtype a) {o->box(a);}
inline void fl_set_object_lsize(Fl_Widget* o, int s) {o->labelfont((Fl_Font)(a&0xff)); o->labeltype((Fl_Labeltype)(a>>8));}
inline void fl_set_object_lstyle(Fl_Widget* o, int a) {o->labelfont((Fl_Font)(a&0xff)); o->labeltype((Fl_Labeltype)(a>>8));}
inline void fl_set_object_lcol(Fl_Widget* o, Fl_Color a) {o->labelcolor(a);}
#define fl_set_object_lcolor fl_set_object_lcol
inline void fl_set_object_lalign(Fl_Widget* o, Fl_Align a) {o->align(a);}
#define fl_set_object_align fl_set_object_lalign
inline void fl_set_object_color(Fl_Widget* o, Fl_Color a, Fl_Color b) {o->color(a,b);}
inline void fl_set_object_label(Fl_Widget* o, const char* a) {o->label(a); o->redraw();}
inline void fl_set_object_position(Fl_Widget* o, int x, int y) {o->position(x,y);}
inline void fl_set_object_geometry(Fl_Widget* o, int x, int y, int w, int h) {o->position(x,y,w,h);}
inline void fl_set_object_label(Fl_Widget* o, const char* a) {o->label(a); o->redraw();}
inline void fl_set_object_position(Fl_Widget* o, int x, int y) {o->position(x,y);}
inline void fl_set_object_geometry(Fl_Widget* o, int x, int y, int w, int h) {o->position(x,y,w,h);}

#define Form_CB (Forms_CB) (FL_Widget*, long);
inline void fl_set_object_callback(Fl_Widget* o, Forms_CB cb, long a) {o->callback(cb(a));}
#define fl_set_object_callback (Forms_CB) (FL_Widget*, long)
inline void fl_set_object_callback(Fl_Widget* o, Forms_CB cb, long a) {o->callback(cb(a));}
inline void fl_trigger_object(Fl_Widget* o) {o->do_callback();}
inline void fl_set_object_return(Fl_Widget* o, int v) {o->when((Fl_When)(v|FL_WHEN_RELEASE));}
inline void fl_get_border_width() {return 3;}
inline void fl_set_border_width(int) {}  
inline void fl_set_form_dblbuffer(Fl_Window*, int) {}  

// Fl_Window:

inline void fl_free_form(Fl_Window* x) {delete x;}
inline void fl_redraw_form(Fl_Window* f) {f->redraw();}
inline void fl_get_form_position(Fl_Window*, int x, int y) {f->position(x,y);}
inline void fl_free_object(Fl_Widget* x) {delete x;}
inline void fl_redraw_object(Fl_Widget* f) {f->redraw();}
inline void fl_set_object_dblbuffer(Fl_Widget* o, int) {o->dblbuffer(int);}
inline void fl_addto_form(Fl_Window* f) {f->begin();}
inline Fl_Group* fl_bgn_group() {return new Fl_Group(0,0,0,0,0);}
inline void fl_end_group() {Fl_Group::current()->forms_end();}
inline void fl_addto_group(Fl_Widget* o) {((Fl_Group* )o)->begin();

inline void fl_add_object(Fl_Window* f, Fl_Widget* x) {f->add(x);}
inline void fl_insert_object(Fl_Widget* o, Fl_Widget* b) {b->parent()|insert(+o,b);}

inline Fl_Widget* FL_ObjWin(Fl_Widget* o) {return o->window();}
inline Fl_Ob jMin(Fl_Widget* o) {return o->window();}

// things that appered in the demos a lot that I don’t emulate, but
// I did not want to edit out of all the demos...

// Fl_Widget:

// Fl_Window:

// Forms lib font indexes must be byte sized - extract correct byte from style word */

// void fl_set_form_atclose(Fl_Window*w,int (*cb)(Fl_Window*,void*),void* v)
// void fl_set_atclose(int (*cb)(Fl_Window*,void*),void*)
// fl_set_form_atactivate/atdeactivate not implemented!

// Fl_Widget:

inline void fl_set_object_boxtype(Fl_Widget* o, Fl_Boxtype a) {o->box(a);}
inline void fl_set_object_lsize(Fl_Widget* o, int s) {o->labelfont((Fl_Font)(a&0xff)); o->labeltype((Fl_Labeltype)(a>>8));}
inline void fl_set_object_lstyle(Fl_Widget* o, int a) {o->labelfont((Fl_Font)(a&0xff)); o->labeltype((Fl_Labeltype)(a>>8));}
inline void fl_set_object_lcol(Fl_Widget* o, Fl_Color a) {o->labelcolor(a);}
#define fl_set_object_lcolor fl_set_object_lcol
inline void fl_set_object_lalign(Fl_Widget* o, Fl_Align a) {o->align(a);}
#define fl_set_object_align fl_set_object_lalign
inline void fl_set_object_color(Fl_Widget* o, Fl_Color a, Fl_Color b) {o->color(a,b);}
inline void fl_set_object_label(Fl_Widget* o, const char* a) {o->label(a); o->redraw();}
inline void fl_set_object_position(Fl_Widget* o, int x, int y) {o->position(x,y);}
inline void fl_set_object_geometry(Fl_Widget* o, int x, int y, int w, int h) {o->position(x,y,w,h);}
inline void fl_set_object_label(Fl_Widget* o, const char* a) {o->label(a); o->redraw();}
inline void fl_set_object_position(Fl_Widget* o, int x, int y) {o->position(x,y);}
inline void fl_set_object_geometry(Fl_Widget* o, int x, int y, int w, int h) {o->position(x,y,w,h);}

#define Form_CB (Forms_CB) (FL_Widget*, long);
inline void fl_set_object_callback(Fl_Widget* o, Forms_CB cb, long a) {o->callback(cb(a));}
#define fl_set_object_callback (Forms_CB) (FL_Widget*, long)
inline void fl_set_object_callback(Fl_Widget* o, Forms_CB cb, long a) {o->callback(cb(a));}
inline void fl_trigger_object(Fl_Widget* o) {o->do_callback();}
inline void fl_set_object_return(Fl_Widget* o, int v) {o->when((Fl_When)(v|FL_WHEN_RELEASE));}
inline void fl_get_border_width() {return 3;}
inline void fl_set_border_width(int) {}  
inline void fl_set_form_dblbuffer(Fl_Window*, int) {}  

// Fl_Window:

inline void fl_free_form(Fl_Window* x) {delete x;}
inline void fl_redraw_form(Fl_Window* f) {f->redraw();}
inline void fl_get_form_position(Fl_Window*, int x, int y) {f->position(x,y);}
inline void fl_free_object(Fl_Widget* x) {delete x;}
inline void fl_redraw_object(Fl_Widget* f) {f->redraw();}
inline void fl_set_object_dblbuffer(Fl_Widget* o, int) {o->dblbuffer(int);}
inline void fl_add_object(Fl_Window* f, Fl_Widget* x) {f->add(x);}
inline void fl_insert_object(Fl_Widget* o, Fl_Widget* b) {b->parent()|insert(+o,b);}

inline Fl_Widget* FL_ObjWin(Fl_Widget* o) {return o->window();}
inline Fl_Ob jMin(Fl_Widget* o) {return o->window();}

// things that appered in the demos a lot that I don’t emulate, but
// I did not want to edit out of all the demos...

// Fl_Widget:

// Fl_Window:

// Forms lib font indexes must be byte sized - extract correct byte from style word */
271 inline void fl_set_form_geometry(Fl_Window* f, int x, int y, int w, int h) {
272 f->resize(x, y, w, h);
273}
274 #define fl_set_initial_placement fl_set_form_geometry
275 inline void fl_adjust_form_size(Fl_Window*) {}
276
277 FL_EXPORT void fl_show_form(Fl_Window* f, int p, int b, const char* n);
278 enum { // "p" argument values:
279 FL_PLACE_FREE = 0, // make resizable
280 FL_PLACE_MOUSE = 1, // mouse centered on form
281 FL_PLACE_CENTER = 2, // center of the screen
282 FL_PLACE_POSITION = 4, // fixed position, resizable
283 FL_PLACE_SIZE = 8, // fixed size, normal fltk behavior
284 FL_PLACE_GEOMETRY = 16, // fixed size and position
285 FL_PLACE_ASPECT = 32, // keep aspect ratio (ignored)
286 FL_PLACE_FULLSCREEN = 64, // fill screen
287 FL_PLACE_HOTSPOT = 128, // enables hotspot
288 FL_PLACE_ICONIC = 256, // iconic (ignored)
289 FL_FREE_SIZE=(1<<14), // force resizable
290 FL_FIX_SIZE=(1<<15) // force off resizable
291};
292 #define FL_PLACE_FREE_CENTER (FL_PLACE_CENTER|FL_FREE_SIZE)
293 #define FL_PLACE_CENTERFREE (FL_PLACE_CENTER|FL_FREE_SIZE)
294 enum { // "b" argument values:
295 FL_NOBORDER = 0,
296 FL_FULLBORDER,
297 FL_TRANSIENT
298};
299 inline void fl_set_form_hotspot(Fl_Window* w, int x, int y) {w->hotspot(x, y);}
300 inline void fl_set_form_hotobject(Fl_Window* w, Fl_Widget* o) {w->hotspot(o);}
301 extern FL_EXPORT char fl_flip; // in forms.C
302 inline void fl_flip_yorigin() {fl_flip = 1;}
303
304 #define fl_prepare_form_window fl_show_form
305 inline void fl_show_form_window(Fl_Window*) {};
306
307 inline void fl_raise_form(Fl_Window* f) {f->show();}
308
309 inline void fl_hide_form(Fl_Window* f) {f->hide();}
310 inline void fl_pop_form(Fl_Window* f) {f->show();}
311
312 extern FL_EXPORT char fl_modal_next; // in forms.C
313 inline void fl_activate_all_forms() {}
314 inline void fl_deactivate_all_forms() {fl_modal_next = 1;}
315 inline void fl_deactivate_form(Fl_Window*w) {w->deactivate();}
316 inline void fl_activate_form(Fl_Window*w) {w->activate();}
317
318 inline void fl_set_form_title(Fl_Window* f, const char* s) {f->label(s);}
319 inline void fl_title_form(Fl_Window* f, const char* s) {f->label(s);}
320
321 typedef void (*Forms_FormCB)(Fl_Widget*);
322 inline void fl_set_form_callback(Fl_Window* f, Forms_FormCB c) {f->callback(c);}
323 #define fl_set_form_call_back fl_set_form_callback
324
325 inline void fl_init() {}
326 FL_EXPORT void fl_set_graphics_mode(int,int);
327
328 inline int fl_form_is_visible(Fl_Window* f) {return f->visible();}
329
330 inline int fl_mouse_button() {return Fl::event_button();}
331 #define fl_mousebutton fl_mouse_button
332
333 #define fl_free free
334 #define fl_malloc malloc
335 #define fl_calloc calloc
336 #define fl_realloc realloc
337
339 // Drawing functions. Only usable inside an Fl_Free object?
340
341 inline void fl_drw_box(Fl_Boxtype b, int x, int y, int w, int h, Fl_Color bgc, int=3) {
342 fl_draw_box(b, x, y, w, h, bgc);
343}
344 inline void fl_drw_box(Fl_Boxtype b, int x, int y, int w, int h, Fl_Color bgc, int=3) {
345 fl_draw_box(b, x, y, w, h, bgc);
346}
347 inline void fl_drw_text(Fl_Align align, int x, int y, int w, int h, Fl_Color fgcolor, int size, Fl_Font style,
348 const char* s) {
349 fl_font(style, size);
350 fl_color(fgcolor);
351 fl_draw(s, x, y, w, h, align);
352}
353
354 // this does not work except for CENTER...
355 inline void fl_drw_text_beside(Fl_Align align, int x, int y, int w, int h, Fl_Color fgcolor, int size, Fl_Font style,
356 const char* s) {
357 fl_font(style, size);
35.185 forms.H

359 fl_color(fgcolor);
360 fl_draw(s,x,y,w,h,align);
361 }
362
363 inline void fl_set_font_name(Fl_Font n, const char* s) { Fl::set_font(n,s); }
364 inline void fl_mapcolor(Fl_Color c, uchar r, uchar g, uchar b) { Fl::set_color(c,r,g,b); }
365 #define fl_set_clipping(x,y,w,h) fl_push_clip(x,y,w,h)
366 #define fl_unset_clipping() fl_pop_clip()
367
368 // Forms classes:
369
370 inline Fl_Widget* fl_add_new(Fl_Widget* p) { return p; }
371 inline Fl_Widget* fl_add_new(uchar t, Fl_Widget* p) { p->type(t); return p; }
372
373 // Define forms constructors:
374
375 inline Fl_Widget* fl_add_new(Fl_Widget* p) { return p; }
376 inline Fl_Widget* fl_add_new(uchar t, Fl_Widget* p) { p->type(t); return p; }
377
378 #define forms_constructor(type, name)
379
380 // 
381 inline type* name(uchar t, int x, int y, int w, int h) { return (type*) fl_add_new(type, x, y, w, h, name); }
382
383 inline type* name(uchar t, int x, int y, int w, int h, const char* l) { return (type*) fl_add_new(type, x, y, w, h, l); }
384
385 #define forms_constructorb(type, name)
386
387 // 
388 inline type* name(Fl_Boxtype t, int x, int y, int w, int h) { return (type*) fl_add_new(type, t, x, y, w, h); }
389
390 #include "Fl_FormsBitmap.H"
391 #define FL_NORMAL_BITMAP FL_NO_BOX
392 forms_constructorb(Fl_FormsBitmap, fl_add_bitmap)
393 inline void fl_set_bitmap_data(Fl_Widget* o, int w, int h, const uchar* b) {
394 ((Fl_FormsBitmap*)o)->set(w,h,b);
395 }
396
397 #include "Fl_FormsPixmap.H"
398 #define FL_NORMAL_PIXMAP FL_NO_BOX
399 forms_constructorb(Fl_FormsPixmap, fl_add_pixmap)
400 inline void fl_set_pixmap_data(Fl_Widget* o, char*const* b) {
401 ((Fl_FormsPixmap*)o)->set(b);
402 }
403
404 #include "Fl_Browser.H"
405 forms_constructor(Fl_Browser, fl_add_browser)
406
407 // Fl_Browser:
408
409 inline void fl_clear_browser(Fl_Widget* o) {
410 ((Fl_Browser*)o)->clear();
411 inline void fl_add_browser_line(Fl_Widget* o, const char* s) {
412 ((Fl_Browser*)o)->add(s);
413 inline void fl_add_hidden_browser(Fl_Widget* o, const char* s) {
414 ((Fl_Browser*)o)->add_hidden(s);
415 // should also scroll to bottom
416 // /inline void fl_add_browser_chars(Fl_Widget*, const char*)
417 // #define fl_append_browser fl_add_browser_chars
418 inline void fl_insert_browser_line(Fl_Widget* o, int n, const char* s) {
419 ((Fl_Browser*)o)->insert(n,s);
420 inline void fl_delete_browser_line(Fl_Widget* o, int n) {
421 ((Fl_Browser*)o)->remove(n);
422 inline void fl_replace_browser_line(Fl_Widget* o, int n, const char* s) {
423 ((Fl_Browser*)o)->replace(n,s);
424 inline char* fl_get_browser_line(Fl_Widget* o, int n) {
425 return ((Fl_Browser*)o)->text(n);
426 inline int fl_load_browser(Fl_Widget* o, const char* f) {
427 return Fl::load_browser(o,f);
428 inline void fl_select_browser_line(Fl_Widget* o, int n) {
429 ((Fl_Browser*)o)->select(n,1);
430 inline void fl_deselect_browser_line(Fl_Widget* o, int n) {
431 ((Fl_Browser*)o)->deselect(n,0);
432 inline void fl_deselect_browser(Fl_Widget* o) {
433 //inline int fl_isselected_browser_line(Fl_Widget* o, int n) {
434 return fl::isselected_browser_line(o,n);
435 inline void fl_get_browser_topline(Fl_Widget* o) {
436 return ((Fl_Browser*)o)->topline();
437 inline void fl_get_browser(Fl_Widget* o) {
438 return ((Fl_Browser*)o)->value();
439 inline void fl_get_browser_maxline(Fl_Widget* o) {
440 return ((Fl_Browser*)o)->size();
441 //inline int fl_get_browser_screenslines(Fl_Widget*);
442 inline void fl_set_browser_topline(Fl_Widget* o, int n) {
443 ((Fl_Browser*)o)->topline(n);
444 inline void fl_set_browser_fontsize(Fl_Widget* o, Fl_Font s) {
445 ((Fl_Browser*)o)->textsize(s);
446 inline void fl_set_browser_fontstyle(Fl_Widget* o, Fl_Font s) {
inline void fl_set_browser_specialkey(Fl_Widget* o, char c) {
    ((Fl_Browser *)o)->textfont(s);
}

inline void fl_set_browser_vscrollbar(Fl_Widget*, int);
inline void fl_set_browser_hscrollbar(Fl_Widget*, int);
#define fl_set_browser_leftscrollbar fl_set_browser_leftslider
inline void fl_set_browser_line_selectable(Fl_Widget*, int, int);
inline void fl_set_browser_dimension(Fl_Widget*, int, int*, int*, int*, int);
inline void fl_set_browser_dblclick_callback(Fl_Widget*, FL_CALLBACKPTR, long);
inline void fl_set_browser_scrollbarsize(Fl_Widget*, int, int);

inline void fl_setdisplayed_browser_line(Fl_Widget* o, int n, int i) {
    ((Fl_Browser *)o)->display(n, i);
}
inline int fl_isdisplayed_browser_line(Fl_Widget* o, int n) {
    return ((Fl_Browser *)o)->displayed(n);
}

#include "Fl_Button.H"

#define FL_NORMAL_BUTTON 0
#define FL_TOUCH_BUTTON 4
#define FL_INOUT_BUTTON 5
#define FL_RETURN_BUTTON 6
#define FL_HIDDEN_RET_BUTTON 7
#define FL_PUSH_BUTTON FL_TOGGLE_BUTTON
#define FL_MENU_BUTTON 9

FL_EXPORT Fl_Button* fl_add_button(uchar t, int x, int y, int w, int h, const char* l);
inline int fl_get_button(Fl_Widget* b) {return ((Fl_Button*)b)->value();}
inline void fl_set_button(Fl_Widget* b, int v) {((Fl_Button*)b)->value(v);}
inline int fl_get_button_numb(Fl_Widget*) {return Fl::event_button();}
inline void fl_set_button_shortcut(Fl_Widget* b, const char* s, int=0) {
    ((Fl_Button*)b)->shortcut(s);
}
#define fl_set_object_shortcut(b,s) fl_set_button_shortcut(b,s)

#include "Fl_Light_Button.H"
forms_constructor(Fl_Light_Button, fl_add_lightbutton)

#include "Fl_Round_Button.H"
forms_constructor(Fl_Round_Button, fl_add_roundbutton)
forms_constructor(Fl_Round_Button, fl_add_round3dbutton)

#include "Fl_Check_Button.H"
forms_constructor(Fl_Check_Button, fl_add_checkbutton)

inline Fl_Widget* fl_add_bitmapbutton(int t, int x, int y, int w, int h, const char* l) {
    Fl_Widget* o = fl_add_button(t, x, y, w, h, l);
    return o;
}
inline void fl_set_bitmapbutton_data(Fl_Widget* o, int a, int b, uchar* c) {
    (new Fl_Bitmap(c, a, b))->label(o); // does not delete old Fl_Bitmap!
}

inline Fl_Widget* fl_add_pixmapbutton(int t, int x, int y, int w, int h, const char* l) {
    Fl_Widget* o = fl_add_button(t, x, y, w, h, l);
    return o;
}
inline void fl_set_pixmapbutton_data(Fl_Widget* o, const char* const* c) {
    (new Fl_Pixmap(c))->label(o); // does not delete old Fl_Pixmap!
}

// Fl_Canvas object not yet implemented!

#include "Fl_Chart.H"
forms_constructor(Fl_Chart, fl_add_chart)
inline void fl_clear_chart(Fl_Widget* o) {
    ((Fl_Chart*)o)->clear();
}
inline void fl_add_chart_value(Fl_Widget* o, double v, const char* s, uchar c) {
    ((Fl_Chart*)o)->add(v, s, c);
}
inline void fl_insert_chart_value(Fl_Widget* o, int i, double v, const char* s, uchar c) {
    ((Fl_Chart*)o)->insert(i, v, s, c);
}
inline void fl_replace_chart_value(Fl_Widget* o, int i, double v, const char* s, uchar c) {
    ((Fl_Chart*)o)->replace(i, v, s, c);
}
inline void fl_set_chart_bounds(Fl_Widget* o, double a, double b) {
    ((Fl_Chart*)o)->bounds(a, b);
}
inline void fl_set_chart_maxnumb(Fl_Widget* o, int v) {
    ((Fl_Chart*)o)->maxnumb(v);
}
inline void fl_set_chart_maxsize(Fl_Widget* o, int v) {
    ((Fl_Chart*)o)->maxsize(v);
}
inline void fl_set_chart_justification(Fl_Widget* o, FL_JUSTIFY v) {
    ((Fl_Chart*)o)->justification(v);
}
inline void fl_set_chart_lstyle(Fl_Widget* o, Fl_Font v) {
    ((Fl_Chart*)o)->lstyle(v);
}
inline void fl_set_chart_lsize(Fl_Widget* o, int v) {
    ((Fl_Chart*)o)->lsize(v);
}
inline void fl_set_chart_lcolor(Fl_Widget* o, Fl_Color v) {
    ((Fl_Chart*)o)->lcolor(v);
}
#define fl_set_chart_lcol fl_set_chart_lcolor

#include "Fl_Choice.H"
#define FL_NORMAL_CHOICE 0
#define FL_NORMAL_CHOICE2 0
#define FL_DROPLIST_CHOICE 0
inline void fl_clear_choice(Fl_Widget* o) {
    ((Fl_Choice *)o)->clear();
}

inline void fl_add_choice(Fl_Widget* o, const char* s) {
    ((Fl_Choice *)o)->add(s);
}

inline void fl_replace_choice(Fl_Widget* o, int i, const char* s) {
    ((Fl_Choice *)o)->replace(i-1, s);
}

inline void fl_delete_choice(Fl_Widget* o, int i) {
    ((Fl_Choice *)o)->remove(i-1);
}

inline void fl_set_choice(Fl_Widget* o, int i) {
    ((Fl_Choice *)o)->value(i-1);
}

// inline void fl_set_choice_text(Fl_Widget*, const char*);

inline int fl_get_choice(Fl_Widget* o) {
    return ((Fl_Choice *)o)->value()+1;
}

// inline const char* fl_get_choice_item_text(Fl_Widget*, int);

inline const char* fl_get_choice_text(Fl_Widget* o) {
    return ((Fl_Choice *)o)->text();
}

inline void fl_set_choice_fontsize(Fl_Widget* o, int x) {
    ((Fl_Choice *)o)->textsize(x);
}

inline void fl_set_choice_fontstyle(Fl_Widget* o, Fl_Font x) {
    ((Fl_Choice *)o)->textfont(x);
}

// inline void fl_set_choice_item_mode(Fl_Widget*, int, unsigned);

// inline void fl_set_choice_item_shortcut(Fl_Widget*, int, const char*);

#include "Fl_Clock.H"

forms_processor(Fl_Clock, fl_add_clock)

inline void fl_get_clock(Fl_Widget* o, int* h, int* m, int* s) {
    *h = ((Fl_Clock*)o)->hour();
    *m = ((Fl_Clock*)o)->minute();
    *s = ((Fl_Clock*)o)->second();
}

#include "Fl_Counter.H"

forms_processor(Fl_Counter, fl_add_counter)

inline void fl_set_counter_value(Fl_Widget* o, double v) {
    ((Fl_Counter *)o)->value(v);
}

inline void fl_set_counter_bounds(Fl_Widget* o, double a, double b) {
    ((Fl_Counter*)o)->bounds(a, b);
}

inline void fl_set_counter_step(Fl_Widget* o, double a, double b) {
    ((Fl_Counter*)o)->step(a, b);
}

inline void fl_set_counter_precision(Fl_Widget* o, int v) {
    ((Fl_Counter*)o)->precision(v);
}

inline void fl_set_counter_return(Fl_Widget* o, int v) {
    ((Fl_Counter*)o)->when((Fl_When)(v|FL_WHEN_RELEASE));
}

inline double fl_get_counter_value(Fl_Widget* o) {
    return ((Fl_Counter*)o)->value();
}

inline void fl_get_counter_bounds(Fl_Widget* o, float* a, float* b) {
    *a = float(((Fl_Counter*)o)->minimum());
    *b = float(((Fl_Counter*)o)->maximum());
}

// inline void fl_set_counter_filter(Fl_Widget*, const char* (*)(Fl_Widget*, double, int));

// Cursor stuff cannot be emulated because it uses X stuff

inline void fl_set_cursor(Fl_Window* w, Fl_Cursor c) {w->cursor(c);
}

#define FL_INVISIBLE_CURSOR FL_CURSOR_NONE
#define FL_DEFAULT_CURSOR FL_CURSOR_DEFAULT

#include "Fl_Dial.H"

forms_processor(Fl_Dial, fl_add_dial)

#define FL_DIAL_COL1 FL_GRAY
#define FL_DIAL_COL2 37

inline void fl_set_dial_value(Fl_Widget* o, double v) {
    ((Fl_Dial *)o)->value(v);
}

inline double fl_get_dial_value(Fl_Widget* o) {
    return ((Fl_Dial *)o)->value();
}

inline void fl_set_dial_bounds(Fl_Widget* o, double a, double b) {
    ((Fl_Dial*)o)->bounds(a, b);
}

inline void fl_get_dial_bounds(Fl_Widget* o, float* a, float* b) {
    *a = float(((Fl_Dial*)o)->minimum());
    *b = float(((Fl_Dial*)o)->maximum());
}

// inline void fl_set_dial_angles(Fl_Widget* o, int a, int b);

// inline void fl_set_dial_direction(Fl_Widget* o, uchar d) {
//    ((Fl_Dial *)o)->direction(d);

inline void fl_set_dial_step(Fl_Widget* o, double v) {
    ((Fl_Dial *)o)->step(v);
}

// Frames:
inline Fl_Widget* fl_add_frame(Fl_Boxtype i, int x, int y, int w, int h, const char* l) {
    return fl_add_box(i, x-3, y-3, w+6, h+6, l);
}

// labelframe nyi
inline Fl_Widget* fl_add_labelframe(Fl_Boxtype i, int x, int y, int w, int h, const char* l) {
    Fl_Widget * o = fl_add_box(i, x-3, y-3, w+6, h+6, l);
    o->align(FL_ALIGN_TOP_LEFT);
    return o;
}

#include "Fl_Free.H"
inline Fl_Free* fl_add_free(int t, double x, double y, double w, double h, const char* l, FL_HANDLEPTR hdl) {
    return (Fl_Free *) (fl_add_new(new Fl_Free(t, int(x), int(y), int(w), int(h), l, hdl)));
}

#include "fl_ask.H"
#include "fl_show_colormap.H"

inline int fl_show_question(const char* c, int = 0) {return fl_choice("%s", fl_no, fl_yes, 0L, c);}
FL_EXPORT void fl_show_message(const char *, const char *, const char *);
FL_EXPORT void fl_show_alert(const char *, const char *, const char *, int=0);
FL_EXPORT int fl_show_question(const char *, const char *, const char *);
inline const char *fl_show_input(const char *l, const char*d=0) {return fl_input("%s", d, l);}
FL_EXPORT /*const*/ char *fl_show_simple_input(const char *label, const char *deflt = 0);
FL_EXPORT int fl_show_choice(const char *m1, const char *m2, const char *m3, int numb, const char *b0, const char *b1, const char *b2);
inline void fl_set_goodies_font(Fl_Font a, Fl_Fontsize b) {fl_message_font(a, b);}
#define fl_show_messages fl_message
inline int fl_show_choices(const char* c, int n, const char* b1, const char* b2, const char * b3, int) {
    return fl_show_choice(0, c, 0, n, b1, b2, b3);
}

#include "filename.H"
#include "Fl_File_Chooser.H"
inline int do_matching(char* a, const char* b) {return fl_filename_match(a, b);}

// Forms-compatible file chooser (implementation in fselect.C):
FL_EXPORT char* fl_show_file_selector(const char* message, const char* dir, const char* pat, const char* fname);
FL_EXPORT char* fl_get_directory();
FL_EXPORT char* fl_get_pattern();
FL_EXPORT char* fl_get_filename();

#include "Fl_Input.H"
forms_constructor(Fl_Input, fl_add_input)
inline void fl_set_input(Fl_Widget* o, const char* v) {
    ((Fl_Input *)o)->value(v);
}
inline void fl_set_input_return(Fl_Widget* o, int x) {
    ((Fl_Input *)o)->when((Fl_When)(x | FL_WHEN_RELEASE));
}
inline void fl_set_input_color(Fl_Widget* o, Fl_Color a, Fl_Color b) {
    ((Fl_Input *)o)->textcolor(a);
    (Fl_Input *)o)->cursor_color(b);
}
inline void fl_set_input_cursorpos(Fl_Widget* o, int x, int /*y*/) {
    ((Fl_Input*)o)->insert_position(x);
}
inline int fl_get_input_topline(Fl_Widget*);
inline int fl_get_input_screenlines(Fl_Widget*);
inline int fl_get_input_cursorpos(Fl_Widget* o, int x, int /*y*/) {
    *x = ((Fl_Input*)o)->insert_position(); *y = 0; return *x;
}
inline int fl_get_input_numberoflines(Fl_Widget*);
inline void fl_get_input_format(Fl_Widget*, int*, int*);
inline const char* fl_get_input(Fl_Widget* o) {
    return ((Fl_Input*)o)->value();
}

#include "Fl_Menu_Button.H"
#define FL_TOUCH_MENU 0
#define FL_PUSH_MENU 1
#define FL_PULLDOWN_MENU 2

forms_constructor(Fl_Menu_Button, fl_add_menu)

inline void fl_clear_menu(Fl_Widget* o) { ((Fl_Menu_Button *)o)->clear();}
inline void fl_set_menu(Fl_Widget* o, const char* s) { ((Fl_Menu_Button *)o)->clear(); ((Fl_Menu_Button*)o)->add(s);}
inline void fl_addto_menu(Fl_Widget* o, const char* s) { ((Fl_Menu_Button *)o)->add(s);}
inline void fl_replace_menu_item(Fl_Widget* o, int i, const char* s) { ((Fl_Menu_Button *)o)->replace(i-1,s);}
inline void fl_delete_menu_item(Fl_Widget* o, int i) { ((Fl_Menu_Button *)o)->remove(i-1);}
inline void fl_set_menu_item_shortcut(Fl_Widget* o, int i, const char* s) { ((Fl_Menu_Button *)o)->shortcut(i-1,fl_old_shortcut(s));}
inline void fl_set_menu_item_mode(Fl_Widget* o, int i, long x) { ((Fl_Menu_Button *)o)->mode(i-1, (int)x);}
inline void fl_set_menu_popup(Fl_Widget*, int);
inline int fl_get_menu(Fl_Widget* o) { return ((Fl_Menu_Button *)o)->value()+1;}
inline const char* fl_get_menu_item_text(Fl_Widget* o, int i) { return ((Fl_Menu_Button *)o)->text(i);}
inline int fl_get_menu_maxitems(Fl_Widget* o) { return ((Fl_Menu_Button *)o)->size();}
inline int fl_get_menu_item_mode(Fl_Widget* o, int i) { return ((Fl_Menu_Button *)o)->mode(i);}
inline const char* fl_get_menu_text(Fl_Widget* o) { return ((Fl_Menu_Button *)o)->text();}

#include "Fl_Positioner.H"
#define FL_NORMAL_POSITIONER 0
forms_constructor(Fl_Positioner, fl_add_positioner)
inline void fl_set_positioner_xvalue(Fl_Widget* o, double v) { ((Fl_Positioner*)o)->xvalue(v);}
inline void fl_set_positioner_xbounds(Fl_Widget* o, double a, double b) { ((Fl_Positioner*)o)->xbounds(a,b);}
inline void fl_set_positioner_xstep(Fl_Widget* o, double v) { ((Fl_Positioner*)o)->xstep(v);}
inline void fl_set_positioner_ystep(Fl_Widget* o, double v) { ((Fl_Positioner*)o)->ystep(v);}
inline void fl_set_positioner_xminimum(Fl_Widget* o, float a) { ((Fl_Positioner*)o)->xmin(a);}
inline void fl_set_positioner_xmaximum(Fl_Widget* o, float b) { ((Fl_Positioner*)o)->xmax(b);}
inline void fl_set_positioner_yvalue(Fl_Widget* o, double v) { ((Fl_Positioner*)o)->yvalue(v);}
inline void fl_set_positioner_yminimum(Fl_Widget* o, float a) { ((Fl_Positioner*)o)->ymin(a);}
inline void fl_set_positioner_ymaximum(Fl_Widget* o, float b) { ((Fl_Positioner*)o)->ymax(b);}
inline void fl_set_positioner_ybounds(Fl_Widget* o, double a, double b) { ((Fl_Positioner*)o)->ybounds(a,b);}
inline void fl_set_positioner_return(Fl_Widget* o, int i) { ((Fl_Positioner*)o)->when((Fl_When)(i|FL_WHEN_RELEASE));}
inline void fl_set_positioner_size(Fl_Widget* o, double v) { ((Fl_Positioner*)o)->slider_size(v);}

#include "Fl_Slider.H"
#define FL_HOR_BROWSER_SLIDER FL_HOR_SLIDER
#define FL_VERT_BROWSER_SLIDER FL_VERT_SLIDER
forms_constructort(Fl_Slider, fl_add_slider)
#define FL_SLIDER_COL1 FL_GRAY
inline void fl_set_slider_value(Fl_Widget* o, double v) { ((Fl_Slider *)o)->value(v);}
inline double fl_get_slider_value(Fl_Widget* o) { return ((Fl_Slider *)o)->value();}
inline void fl_set_slider_bounds(Fl_Widget* o, double a, double b) { ((Fl_Slider *)o)->bounds(a, b);}
inline void fl_set_slider_step(Fl_Widget* o, double v) { ((Fl_Slider *)o)->step(v);}
inline void fl_set_slider_increment(Fl_Widget* o, double a, double b) { ((Fl_Slider *)o)->increment(a, b);}
inline void fl_set_slider_return(Fl_Widget* o, int v) { ((Fl_Slider*)o)->when(FL_WHEN_RELEASE|(v|FL_WHEN_RELEASE));

#include "Fl_Browser.H"
# File Documentation

```c
#include "Fl_Value_Slider.H"
forms_constructor(Fl_Value_Slider, fl_add_valslider)

inline void fl_set_slider_precision(Fl_Widget* o, int i) {
    ((Fl_Value_Slider *)o)->precision(i);
}
// filter function!

// The forms text object was the same as an Fl_Box except it inverted the
// meaning of FL_ALIGN_INSIDE. Implementation in forms.cxx
class FL_EXPORT Fl_FormsText : public Fl_Widget {
    protected:
    void draw() FL_OVERRIDE;
    public:
    Fl_FormsText(Fl_Boxtype b, int X, int Y, int W, int H, const char * l=0)
    : Fl_Widget(X,Y,W,H,l) {box(b); align(FL_ALIGN_LEFT);}
};
#define FL_NORMAL_TEXT FL_NO_BOX
forms_constructorb(Fl_FormsText, fl_add_text)

#include "Fl_Timer.H"
forms_constructort(Fl_Timer, fl_add_timer)
inline void fl_set_timer(Fl_Widget* o, double v) {((Fl_Timer*)o)->value(v);}
inline double fl_get_timer(Fl_Widget* o) {return ((Fl_Timer*)o)->value();}
inline void fl_suspend_timer(Fl_Widget* o) {((Fl_Timer*)o)->suspended(1);}
inline void fl_resume_timer(Fl_Widget* o) {((Fl_Timer*)o)->suspended(0);}
inline void fl_set_timer_countup(Fl_Widget* o,char d) {((Fl_Timer*)o)->direction(d);}
void FL_EXPORT fl_gettime(long* sec, long* usec);

// Fl_XYPlot nyi

// stuff from DDForms:

inline int fl_double_click() {return Fl::event_clicks();}
inline void fl_draw() {Fl::flush();}

#endif /* define __FORMS_H__ */
```

### 35.186 gl.h File Reference

This file defines wrapper functions for OpenGL in FLTK.

```c
#include "Enumerations.H"
#include <GL/gl.h>
```

**Functions**

- **void gl_color (Fl_Color i)**
  
  Sets the current OpenGL color to an FLTK color.

- **void gl_color (int c)**
  
  back compatibility

- **int gl_descent ()**
  
  Returns the current font’s descent.

- **void gl_draw (const char *)**
  
  Draws a null-terminated string in the current font at the current position.

- **void gl_draw (const char *, float x, float y)**
  
  Draws a null-terminated string in the current font at the given position.

- **void gl_draw (const char *, int n)**
  
  Draws an array of n characters of the string in the current font at the current position.

- **void gl_draw (const char *, int n, float x, float y)**
  
  Draws n characters of the string in the current font at the given position.

- **void gl_draw (const char *, int n, int x, int y)**
  
  Draws n characters of the string in the current font at the given position.

- **void gl_draw (const char *, int x, int y)**
  
  Draws a null-terminated string in the current font at the given position.

- **void gl_draw (const char *, int x, int y, int w, int h, Fl_Align)**
  
  Draws a null-terminated string in the current font at the given position.

Generated by Doxygen
Draws a string formatted into a box, with newlines and tabs expanded, other control characters changed to `\^X`.

- `void gl_draw_image(const uchar *, int x, int y, int w, int h, int d=3, int ld=0)`
  - Releases an OpenGL context.
- `void gl_finish()`
  - Sets the current OpenGL font to the same font as calling `fl_font()`.
- `int gl_height()`
  - Returns the current font's height.
- `void gl_measure(const char *, int &x, int &y)`
  - Measures how wide and tall the string will be when drawn by the `gl_draw()` function.
- `void gl_rect(int x, int y, int w, int h)`
  - Outlines the given rectangle with the current color.
- `void gl_rectf(int x, int y, int w, int h)`
  - Fills the given rectangle with the current color.
- `void gl_start()`
  - Creates an OpenGL context.
- `int gl_texture_pile_height()`
  - Returns the current maximum height of the pile of pre-computed string textures.
- `void gl_texture_pile_height(int max)`
  - Changes the maximum height of the pile of pre-computed string textures.
- `void gl_texture_reset()`
  - To call after GL operations that may invalidate textures used to draw text in GL scenes (e.g., switch between `FL_DOUBLE / FL_SINGLE` modes).
- `double gl_width(const char *)`
  - Returns the width of the string in the current font.
- `double gl_width(const char *, int n)`
  - Returns the width of n characters of the string in the current font.
- `double gl_width(uchar)`
  - Returns the width of the character in the current font.

### 35.186.1 Detailed Description

This file defines wrapper functions for OpenGL in FLTK. To use OpenGL from within an FLTK application you MUST use `gl_visual()` to select the default visual before doing `show()` on any windows. Mesa will crash if you try to use a visual not returned by `glxChooseVisual`.

Historically, this did not always work well with `Fl_Double_Window's`! It can try to draw into the front buffer. Depending on the system this might either crash or do nothing (when pixmaps are being used as back buffer and GL is being done by hardware), work correctly (when GL is done with software, such as Mesa), or draw into the front buffer and be erased when the buffers are swapped (when double buffer hardware is being used).

### 35.186.2 Function Documentation

#### 35.186.2.1 gl_color()

```c
void gl_color (Fl_Color i)
```

Sets the current OpenGL color to an FLTK color.

For color-index modes it will use `fl_xpixel(c)`, which is only right if the window uses the default colormap!
35.186.2.2 gl_draw() [1/7]
void gl_draw(
    const char * str)
Draws a nul-terminated string in the current font at the current position.
See also
    gl_texture_pile_height(int)

35.186.2.3 gl_draw() [2/7]
void gl_draw(
    const char * str,
    float x,
    float y)
Draws a nul-terminated string in the current font at the given position.
See also
    gl_texture_pile_height(int)

35.186.2.4 gl_draw() [3/7]
void gl_draw(
    const char * str,
    int n)
Draws an array of n characters of the string in the current font at the current position.
See also
    gl_texture_pile_height(int)

35.186.2.5 gl_draw() [4/7]
void gl_draw(
    const char * str,
    int n,
    float x,
    float y)
Draws n characters of the string in the current font at the given position.
See also
    gl_texture_pile_height(int)

35.186.2.6 gl_draw() [5/7]
void gl_draw(
    const char * str,
    int n,
    int x,
    int y)
Draws n characters of the string in the current font at the given position.
See also
    gl_texture_pile_height(int)
35.186.2.7  **gl_draw()** [6/7]

```c
void gl_draw (  
    const char * str,  
    int x,  
    int y)
```

Draws a null-terminated string in the current font at the given position.

See also

- `gl_texture_pile_height(int)`

35.186.2.8  **gl_draw()** [7/7]

```c
void gl_draw (  
    const char * str,  
    int x,  
    int y,  
    int w,  
    int h,  
    Fl_Align align)
```

Draws a string formatted into a box, with newlines and tabs expanded, other control characters changed to ^X and aligned with the edges or center. Exactly the same output as fl_draw().

35.186.2.9  **gl_font()**

```c
void gl_font (  
    int fontid,  
    int size)
```

Sets the current OpenGL font to the same font as calling fl_font().

See also

- `Fl::draw_GL_text_with_textures(int val)`

35.186.2.10  **gl_rect()**

```c
void gl_rect (  
    int x,  
    int y,  
    int w,  
    int h)
```

Outlines the given rectangle with the current color. If Fl_GL_Window::ortho() has been called, then the rectangle will exactly fill the given pixel rectangle.

35.186.2.11  **gl_rectf()**

```c
void gl_rectf (  
    int x,  
    int y,  
    int w,  
    int h)
```

Fills the given rectangle with the current color.

See also

- `gl_rect(int x, int y, int w, int h)`
35.186.2.12  gl_texture_pile_height() [1/2]

int gl_texture_pile_height (    
    void    )

Returns the current maximum height of the pile of pre-computed string textures.
The default value is 100

See also

Fl::draw_GL_text_with_textures(int)

35.186.2.13  gl_texture_pile_height() [2/2]

void gl_texture_pile_height (    
    int max    )

Changes the maximum height of the pile of pre-computed string textures.
Strings that are often re-displayed can be processed much faster if this pile is set high enough to hold all of them.

Parameters

max | Maximum height of the texture pile

See also

Fl::draw_GL_text_with_textures(int)

35.187  gl.h

Go to the documentation of this file.

1 //
2 // OpenGL header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // You must include this instead of GL/gl.h to get the Microsoft
7 // APIENTRY stuff included (from <windows.h>) prior to the OpenGL
8 // header files.
9 //
10 // This file also provides "missing" OpenGL functions, and
11 // gl_start() and gl_finish() to allow OpenGL to be used in any window
12 //
13 // This library is free software. Distribution and use rights are outlined in
14 // the file "COPYING" which should have been included with this file.  If this
15 // file is missing or damaged, see the license at:
16 //
17 //  https://www.fltk.org/COPYING.php
18 //
19 // Please see the following page on how to report bugs and issues:
20 //
21 //  https://www.fltk.org/bugs.php
22 //
23 #ifndef FL_gl_H
24 # define FL_gl_H
25 # include "Enumerations.H" // for color names
26 # ifdef _WIN32
27 # include <windows.h>
28 # endif
29 # ifndef APIENTRY
30 # if defined(__CYGWIN__)
31 # define APIENTRY __attribute__ ((__stdcall__))
32 # else
33 # define APIENTRY
34 # endif
35 # endif
36
37 # ifdef __APPLE__ // PORTME: OpenGL path abstraction
38 # ifndef GL_SILENCE_DEPRECATION
39 # define GL_SILENCE_DEPRECATION
40 # define GL_SILENCE_DEPRECATION 1
41 # endif
42 # endif
43
44 #endif

Generated by Doxygen
35.188 gl2opengl.h

1 /*
2 gl.h
3
4 GL to OpenGL translator.
5 If you include this, you might be able to port old GL programs.
6 There are also much better emulators available on the net.
7 */
8
9 ifndef _FL_gl2opengl_h_
10 #define _FL_gl2opengl_h_
11
12 #include <FL/gl.h>
13 #include "gl_draw.H"
14
15 inline void clear() {glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT);}
16 #define RGBcolor(r,g,b) glColor3ub(r,g,b)
17 #define bgnline() glBegin(GL_LINE_STRIP)
18 #define bgnpolygon() glBegin(GL_POLYGON)
19 #define bgnclosedline() glBegin(GL_LINE_LOOP)
20 #define endline() glEnd()
21 #define endpolygon() glEnd()
22 #define endclosedline() glEnd()
23 #define v2f(v) glVertex2fv(v)
24 #define v2s(v) glVertex2sv(v)
25 #define cmov(x,y,z) glRasterPos3f(x,y,z)
26 #define charstr(s) gl_draw(s)
27 #define fmprstr(s) gl_draw(s)
28 typedef float Matrix[4][4];
29 inline void pushmatrix() {glPushMatrix();}
30 inline void popmatrix() {glPopMatrix();}
31 inline void multmatrix(Matrix m) {glMultMatrixf((float *)m);}
32 inline void color(int n) {glIndexi(n);}
33 inline void rect(int x,int y,int r,int t) {gl_rect(x,y,r-x,t-y);}
34 inline void rectf(int x,int y,float r,float t) {glRectf(x,y,r-x,t-y);}
35 inline void recti(int x,int y,int r,int t) {gl_recti(x,y,r-x,t-y);}
36 inline void rectfi(int x,int y,float r,float t) {gl_rectfi(x,y,r-x,t-y);}
37 inline void rects(int x,int y,int r,int t) {gl_rects(x,y,r-x,t-y);}
38 inline void rectfs(int x,int y,float r,float t) {gl_rectfs(x,y,r-x,t-y);}
39 #endif /* _FL_gl2opengl_h_ */

Generated by Doxygen
35.189  gl_draw.H

1 //
2 // OpenGL header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 #include "gl.h"
17
18 extern FL_EXPORT void gl_remove_displaylist_fonts();

35.190  glu.h

1 //
2 // GLu header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // You must include this instead of GL/gl.h to get the Microsoft
7 // APIENTRY stuff included (from <windows.h>) prior to the OpenGL
8 // header files.
9 //
10 // This file also provides "missing" OpenGL functions, and
11 // gl_start() and gl_finish() to allow OpenGL to be used in any window
12 //
13 // This library is free software. Distribution and use rights are outlined in
14 // the file "COPYING" which should have been included with this file. If this
15 // file is missing or damaged, see the license at:
16 //
17 // https://www.fltk.org/COPYING.php
18 //
19 // Please see the following page on how to report bugs and issues:
20 //
21 // https://www.fltk.org/bugs.php
22 //
23 #ifndef FL_glu_H
24 # define FL_glu_H
25
26 # include "Enumerations.H" // for color names
27 # ifdef _WIN32
28 # include <windows.h>
29 # endif
30 # ifdef __APPLE__ // PORTME: OpenGL Path abstraction
31 # include <OpenGL/glu.h>
32 # else
33 # include <GL/glu.h>
34 # endif
35 #endif // !FL_glu_H

35.191  glut.H

1 //
2 // GLUT emulation header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
// Please see the following page on how to report bugs and issues:
https://www.fltk.org/bugs.php

// Emulation of GLUT using fltk.

// GLUT is Copyright (c) Mark J. Kilgard, 1994, 1995, 1996:
// "This program is freely distributable without licensing fees and is
// provided without guarantee or warranty expressed or implied. This
// program is ¬not¬ in the public domain."

// Although I have copied the GLUT API, none of my code is based on
// any GLUT implementation details and is therefore covered by the LGPL.

// Commented out lines indicate parts of GLUT that are not emulated.

// Notes: as pointed out in STR #3458 the current GLUT window,
// i.e. the global static variable 'glut_window' can be NULL ...
// (a) if not (yet) initialized
// (b) if the current GLUT window is deleted at any time.
// The FLTK implementation silently ignores function calls if the current
// window is NULL to avoid dereferencing a NULL pointer. This is obviously
// compatible with GLUT version 3.7 according to comment #5 on STR #3458.
// According to the same comment FreeGLUT 3.0 would issue an error message
// and quit.

// Albrecht-S, Oct 2023

 ifndef _FL_glut_H_
define _FL_glut_H_

#include "gl.h"

#include "Fl.H"
#include "Fl_Gl_Window.H"

class FL_EXPORT Fl_Glut_Window : public Fl_Gl_Window {
  void _init();
  int mouse_down;
protected:
  void draw() FL_OVERRIDE;
  void draw_overlay() FL_OVERRIDE;
  int handle(int) FL_OVERRIDE;
public:
  int number;
  int menu[3];
  void make_current();
  void ( *display)();
  void ( *overlaydisplay)();
  void ( *reshape)(int w, int h);
  void ( *keyboard)(uchar, int x, int y);
  void ( *mouse)(int b, int state, int x, int y);
  void ( *motion)(int x, int y);
  void ( *passivemotion)(int x, int y);
  void ( *entry)(int);
  void ( *visibility)(int);
  void ( *special)(int, int x, int y);
  Fl_Glut_Window(int w, int h, const char *t=0);
  Fl_Glut_Window(int x, int y, int w, int h, const char *t=0);
  ~Fl_Glut_Window();
};

eextern FL_EXPORT Fl_Glut_Window *glut_window; // the current window

eextern FL_EXPORT int glut_menu; // the current menu

// function pointers that are not per-window:
eextern FL_EXPORT void (*glutIdleFunction)();
eextern FL_EXPORT void (*glutMenuStateFunction)(int);
eextern FL_EXPORT void (*glutMenuStatusFunction)(int,int,int);

// define GLUT_API_VERSION This does not match any version of GLUT exactly...

FL_EXPORT void glutInit(int *argcp, char **argv); // creates first window

FL_EXPORT void glutInitDisplayMode(unsigned int mode); // the FL_symbols have the same value as the GLUT ones:
define GL_RGB FL_RGB
define GL_RGBA FL_RGBA
define GL_INDEX FL_INDEX
define GL_RGB ALPHA FL_ALPHA
define GL_DEPTH FL_DEPTH
# define GLUT_STENCIL FL_STENCIL
# define GLUT_MULTISAMPLE FL_MULTISAMPLE
# define GLUT_STEREO FL_STEREO
// # define GLUT_LUMINANCE 512

FL_EXPORT void glutInitWindowPosition(int x, int y);

FL_EXPORT void glutInitWindowSize(int w, int h);

FL_EXPORT void glutMainLoop();

FL_EXPORT int glutCreateWindow(char *title);
FL_EXPORT int glutCreateWindow(const char *title);

FL_EXPORT int glutCreateSubWindow(int win, int x, int y, int width, int height);

FL_EXPORT void glutDestroyWindow(int win);

inline void glutPostRedisplay() {
  if (glut_window) glut_window->redraw();
}

FL_EXPORT void glutPostWindowRedisplay(int win);

FL_EXPORT void glutSwapBuffers();

inline int glutGetWindow() {
  return glut_window ? glut_window->number : 0;
}

inline void glutSetWindowTitle(char *t) {
  if (glut_window) glut_window->label(t);
}

inline int glutSetIconTitle(char *t) {
  if (glut_window) glut_window->iconlabel(t);
}

inline void glutPositionWindow(int x, int y) {
  if (glut_window) glut_window->position(x,y);
}

inline void glutReshapeWindow(int w, int h) {
  if (glut_window) glut_window->size(w,h);
}

inline void glutShowWindow() {
  if (glut_window) glut_window->show();
}

inline void glutHideWindow() {
  if (glut_window) glut_window->hide();
}

inline void glutFullScreen() {
  if (glut_window) glut_window->fullscreen();
}

inline void glutPopWindow() {
  if (glut_window) glut_window->show();
}

inline void glutPushWindow() { /* do nothing */ }

inline void glutIconifyWindow() {
  if (glut_window) glut_window->iconize();
}

inline void glutShowWindow() {
  if (glut_window) glut_window->show();
}

inline void glutHideWindow() {
  if (glut_window) glut_window->hide();
}

inline void glutFullScreen() {
  if (glut_window) glut_window->fullscreen();
}

#pragma warning(push)  // notice that the numeric values are different than glut:

#define GLUT_CURSOR_RIGHT_ARROW ((Fl_Cursor)2)
#define GLUT_CURSOR_LEFT_ARROW ((Fl_Cursor)7)
#define GLUT_CURSOR_INFO FL_CURSOR_HAND
#define GLUT_CURSOR_DESTROY ((Fl_Cursor)45)
#define GLUT_CURSOR_HELP FL_CURSOR_HELP
#define GLUT_CURSOR_CYCLE ((Fl_Cursor)26)
#define GLUT_CURSOR_SPRAY ((Fl_Cursor)63)
#define GLUT_CURSOR_WAIT FL_CURSOR_WAIT
#define GLUT_CURSOR_TEXT FL_CURSOR_INSERT
#define GLUT_CURSOR_CROSSHAIR FL_CURSOR_CROSS
#define GLUT_CURSOR_UP_DOWN FL_CURSOR_NS
#define GLUT_CURSOR_LEFT_RIGHT FL_CURSOR_NE
#pragma warning(pop)
# define GLUT_CURSOR_TOP_SIDE FL_CURSOR_N
# define GLUT_CURSOR_BOTTOM_SIDE FL_CURSOR_S
# define GLUT_CURSOR_LEFT_SIDE FL_CURSOR_W
# define GLUT_CURSOR_RIGHT_SIDE FL_CURSOR_E
# define GLUT_CURSOR_TOP_LEFT_CORNER FL_CURSOR_NW
# define GLUT_CURSOR_TOP_RIGHT_CORNER FL_CURSOR_NE
# define GLUT_CURSOR_BOTTOM_RIGHT_CORNER FL_CURSOR_SE
# define GLUT_CURSOR_BOTTOM_LEFT_CORNER FL_CURSOR_SW
# define GLUT_CURSOR_INHERIT FL_CURSOR_DEFAULT
# define GLUT_CURSOR_NONE FL_CURSOR_NONE
# define GLUT_CURSOR_FULL_CROSSHAIR FL_CURSOR_CROSS

inline void glutWarpPointer(int, int) { /* do nothing */ }

inline void glutEstablishOverlay() {
    if (glut_window) glut_window->make_overlay_current();
}

inline void glutRemoveOverlay() {
    if (glut_window) glut_window->hide_overlay();
}

inline void glutUseLayer(GLenum layer) {
    if (!glut_window)
        return;
    layer ? glut_window->make_overlay_current() : glut_window->make_current();
}

enum {GLUT_NORMAL, GLUT_OVERLAY};

inline void glutPostOverlayRedisplay() {
    if (glut_window) glut_window->redraw_overlay();
}

inline void glutShowOverlay() {
    if (glut_window) glut_window->redraw_overlay();
}

inline void glutHideOverlay() {
    if (glut_window) glut_window->hide_overlay();
}

FL_EXPORT int glutCreateMenu(void (*)(int));

FL_EXPORT void glutDestroyMenu(int menu);

inline int glutGetMenu() {return glut_menu;}

inline void glutSetMenu(int m) {glut_menu = m;}

FL_EXPORT void glutAddMenuEntry(const char *label, int value);

FL_EXPORT void glutAddSubMenu(char *label, int submenu);

FL_EXPORT void glutChangeToMenuEntry(int item, char *labela, int value);

FL_EXPORT void glutChangeToSubMenu(int item, char *label, int submenu);

FL_EXPORT void glutRemoveMenuItem(int item);

inline void glutAttachMenu(int b) {
    if (glut_window) glut_window->menu[b] = glut_menu;
}

inline void glutDetachMenu(int b) {
    if (glut_window) glut_window->menu[b] = 0;
}

inline void glutDisplayFunc(void (*f)()) {
    if (glut_window) glut_window->display = f;
}

inline void glutReshapeFunc(void (*f)(int w, int h)) {
    if (glut_window) glut_window->reshape = f;
}

inline void glutKeyboardFunc(void (*f)(uchar key, int x, int y)) {
    if (glut_window) glut_window->keyboard = f;
}

inline void glutMouseFunc(void (*f)(int b, int state, int x, int y)) {
    if (glut_window) glut_window->mouse = f;
}

# define GLUT_LEFT_BUTTON 0
# define GLUT_MIDDLE_BUTTON 1
# define GLUT_RIGHT_BUTTON 2
# define GLUT_DOWN 0
#define GLUT_UP 1

inline void glutMotionFunc(void (*f)(int x, int y)) {
  if (glut_window) glut_window->motion = f;
}

inline void glutPassiveMotionFunc(void (*f)(int x, int y)) {
  if (glut_window) glut_window->passivemotion = f;
}

inline void glutEntryFunc(void (*f)(int s)) {
  if (glut_window) glut_window->entry = f;
}

enum {GLUT_LEFT, GLUT_ENTERED};

inline void glutVisibilityFunc(void (*f)(int s)) {
  if (glut_window) glut_window->visibility = f;
}
enum {GLUT_NOT_VISIBLE, GLUT_VISIBLE};

FL_EXPORT void glutIdleFunc(void (*f)());

inline void glutTimerFunc(unsigned int msec, void (*f)(int), int value) {
  Fl::add_timeout(msec *.001, (void (*)(void *))f, (void *)(fl_intptr_t)value);
}

inline void glutMenuStateFunc(void (*f)(int state)) {
  glut_menustate_function = f;
}
inline void glutMenuStatusFunc(void (*f)(int status, int x, int y)) {
  glut_menustatus_function = f;
}
enum {GLUT_MENU_NOT_IN_USE, GLUT_MENU_IN_USE};

inline void glutSpecialFunc(void (*f)(int key, int x, int y)) {
  if (glut_window) glut_window->special = f;
}

#define GLUT_KEY_F1 1
#define GLUT_KEY_F2 2
#define GLUT_KEY_F3 3
#define GLUT_KEY_F4 4
#define GLUT_KEY_F5 5
#define GLUT_KEY_F6 6
#define GLUT_KEY_F7 7
#define GLUT_KEY_F8 8
#define GLUT_KEY_F9 9
#define GLUT_KEY_F10 10
#define GLUT_KEY_F11 11
#define GLUT_KEY_F12 12

// WARNING: Different values than GLUT uses:
#define GLUT_KEY_LEFT FL_Left
#define GLUT_KEY_UP FL_Up
#define GLUT_KEY_RIGHT FL_Right
#define GLUT_KEY_PAGE_UP FL_Page_Up
#define GLUT_KEY_PAGE_DOWN FL_Page_Down
#define GLUT_KEY_HOME FL_Home
#define GLUT_KEY_END FL_End
#define GLUT_KEY_INSERT FL_Insert

// inline void glutSpaceballMotionFunc(void (*)(int x, int y, int z));
// inline void glutSpaceballRotateFunc(void (*)(int x, int y, int z));
// inline void glutSpaceballButtonFunc(void (*)(int button, int state));
// inline void glutButtonBoxFunc(void (*)(int button, int state));
// inline void glutDialsFunc(void (*)(int dial, int value));
// inline void glutTabletMotionFunc(void (*)(int x, int y));
// inline void glutTabletButtonFunc(void (*)(int button, int state, int x, int y));
// inline void glutOverlayDisplayFunc(void (*)(int x, int y));
// inline void glutWindowStatusFunc(void (*)(int state));
enum {GLUT_HIDDEN, GLUT_FULLY_RETAINED, GLUT_PARTIALLY_RETAINED, GLUT_FULLY_COVERED};

inline void glutSetColor(int ndx, GLfloat red, GLfloat green, GLfloat blue);
inline GLfloat glutGetColor(int ndx, int component);
// define GLUT_RED 0
// define GLUT_GREEN 1
// define GLUT_BLUE 2

// inline void glutCopyColormap(int win);

// Warning: values are changed from GLUT!
// Also relies on the GL_ symbols having values greater than 100
FL_EXPORT int glutGet(GLenum type);

enum {
    GLUT_RETURN_ZERO = 0,
    GLUT_WINDOW_X,
    GLUT_WINDOW_Y,
    GLUT_WINDOW_WIDTH,
    GLUT_WINDOW_HEIGHT,
    GLUT_WINDOW_PARENT,
    GLUT_SCREEN_WIDTH,
    GLUT_SCREEN_HEIGHT,
    GLUT_MENU_NUM_ITEMS,
    GLUT_DISPLAY_MODE_POSSIBLE,
    GLUT_INIT_WINDOW_X,
    GLUT_INIT_WINDOW_Y,
    GLUT_INIT_WINDOW_WIDTH,
    GLUT_INIT_WINDOW_HEIGHT,
    GLUT_INIT_DISPLAY_MODE,
    GLUT_WINDOW_BUFFER_SIZE,
    GLUT_VERSION,
    GLUT_WINDOW_NUM_CHILDREN,
    GLUT_WINDOW_CURSOR,
    GLUT_WINDOW_STENCIL_SIZE,
    GLUT_WINDOW_DEPTH_SIZE,
    GLUT_WINDOW_RED_SIZE,
    GLUT_WINDOW_GREEN_SIZE,
    GLUT_WINDOW_BLUE_SIZE,
    GLUT_WINDOW_ALPHA_SIZE,
    GLUT_WINDOW_ACCUM_RED_SIZE,
    GLUT_WINDOW_ACCUM_GREEN_SIZE,
    GLUT_WINDOW_ACCUM_BLUE_SIZE,
    GLUT_WINDOW_ACCUM_ALPHA_SIZE,
    GLUT_WINDOW_DOUBLEBUFFER,
    GLUT_WINDOW_RGBA,
    GLUT_WINDOW_COLORMAP_SIZE,
    GLUT_WINDOW_NUM_SAMPLES,
    GLUT_WINDOW_STEREO,
    GLUT_HAS_KEYBOARD,
    GLUT_HAS_MOUSE,
    GLUT_HAS_SPACEBALL,
    GLUT_HAS_DIAL_AND_BUTTON_BOX,
    GLUT_HAS_TABLET,
    GLUT_NUM_MOUSE_BUTTONS,
    GLUT_NUM_SPACEBALL_BUTTONS,
    GLUT_NUM_BUTTON_BOX_BUTTONS,
    GLUT_NUM_DIALS,
    GLUT_NORMAL_DAMAGED,
    GLUT_OVERLAY_DAMAGED,
};

#define GLUT_WINDOW_STENCIL_SIZE GL_STENCIL_BITS
#define GLUT_WINDOW_DEPTH_SIZE GL_DEPTH_BITS
#define GLUT_WINDOW_RED_SIZE GL_RED_BITS
#define GLUT_WINDOW_GREEN_SIZE GL_GREEN_BITS
#define GLUT_WINDOW_BLUE_SIZE GL_BLUE_BITS
#define GLUT_WINDOW_ALPHA_SIZE GL_ALPHA_BITS
#define GLUT_WINDOW_ACCUM_RED_SIZE GL_ACCUM_RED_BITS
#define GLUT_WINDOW_ACCUM_GREEN_SIZE GL_ACCUM_GREEN_BITS
#define GLUT_WINDOW_ACCUM_BLUE_SIZE GL_ACCUM_BLUE_BITS
#define GLUT_WINDOW_ACCUM_ALPHA_SIZE GL_ACCUM_ALPHA_BITS
#define GLUT_WINDOW_DOUBLEBUFFER GL_DOUBLEBUFFER
#define GLUT_WINDOW_RGBA GL_RGBA
#define GLUT_WINDOW_COLORMAP_SIZE GL_INDEX_BITS

#ifndef GL_SAMPLES_SGIS
#define GLUT_WINDOW_NUM_SAMPLES GL_SAMPLES_SGIS
#else
#define GLUT_WINDOW_NUM_SAMPLES GLUT_RETURN_ZERO
#endif
#define GLUT_WINDOW_STEREO GL_STEREO
#define GLUT_WINDOW_NUM_SAMPLES GLUT_RETURN_ZERO
#define GLUT_HAS_KEYBOARD FL_SHIFT
#define GLUT_HAS_MOUSE FL_CTRL
#define GLUT_HAS_SPACEBALL FL_ALT

#define GLUT_ACTIVE_SHIFT FL_SHIFT
#define GLUT_ACTIVE_CTRL FL_CTRL
#define GLUT_ACTIVE_ALT FL_ALT

inline int glutGetModifiers() {
    return Fl::event_state() & (GLUT_ACTIVE_SHIFT | GLUT_ACTIVE_CTRL | GLUT_ACTIVE_ALT);
}

FL_EXPORT int glutDeviceGet(GLenum type);

#define GLUT_OVERLAY_POSSIBLE GLUT_NORMAL_DAMAGED
#define GLUT_LAYER_IN_USE GLUT_NORMAL_DAMAGED
#define GLUT_HAS_OVERLAY GLUT_NORMAL_DAMAGED
#define GLUT_NORMAL_DAMAGED GLUT_NORMAL_DAMAGED
FLEXPORT GLUTproc glutGetProcAddress(const char *procName);

// inline int glutVideoResizeGet(GLenum param);
// #define GLUT_VIDEO_RESIZE_POSSIBLE 900
// #define GLUT_VIDEO_RESIZE_IN_USE 901
// #define GLUT_VIDEO_RESIZE_X_DELTA 902
// #define GLUT_VIDEO_RESIZE_Y_DELTA 903
// #define GLUT_VIDEO_RESIZE_WIDTH_DELTA 904
// #define GLUT_VIDEO_RESIZE_HEIGHT_DELTA 905
// #define GLUT_VIDEO_RESIZE_X 906
// #define GLUT_VIDEO_RESIZE_Y 907
// #define GLUT_VIDEO_RESIZE_WIDTH 908
// #define GLUT_VIDEO_RESIZE_HEIGHT 909

// inline void glutSetupVideoResizing();
// inline void glutStopVideoResizing();
// inline void glutVideoResize(int x, int y, int width, int height);
// void glutVideoPan(int x, int y, int width, int height);

// Font argument must be a void* for compatibility, so...
struct Fl_Glut_Bitmap_Font {Fl_Font font; Fl_Fontsize size;};

extern FLEXPORT struct Fl_Glut_Bitmap_Font
glutBitmap9By15, glutBitmap8By13, glutBitmapTimesRoman10,
glutBitmapTimesRoman24, glutBitmapHelvetica10, glutBitmapHelvetica12,
glutBitmapHelvetica18;

#define GLUT_BITMAP_9_BY_15 (&glutBitmap9By15)
#define GLUT_BITMAP_8_BY_13 (&glutBitmap8By13)
#define GLUT_BITMAP_TIMES_ROMAN_10 (&glutBitmapTimesRoman10)
#define GLUT_BITMAP_TIMES_ROMAN_24 (&glutBitmapTimesRoman24)
#define GLUT_BITMAP_HELVETICA_10 (&glutBitmapHelvetica10)
#define GLUT_BITMAP_HELVETICA_12 (&glutBitmapHelvetica12)
#define GLUT_BITMAP_HELVETICA_18 (&glutBitmapHelvetica18)

FLEXPORT void glutBitmapCharacter(void *font, int character);
FLEXPORT int glutBitmapHeight(void *font);
FLEXPORT int glutBitmapLength(void *font, const unsigned char *string);
FLEXPORT void glutBitmapString(void *font, const unsigned char *string);
FLEXPORT int glutBitmapWidth(void *font, int character);

/* GLUT stroked font sub-API */
struct Fl_Glut_StrokeVertex {
  GLfloat X, Y;
};

struct Fl_Glut_StrokeStrip {
  int Number;
  const Fl_Glut_StrokeVertex * Vertices;
};

struct Fl_Glut_StrokeChar {
  GLfloat Right;
  int Number;
  const Fl_Glut_StrokeStrip * Strips;
};

struct Fl_Glut_StrokeFont {
  char * Name; // The source font name
  int Quantity; // Number of chars in font
  GLfloat Height; // Height of the characters
  const Fl_Glut_StrokeChar ** Characters; // The characters mapping
};

extern FLEXPORT Fl_Glut_StrokeFont
glutStrokeRoman;
extern FLEXPORT Fl_Glut_StrokeFont
glutStrokeMonoRoman;
#define GLUT_STROKE_ROMAN (&glutStrokeRoman)
#define GLUT_STROKE_MONO_ROMAN (&glutStrokeMonoRoman)

FLEXPORT void glutStrokeCharacter(void *font, int character);
FLEXPORT GLfloat glutStrokeHeight(void *font);
FLEXPORT int glutStrokeLength(void *font, const unsigned char *string);
FLEXPORT void glutStrokeString(void *font, const unsigned char *string);
FLEXPORT int glutStrokeWidth(void *font, int character);

/* GLUT pre-built models sub-API */
FLEXPORT void glutWireSphere(GLdouble radius, GLint slices, GLint stacks);
FLEXPORT void glutSolidSphere(GLdouble radius, GLint slices, GLint stacks);
FLEXPORT void glutWireCube(GLdouble size);
FLEXPORT void glutSolidCube(GLdouble size);
FLEXPORT void glutWireTorus(GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings);
FLEXPORT void glutSolidTorus(GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings);
Mac OS X-specific symbols.

Classes

- class Fl_Mac_App_Menu

Functions

- FL_Window * fl_mac_find (FLWindow *)
  Returns the FL_Window corresponding to the given macOS-specific window reference.
- CGContextRef fl_mac_gc ()
  Returns the macOS-specific graphics context for the current window.
- void fl_mac_set_about (FL_Callback *cb, void *user_data, int shortcut=0)
  Attaches a callback to the "About myprog" item of the system application menu.
- FLWindow * fl_mac_xid (const Fl_Window *win)
  Returns the macOS-specific window reference corresponding to the given Fl_Window object.

Variables

- int fl_mac_os_version
  The version number of the running Mac OS X (e.g., 10.06.04 for 10.6.4, 10.13.0 for 10.13, 14.01.02 for 14.1.2).

Detailed Description

Mac OS X-specific symbols.

Go to the documentation of this file.
#ifndef FL_PLATFORM_H
#endif // !FL_PLATFORM_H

#ifdef __OBJC__
@class NSOpenGLContext;
#ifndef GL_SILENCE_DEPRECATED
#define GL_SILENCE_DEPRECATED 1
#endif
#if defined(__cplusplus)
class NSOpenGLContext;
#else
extern NSOpenGLContext *fl_mac_glcontext(GLContext rc);
#endif /* __OBJC__ */

#ifdef __OBJC__
@class FLWindow; // a subclass of the NSWindow Cocoa class
typedef FLWindow *Window;
#else
typedef class FLWindow *Window; // pointer to the FLWindow objective-c class
#endif // __OBJC__

#include <FL/Fl_Widget.H> // for Fl_Callback

#if (defined(FL_LIBRARY) || defined(FL_INTERNALS)) // this part must be compiled when building the FLTK libraries

// Standard MacOS C/C++ includes...
#include <ApplicationServices/ApplicationServices.h>
#undef check // because of Fl::check()
#endif

#ifndef NSINTEGER_DEFINED // appears with 10.5 in NSObjCRuntime.h
#if defined(__LP64__) && __LP64__
typedef long NSInteger;
typedef unsigned long NSUInteger;
#else
typedef int NSInteger;
#endif
#endif // NSINTEGER_DEFINED

#ifndef MAC_OS_X_VERSION_10_4
#define MAC_OS_X_VERSION_10_4 1040
#endif
#ifndef MAC_OS_X_VERSION_10_5
#define MAC_OS_X_VERSION_10_5 1050
#endif
#ifndef MAC_OS_X_VERSION_10_6
#define MAC_OS_X_VERSION_10_6 1060
#endif
#ifndef MAC_OS_X_VERSION_10_7
#define MAC_OS_X_VERSION_10_7 1070
#endif
#ifndef MAC_OS_X_VERSION_10_8
#define MAC_OS_X_VERSION_10_8 1080
#endif
#ifndef MAC_OS_X_VERSION_10_9
#define MAC_OS_X_VERSION_10_9 1090
#endif
#ifndef MAC_OS_X_VERSION_10_10
#define MAC_OS_X_VERSION_10_10 101000
#endif
#ifndef MAC_OS_X_VERSION_10_11
#define MAC_OS_X_VERSION_10_11 101100
#endif
#ifndef MAC_OS_X_VERSION_10_12
#define MAC_OS_X_VERSION_10_12 101200
#endif
#ifndef MAC_OS_X_VERSION_10_13
#define MAC_OS_X_VERSION_10_13 101300
#endif
#ifndef MAC_OS_X_VERSION_10_14
#define MAC_OS_X_VERSION_10_14 101400
#endif
#ifndef MAC_OS_X_VERSION_10_15
#define MAC_OS_X_VERSION_10_15 101500
#endif
#ifndef MAC_OS_X_VERSION_10_16
#define MAC_OS_X_VERSION_10_16 101600
#endif
#ifndef MAC_OS_VERSION_11_0
#define MAC_OS_VERSION_11_0 110000
#endif
#ifndef MAC_OS_VERSION_12_0
#define MAC_OS_VERSION_12_0 120000
#endif
#ifndef MAC_OS_VERSION_13_0
#define MAC_OS_VERSION_13_0 130000
#endif
#ifndef MAC_OS_VERSION_14_0
#define MAC_OS_VERSION_14_0 140000
#endif
#ifndef MAC_OS_VERSION_15_0
#define MAC_OS_VERSION_15_0 150000
#endif
#ifndef MAC_OS_VERSION_16_0
#define MAC_OS_VERSION_16_0 160000
#endif
#ifndef MAC_OS_VERSION_17_0
#define MAC_OS_VERSION_17_0 170000
#endif
#ifndef MAC_OS_VERSION_18_0
#define MAC_OS_VERSION_18_0 180000
#endif
#ifndef MAC_OS_VERSION_19_0
#define MAC_OS_VERSION_19_0 190000
#endif
#ifndef MAC_OS_VERSION_20_0
#define MAC_OS_VERSION_20_0 200000
#endif
#ifndef MAC_OS_VERSION_21_0
#define MAC_OS_VERSION_21_0 210000
#endif
#ifndef MAC_OS_VERSION_22_0
#define MAC_OS_VERSION_22_0 220000
#endif

// typedefs
typedef NSOpenGLContext *NSOpenGLContext;
typedef FLWindow *FLWindow;
typedef int NSInteger;
typedef unsigned long NSUInteger;
typedef long NSInteger;
typedef unsigned long NSUInteger;
typedef NSOpenGLContext *NSOpenGLContext;
typedef FLWindow *FLWindow;
typedef int NSInteger;
typedef unsigned long NSUInteger;
#endif // MAC_##MACHOSYSTEM_VERSION_10_0_0
#endif
# Math header file for the Fast Light Tool Kit (FLTK).

// Copyright 1998-2020 by Bill Spitzak and others.

// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:
// https://www.fltk.org/COPYING.php

// Please see the following page on how to report bugs and issues:
// https://www.fltk.org/bugs.php

// Xcode on macOS includes files by recursing down into directories.
// This code catches the cycle and directly includes the required file.

typedef unsigned int NSUInteger;

\#if MAC_OS_X_VERSION_MAX_ALLOWED < MAC_OS_X_VERSION_10_4
typedef CGImageAlphaInfo CGBitmapInfo;
\#endif

\#if MAC_OS_X_VERSION_MAX_ALLOWED < MAC_OS_X_VERSION_10_4
typedef CGBitmapInfo CGImageAlphaInfo;
\#endif

struct flCocoaRegion {
    int count;
    CGRect *rects;
}; // a region is the union of a series of rectangles

\#ifndef CGFLOAT_DEFINED // appears with 10.5 in CGBase.h
\#if defined(__LP64__) && __LP64__
typedef double CGFloat;
\#else
typedef float CGFloat;
\#endif
\#endif // CGFLOAT_DEFINED

\#else
typedef CGContext* CGContextRef;

\#endif // FL_LIBRARY || FL_INTERNALS

\#else
extern CGContextRef fl_gc;

\#endif // FL_DOXYGEN

\#define fl_math_h_cyclic_include
#include <math.h>

Generated by Doxygen
# undef fl_math_h_cyclic_include

#ifndef M_PI
#define M_PI 3.14159265358979323846
#define M_PI_2 1.57079632679489661923
#define M_PI_4 0.78539816339744830962
#define M_1_PI 0.31830988618379067154
#define M_2_PI 0.63661977236758134508
#endif // !M_PI

#ifndef M_SQRT2
#define M_SQRT2 1.41421356237309504880
#define M_SQRT1_2 0.70710678118654752440
#endif // !M_SQRT2

#if (defined(_WIN32) || defined(CRAY)) && !defined(__MINGW32__)
inline double rint(double v) {return floor(v+.5);}
inline double copysign(double a, double b) {return b<0 ? -a : a;}
#endif // (_WIN32 || CRAY) && !__MINGW32__

#endif // !fl_math_h

35.195 names.h File Reference

This file defines arrays of human readable names for FLTK symbolic constants.

Variables

- const char * const fl_callback_reason_names []
  
  This is an array of callback reason names you can use to convert font numbers into names.

- const char * const fl_eventnames []
  
  This is an array of event names you can use to convert event numbers into names.

- const char * const fl_fontnames []
  
  This is an array of font names you can use to convert font numbers into names.

35.195.1 Detailed Description

This file defines arrays of human readable names for FLTK symbolic constants.

35.196 names.h

Go to the documentation of this file.
"FL_FOCUS",
"FL_UNFOCUS",
"FL_KEYDOWN",
"FL_KEYUP",
"FL_CLOSE",
"FL_MOVE",
"FL_SHORTCUT",
"FL_DEACTIVATE",
"FL_ACTIVATE",
"FL_HIDE",
"FL_SHOW",
"FL_PASTE",
"FL_SELECTIONCLEAR",
"FL_MOUSEWHEEL",
"FL_DND_ENTER",
"FL_DND_DRAG",
"FL_DND_LEAVE",
"FL_DND_RELEASE",
"FL_SCREEN_CONFIGURATION_CHANGED",
"FL_FULLSCREEN",
"FL_ZOOM_GESTURE",
"FL_ZOOM_EVENT",
"FL_EVENT_28", // not yet defined, just in case it /will/ be defined ...
"FL_EVENT_29", // not yet defined, just in case it /will/ be defined ...
"FL_EVENT_30" // not yet defined, just in case it /will/ be defined ...
};

const char * const fl_fontnames[] =
{ "FL_HELVETICA",
  "FL_HELVETICA_BOLD",
  "FL_HELVETICA_ITALIC",
  "FL_HELVETICA_BOLD_ITALIC",
  "FL_COURIER",
  "FL_COURIER_BOLD",
  "FL_COURIER_ITALIC",
  "FL_COURIER_BOLD_ITALIC",
  "FL_TIMES",
  "FL_TIMES_BOLD",
  "FL_TIMES_ITALIC",
  "FL_TIMES_BOLD_ITALIC",
  "FL_SYMBOL",
  "FL_SCREEN",
  "FL_SCREEN_BOLD",
  "FL_ZAPF_DINGBATS",
};

const char * const fl_callback_reason_names[] =
{ "FL_REASON_UNKNOWN",
  "FL_REASON_SELECTED",
  "FL_REASON_DESELECTED",
  "FL_REASON_RESELECTED",
  "FL_REASON_OPENED",
  "FL_REASON_CLOSED",
  "FL_REASON_DRAGGED",
  "FL_REASON_CANCELLED",
  "FL_REASON_CHANGED",
  "FL_REASON_GOT_FOCUS",
  "FL_REASON_LOST_FOCUS",
  "FL_REASON_RELEASED",
  "FL_REASON_ENTER_KEY",
  NULL, NULL, NULL,
  NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
  "FL_REASON_USER", "FL_REASON_USER+1", "FL_REASON_USER+2", "FL_REASON_USER+3",
};
#endif /* FL_NAMES_H */
These are FLTK symbols that are necessary or useful for calling platform specific functions. This file #include's certain platform specific system header files that are necessary to declare platform specific FLTK functions, for instance "Windows.h" under Windows.

You should include this file if (and ONLY if) you need to call platform specific functions directly.

See FLTK documentation: chapter "Operating System Issues" on when you need to #include <FL/platform.H>

#include <FL/platform.H>
#include <FL/platform_types.h> // will bring in FL/flf_config.h
#include <FL/fl_types.h> // for uchar

class Fl_Window;

#ifdef _WIN32
#include "win32.H"
#elif defined(FLTK_USE_WAYLAND)
#include "wayland.H"
#elif defined(FLTK_USE_X11)
#include "x11.H"
#elif defined(__APPLE__)
#include "mac.H"
#endif // _WIN32

// cross-platform declarations
#ifndef FL_LIBRARY || defined(FL_INTERNALS)
#include <FL/Fl_Window.H>
#endif

class FL_EXPORT Fl_X {
public:
  fl_uintptr_t xid;
  Fl_Window* w;
  Fl_Region region;
  Fl_X* next;
  // static variables, static functions and member functions
static Fl_X* first;
static Fl_X* flx(const Fl_Window* w) { return w ? (Fl_X*)w->flx_ : 0; }
static void make_xid(Fl_Window*, XVisualInfo*=fl_visual, Colormap=fl_colormap);
static Fl_X* set_xid(Fl_Window*, Window);
static inline Fl_X* i(const Fl_Window* w) { return flx(w); }
#endif // FL_LIBRARY || FL_INTERNALS

inline Window fl_xid(const Fl_Window* w) { Fl_X* xTemp = Fl_X::flx(w); return xTemp ? (Window)xTemp->xid : 0; }
#endif // !FL_PLATFORM_H

Definitions of platform-dependent types.

Macros

- #define FL_COMMAND opaque
  An alias for FL_CTRL on Windows and X11, or FL_META on MacOS X.
- #define FL_CONTROL opaque
  An alias for FL_META on Windows and X11, or FL_CTRL on MacOS X.
35.198 platform_types.h File Reference

### Typedefs

- typedef opaque **fl_intptr_t**
  
  An integral type large enough to store a pointer or a long value.

- typedef opaque **Fl_Offscreen**
  
  Platform-specific value representing an offscreen drawing buffer.

- typedef struct opaque * **Fl_Region**
  
  Pointer to a platform-specific structure representing a collection of rectangles.

- typedef opaque **FL_SOCKET**
  
  Socket or file descriptor

- typedef opaque **Fl_Timestamp**
  
  Platform-specific point in time, used for delta time calculation.

- typedef opaque **fl_uintptr_t**
  
  An unsigned integral type large enough to store a pointer or an unsigned long value.

- typedef struct opaque * **GLContext**
  
  Pointer to a platform-specific structure representing the window's OpenGL rendering context.

### 35.198.1 Detailed Description

Definitions of platform-dependent types.

The exact nature of these types varies with the platform. Therefore, portable FLTK applications should not assume these types have a specific size, or that they are pointers.

### 35.198.2 Typedef Documentation

#### 35.198.2.1 fl_intptr_t

typedef opaque **fl_intptr_t**

An integral type large enough to store a pointer or a long value.

A pointer value can be safely cast to **fl_intptr_t**, and later cast back to its initial pointer type without change to the pointer value. A variable of type **fl_intptr_t** can also store a long int value.

#### 35.198.2.2 Fl_Offscreen

typedef opaque **Fl_Offscreen**

Platform-specific value representing an offscreen drawing buffer.

**Note**

This value can be safely cast to these types on each platform:

- X11: Pixmap
- Wayland: cairo_t *
- Windows: HBITMAP
- macOS: CGContextRef

#### 35.198.2.3 Fl_Region

typedef struct opaque * **Fl_Region**

Pointer to a platform-specific structure representing a collection of rectangles.
Note
This pointer can be safely cast to these types on each platform:

- X11: Region as defined by X11
- Wayland: struct flCairoRegion *
- Windows: HRGN
- macOS: struct flCocoaRegion *

35.198.2.4 Fl_Timestamp
typedef opaque Fl_Timestamp
Platform-specific point in time, used for delta time calculation.

Note
This type may be a struct. sizeof(Fl_Timestamp) may be different on different platforms. Fl_Timestamp may change with future ABI changes.

35.198.2.5 fl_uintptr_t
typedef opaque fl_uintptr_t
An unsigned integral type large enough to store a pointer or an unsigned long value.
A pointer value can be safely cast to fl_uintptr_t, and later cast back to its initial pointer type without change to the pointer value. A variable of type fl_uintptr_t can also store an unsigned long int value.

35.198.2.6 GLContext
typedef struct opaque* GLContext
Pointer to a platform-specific structure representing the window's OpenGL rendering context.

Note
This pointer can be safely cast to these types on each platform:

- X11: GLXContext
- Wayland: EGLContext
- Windows: HGLRC
- macOS: NSOpenGLContext *

35.199 platform_types.h
Go to the documentation of this file.
typedef opaque fl_uintptr_t;

typedef opaque Fl_Offscreen;

typedef struct opaque *Fl_Region;
typedef opaque FL_SOCKET;

typedef struct opaque *GLContext;

typedef opaque Fl_Timestamp;

#define FL_COMMAND opaque
#define FL_CONTROL opaque

#ifndef FL_PLATFORM_TYPES_H
#define FL_PLATFORM_TYPES_H

#include <FL/fl_config.h>
#include <time.h> // for time_t

/* Platform-dependent types are defined here.
These types must be defined by any platform:
FL_SOCKET, struct dirent, fl_intptr_t, fl_uintptr_t

NOTE: *FIXME* AlbrechtS 13 Apr 2016 (concerning FL_SOCKET)
----------------------------------------------------------
The Fl::add_fd() API is partially inconsistent because some of the methods
explicitly use 'int', but the callback typedefs use FL_SOCKET. With the
definition of FL_SOCKET below we can have different data sizes and
different signedness of socket numbers on *some* platforms.
*/

#ifdef _WIN64

#if defined(_MSC_VER) && (_MSC_VER < 1600)
#include <stddef.h> /* stdint.h not available before VS 2010 (1600) */
#else
#include <stdint.h>
#endif

typedef intptr_t fl_intptr_t;
typedef uintptr_t fl_uintptr_t;

#else /* !_WIN64 */

typedef long fl_intptr_t;
typedef unsigned long fl_uintptr_t;
#endif /* _WIN64 */

typedef void *GLContext;
typedef void *Fl_Region;
typedef fl_uintptr_t Fl_Offscreen;

/* Allows all hybrid combinations except WIN32 + X11 with MSVC */
#endif /* _WIN64 */

typedef void *GLContext;
typedef void *Fl_Region;
typedef fl_uintptr_t Fl_Offscreen;

#ifndef FL_PLATFORM_TYPES_H
#endif /* FL_PLATFORM_TYPES_H */

#include <FL/Fl_Export.H>
extern FL_EXPORT int fl_command_modifier();
extern FL_EXPORT int fl_control_modifier();
#define FL_COMMAND fl_command_modifier()
#define FL_CONTROL fl_control_modifier()

#include <dirent.h>

typedef unsigned __int64 FL_SOCKET; /*FIXME* - FL_SOCKET (see above) */

#include <FL/Fl_Export.H>
extern FL_EXPORT int fl_command_modifier();
extern FL_EXPORT int fl_control_modifier();
#define FL_COMMAND fl_command_modifier()
#define FL_CONTROL fl_control_modifier()

/* If defined(_WIN64) && defined(_MSC_VER)
 */

typedef int FL_SOCKET; /*FIXME* - FL_SOCKET (see above) */

#include <dirent.h>

typedef unsigned __int64 FL_SOCKET; /*FIXME* - FL_SOCKET (see above) */

#include <FL/Fl_Export.H>
extern FL_EXPORT int fl_command_modifier();
extern FL_EXPORT int fl_control_modifier();
#define FL_COMMAND fl_command_modifier()
#define FL_CONTROL fl_control_modifier()

/* This is currently the same for all platforms, but may change in the future
*/

struct Fl_Timestamp_t {
    time_t sec;
    int usec;
};

typedef struct Fl_Timestamp_t Fl_Timestamp;

#endif /* FL_DOXYGEN */

# ifndef __WIN64

# if defined(_WIN32) && !defined(__MINGW32__)

struct dirent {
    char d_name[1];
};

#else

#include <dirent.h>

typedef unsigned __int64 FL_SOCKET; /*FIXME* - FL_SOCKET (see above) */

#endif /* _WIN64 */

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35.200  wayland.H File Reference

Definitions of functions specific to the Wayland platform.

Typedefs

- typedef struct_cairo cairo_t
- typedef void * EGLContext

Functions

- struct wl_compositor * fl_wl_compositor()
  Returns the wl_compositor of the current Wayland session.
- struct wl_display * fl_wl_display()
  Returns the Wayland display in use.
- Fl_Window * fl_wl_find(struct wld_window *)
  Returns the Fl_Window corresponding to a given the platform-specific window reference.
- cairo_t * fl_wl_gc()
  Returns the cairo context associated to the current window or Fl_Image_Surface.
- EGLContext fl_wl_glcontext(GLContext rc)
  Returns the EGLContext corresponding to the given GLContext.
- struct wl_surface * fl_wl_surface(struct wld_window * xid)
  Returns the wl_surface associated to a shown window.
- struct wld_window * fl_wl_xid(const Fl_Window * win)
  Returns a platform-specific reference associated to a shown window.

35.200.1  Detailed Description

Definitions of functions specific to the Wayland platform.

35.200.2  Function Documentation

35.200.2.1  fl_wl_compositor()

struct wl_compositor * fl_wl_compositor()

Returns the wl_compositor of the current Wayland session.

This allows, for example, to create a wl_surface with
struct wl_surface *my_wl_surface = wl_compositor_create_surface(fl_wl_compositor());

35.201  wayland.H

Go to the documentation of this file.

1 //
2 // Wayland/X11 hybrid platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //  https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //  https://www.fltk.org/bugs.php
15 //
16 #if !defined(FL_PLATFORM_H)
17 # error "Never use <FL/wayland.H> directly; include <FL/platform.H> instead."

Generated by Doxygen
Definitions of functions specific to the Windows platform.

**Functions**

- **HINSTANCE fl_win32_display ()**
  
  Returns the Windows-specific display in use

- **FI_Window * fl_win32_find (HWND)**
  
  Returns the FI_Window corresponding to the given Windows-specific window reference.

- **HDC fl_win32_gc ()**
  
  Returns the Windows-specific graphics context for the current window

- **HGLRC fl_win32_glcontext (GLContext rc)**
  
  Returns the Windows-specific GL rendering context corresponding to the given GLContext

- **HWND fl_win32_xid (const FI_Window *win)**
  
  Returns the Windows-specific window reference corresponding to the given FI_Window object.

**35.202.1 Detailed Description**

Definitions of functions specific to the Windows platform.

**35.203 win32.H**

Go to the documentation of this file.
// Do not directly include this file, instead use <FL/platform.H>. It will
// include this file if _WIN32 is defined. This is to encourage
// portability of even the system-specific code...

#ifdef FL_DOXYGEN
#else
#ifndef FL_PLATFORM_H
#error "Never use <FL/win32.H> directly; include <FL/platform.H> instead."
#endif // !FL_PLATFORM_H

#include <windows.h>
typedef HWND Window;

typedef struct HGLRC__ *HGLRC;

extern FL_EXPORT HGLRC fl_win32_glcontext(GLContext rc);
extern FL_EXPORT HWND fl_win32_xid(const Fl_Window *win);
extern FL_EXPORT Fl_Window *fl_win32_find(HWND);

#endif // FL_LIBRARY || FL_INTERNALS

// most recent Fl_color() or Fl_rgbcolor() points at one of these:
extern FL_EXPORT struct Fl_XMap {
  COLORREF rgb; // this should be the type the RGB() macro returns
  HPEN pen; // pen, 0 if none created yet
  int brush; // ref to solid brush, 0 if none created yet
  int pwidth; // the width of the pen, if present
} *fl_current_xmap;
inline COLORREF fl_rgb() {return fl_current_xmap->rgb;}
inline HPEN fl_pen() {return fl_current_xmap->pen;}

extern FL_EXPORT HANDLE fl_display;
extern FL_EXPORT HINSTANCE fl_win32_display();
extern FL_EXPORT HDC fl_gc;
extern FL_EXPORT HDC fl_win32_gc();
extern FL_EXPORT MSG fl_msg;

#endif // FL_DOXYGEN

35.204 x.H

1 //
2 // *Deprecated* platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
35.205 x11.H File Reference

Definitions of functions specific to the X11 platform.

Functions

- cairo_t * fl_cairo_gc ()
  
  Returns the Cairo-specific currently active graphics context (OPTION_USE_CAIRO=On)

- Display * fl_x11_display ()
  
  Returns the X11 Display in use.

- Fl_Window * fl_x11_find (Window xid)
  
  Returns the Fl_Window corresponding to the given Window reference.

- GC fl_x11_gc ()
  
  Returns the X11-specific currently active graphics context.

- Window fl_x11_xid (const Fl_Window * win)
  
  Returns the Window reference for the given Fl_Window, or zero if not shown().

35.205.1 Detailed Description

Definitions of functions specific to the X11 platform.

35.205.2 Function Documentation

35.205.2.1 fl_x11_find()

Fl_Window * fl_x11_find ( Window xid )

Returns the Fl_Window corresponding to the given Window reference.

35.205.2.2 fl_x11_gc()

GC fl_x11_gc ( )

Returns the X11-specific currently active graphics context.

35.205.2.3 fl_x11_xid()

Window fl_x11_xid ( const Fl_Window * win )

Returns the Window reference for the given Fl_Window, or zero if not shown().

Generated by Doxygen
Go to the documentation of this file.

1 //
2 // X11 platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
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8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 // Do not directly include this file, instead use <FL/platform.H>. It will
17 // include this file if FLTK_USE_X11 is defined. This is to encourage
18 // portability of even the system-specific code...
19
20 #ifdef FL_DOXYGEN
21
28 extern Display *fl_x11_display();
30 extern Window fl_x11_xid(const Fl_Window *win);
34 extern GC fl_x11_gc();
36 extern cairo_t* fl_cairo_gc();
37 #else // ! FL_DOXYGEN
38
39 #ifndef FL_PLATFORM_H
40 # error "Never use <FL/x11.H> directly; include <FL/platform.H> instead."
41 #endif // !FL_PLATFORM_H
42
43 #include <FL/Enumerations.H>
44
45 #if defined(__ABI32) || defined(__ABI64) // fix for broken SGI Irix X .h files
46 # pragma set woff 3322
47 #endif
48
49 #include <X11/Xlib.h>
50 #include <X11/Xutil.h>
51 #if defined(__ABI32) || defined(__ABI64)
52 # pragma reset woff 3322
53 #endif
54
55 typedef struct __GLXcontextRec *GLXContext;
56 extern GLXContext fl_x11_glcontext(GLContext rc);
57
58 // constant info about the X server connection:
59 extern FL_EXPORT Display *fl_display;
60 extern FL_EXPORT Display *fl_x11_display();
61 extern FL_EXPORT Window fl_x11_xid(const Fl_Window *win);
62 extern FL_EXPORT Fl_Window *fl_x11_find(Window xid);
63 extern FL_EXPORT int fl_screen;
64 extern FL_EXPORT XVisualInfo *fl_visual;
65 extern FL_EXPORT Colormap fl_colormap;
66
67 // drawing functions:
68 extern FL_EXPORT GC fl_gc;
69 #if FLTK_USE_CAIRO
70 typedef struct _cairo cairo_t;
71 extern FL_EXPORT cairo_t* fl_cairo_gc();
72 #endif
73 extern FL_EXPORT GC fl_x11_gc();
74 FL_EXPORT ulong fl_xpixel(Fl_Color i);
75 FL_EXPORT ulong fl_xpixel(uchar r, uchar g, uchar b);
76
77 // feed events into fltk:
78 FL_EXPORT int fl_handle(const XEvent&);
79
80 // you can use these in Fl::add_handler() to look at events:
81 extern FL_EXPORT void *fl_xftfont;
82 extern FL_EXPORT void *fl_xftmessage;
83 #if defined(FL_LIBRARY) || defined(FL_INTERNALS)
84 extern FL_EXPORT Window fl_message_window;
85 #endif
86 extern FL_EXPORT void *fl_xftfont;
87
88 // access to core fonts:
89 // This class provides a "smart pointer" that returns a pointer to an XFontStruct.
90 // The global variable fl_font can be called wherever a bitmap "core" font is
91 // needed, e.g. when rendering to a GL context under X11.
92 // With Xlib / X11 fonts, fl_font will return the current selected font.
// With XFT / X11 fonts, fl_xfont will attempt to return the bitmap "core" font most
// similar to (usually the same as) the current XFT font.
class FL_EXPORT Fl_XFont_On_Demand
{
  public:
    Fl_XFont_On_Demand(XFontStruct * p = NULL) : ptr(p) { }
    Fl_XFont_On_Demand& operator=(const Fl_XFont_On_Demand& x)
    { ptr = x.ptr; return *this; }
    Fl_XFont_On_Demand& operator=(XFontStruct * p)
    { ptr = p; return *this; }
    XFontStruct& value();
    operator XFontStruct *() { return value(); }
    XFontStruct * operator->() { return value(); }
    bool operator==(const Fl_XFont_On_Demand& x) { return ptr == x.ptr; }
    bool operator!=(const Fl_XFont_On_Demand& x) { return ptr != x.ptr; }
  private:
    XFontStruct *ptr;
};
extern FL_EXPORT Fl_XFont_On_Demand fl_xfont;

extern FL_EXPORT char fl_override_redirect; // hack into Fl_X::make_xid()

#if !FL_LIBRARY || !FL_INTERNALS
#endif // FL_DOXYGEN

35.207 cgdebug.h

The file "COPYING" which should have been included with this file. If this
file is missing or damaged, see the license at:
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https://www.fltk.org/bugs.php

This file allows easier debugging of Mac OS X Core Graphics
but since it has proven to be tremendously useful in debugging
the FLTK port to "Quartz", I decided to add this file in case
more bugs show up.

This header is activated by adding the following
to "config.h"

#include "src/cgdebug.h"

// Running "./configure" will remove this line from "config.h".

When used erroneously, Core Graphics prints warnings to
stderr. This is helpful, however it is not possible to
associate a line number or source file with the warning message.
This header file outputs a trace of CG calls, interweaving
them with CG warnings.

Matthias

#ifndef CGDEBUG
#define CGDEBUG
#include <stdio.h>
#include <Carbon/Carbon.h>

#define CGDebug
#define CGDebugContextCreate
#define CGDebugGetImageData
#define CGBeginCGContext
#define QDEndCGContext

#include <stdio.h>
#include <Carbon/Carbon.h>

AddArc
AddLineToPoint
ClipToRect
ClosePath
ConcatCTM
DrawImage
FillPath
FillRect
inline OSStatus dbgLocation(const char *file, int line)
{
    fprintf(stderr, "%s:%d ", file, line);
    return 0;
}

inline OSStatus dbgEndl()
{
    fprintf(stderr, "\n");
    return 0;
}

inline void dbgCGContextClipToRect(CGContextRef a, CGRect b)
{
    CGContextClipToRect(a, b);
    fprintf(stderr, "%s:%d ", __FILE__, __LINE__);
    fprintf(stderr, "\n");
}

#define CGContextClipToRect(a, b) {
    dbgLocation(__FILE__, __LINE__); \
    dbgCGContextClipToRect(a, b);
    fprintf(stderr, "\n"); 
}

inline void dbgCGContextFillRect(CGContextRef a, CGRect b)
{
    CGContextFillRect(a, b);
    fprintf(stderr, "%s:%d ", __FILE__, __LINE__);
    fprintf(stderr, "\n");
}

#define CGContextFillRect(a, b) {
    dbgLocation(__FILE__, __LINE__); \
    dbgCGContextFillRect(a, b);
    fprintf(stderr, "\n"); 
}

inline OSStatus dbgQDEndCGContext(CGrafPtr a, CGContextRef *b)
{
    return QDEndCGContext(a, b);
}

#define QDEndCGContext(a, b) (
    dbgLocation(__FILE__, __LINE__) + \
    dbgQDEndCGContext(a, b) + \
    dbgEndl() )

inline OSStatus dbgQDBeginCGContext(CGrafPtr a, CGContextRef *b)
{
    return QDBeginCGContext(a, b);
}

#define QDBeginCGContext(a, b) (
    dbgLocation(__FILE__, __LINE__) + \
    dbgQDBeginCGContext(a, b) + \
    dbgEndl() )

inline void dbgClipCGContextToRegion(CGContextRef a, const Rect *b, RgnHandle c)
{
    ClipCGContextToRegion(a, b, c);
    fprintf(stderr, "%s:%d ", __FILE__, __LINE__);
    fprintf(stderr, "\n");
}

#define ClipCGContextToRegion(a, b, c) {
    dbgLocation(__FILE__, __LINE__); \
    dbgClipCGContextToRegion(a, b, c);
    fprintf(stderr, "\n"); 
}

inline void dbgCGContextMoveToPoint(CGContextRef context, float x, float y)
{
    CGContextMoveToPoint(context, x, y);
}

#define CGContextMoveToPoint(a, b, c) {
    dbgLocation(__FILE__, __LINE__); \
    dbgCGContextMoveToPoint(a, b, c);
    fprintf(stderr, "\n"); 
}
#define fastarrow_width 16
#define fastarrow_height 16
static const unsigned char fastarrow_bits[] = {
    0x00, 0x00, 0x00, 0x07, 0xe0, 0x07, 0xfc, 0x03, 0xff, 0xff, 0xfc, 0x03,
    0xe0, 0x07, 0x00, 0x07, 0xe0, 0x00, 0xe0, 0x07, 0xc0, 0x3f, 0xff, 0xff,
    0xc0, 0x3f, 0xe0, 0x07, 0xe0, 0x00, 0x00, 0x00
};
```c
#include <FL/Fl_Tooltip.H>
#include <FL/fl_draw.H>
#include <ctype.h>
#include <stdlib.h>
#include "flstring.h"
```

### Macros

- `#define FOREVER 1e20`

### Functions

- `bool fl_clipboard_notify_empty (void)`
- `void fl_close_display ()`
- `const char * fl_filename_name (const char *name)`
  
  Gets the file name from a path.
- `FL_Window * fl_find (Window xid)`
  
  Returns the FL_Window that corresponds to the given window reference, or `NULL` if not found.
- `void fl_fix_focus ()`
- `void fl_open_callback (void(*cb)(const char *name))`
  
  Register a function called for each file dropped onto an application icon.
- `void fl_open_display ()`
  
  Opens the display.
- `int fl_send_system_handlers (void *e)`
- `void fl_throw_focus (FL_Widget *o)`
- `void fl_trigger_clipboard_notify (int source)`
- `Window fl_xid_(const Fl_Window *w)`

### Variables

- `bool fl_disable_wayland = true`
  
  Prevent the FLTK library from using its Wayland backend and forces it to use its X11 backend.
- `const char * fl_local_alt = Fl::system_driver()->alt_name()`
  
  String pointer used in shortcuts, you can change it to another language.
- `const char * fl_local_ctrl = Fl::system_driver()->control_name()`
  
  String pointer used in shortcuts, you can change it to another language.
- `int(* fl_local_grab )(int)`
- `const char * fl_local_meta = Fl::system_driver()->meta_name()`
  
  String pointer used in shortcuts, you can change it to another language.
- `const char * fl_local_shift = Fl::system_driver()->shift_name()`
  
  String pointer used in shortcuts, you can change it to another language.
- `FL_Widget * fl_oldfocus`
- `FL_Widget * fl_selection_requestor`

#### 35.209.1 Detailed Description

Implementation of the member functions of class `Fl`.

#### 35.209.2 Function Documentation
35.209.2.1 fl_find()

`Fl_Window * fl_find (Window xid)`

Returns the `Fl_Window` that corresponds to the given window reference, or `NULL` if not found.

**Deprecated** Kept in the X11, Windows, and macOS platforms for compatibility with FLTK versions before 1.4. Please use `fl_x11_find(Window)`, `fl_wl_find(struct wld_window*)`, `fl_win32_find(HWND)` or `fl_mac_find(FLWindow*)` with FLTK 1.4.0 and above.

35.209.2.2 fl_open_display()

`void fl_open_display ()`

Opens the display.

Automatically called by the library when the first window is `show()`'n. Does nothing if the display is already open.

35.209.3 Variable Documentation

35.209.3.1 fl_disable_wayland

`bool fl_disable_wayland = true`

Prevent the FLTK library from using its Wayland backend and forces it to use its X11 backend.

Put this declaration somewhere in your code outside the body of any function:

```
FL_EXPORT bool fl_disable_wayland = true;
```

This declaration makes sure source code developed for FLTK 1.3, including X11-specific code, will build and run with FLTK 1.4 and its Wayland platform with this single source code level change. This declaration has no effect on non-Wayland platforms. Don't put this declaration if you want the Wayland backend to be used when it's available.

35.210 fl_arc.cxx File Reference

Utility functions for drawing arcs and circles.

```c
#include <FL/fl_draw.H>
#include <FL/math.h>
```

35.210.1 Detailed Description

Utility functions for drawing arcs and circles.

35.211 fl_ask.cxx File Reference

Utility functions for common dialogs.

```c
#include <FL/Fl.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Input_.H>
#include "flstring.h"
#include "Fl_Screen_Driver.H"
#include <FL/fl_ask.H>
#include "Fl_Message.h"
#include <stdio.h>
#include <stdarg.h>
```

Generated by Doxygen
Functions

• **void fl_alert (const char *fmt,...)**
  Shows an alert message dialog box.

• **int fl_ask (const char *fmt,...)**
  Shows a dialog displaying the fmt message, this dialog features 2 yes/no buttons.

• **void fl_beep (int type)**
  Emits a system beep.

• **int fl_choice (const char *fmt, const char *b0, const char *b1, const char *b2,...)**
  Shows a dialog displaying the printf style fmt message.

• **int fl_choice_n (const char *fmt, const char *b0, const char *b1, const char *b2,...)**
  Shows a dialog displaying the printf style fmt message.

• **const char * fl_input (const char *fmt, const char *defstr,...)**
  Shows an input dialog displaying the fmt message with variable arguments.

• **const char * fl_input (int maxchar, const char *fmt, const char *defstr,...)**
  Shows an input dialog displaying the fmt message with variable arguments.

• **void fl_message (const char *fmt,...)**
  Shows an information message dialog box.

• **int fl_message_hotspot ()**
  Gets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer.

• **void fl_message_hotspot (int enable)**
  Sets whether or not to move the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password() to follow the mouse pointer.

• **Fl_Widget * fl_message_icon ()**
  Gets the Fl_Box icon container of the current default dialog used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• **void fl_message_icon_label (const char *str)**
  Sets the icon label of the dialog window used in many common dialogs.

• **void fl_message_position (const int x, const int y, const int center)**
  Sets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• **void fl_message_position (Fl_Widget *widget)**
  Sets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• **int fl_message_position (int *x, int *y)**
  Gets the preferred position for the message box used in many common dialogs like fl_message(), fl_alert(), fl_ask(), fl_choice(), fl_input(), fl_password().

• **void fl_message_title (const char *title)**
  Sets the title of the dialog window used in many common dialogs.

• **void fl_message_title_default (const char *title)**
  Sets the default title of the dialog window used in many common dialogs.

• **const char * fl_password (const char *fmt, const char *defstr,...)**
  Shows an input dialog displaying the fmt message with variable arguments.

• **const char * fl_password (int maxchar, const char *fmt, const char *defstr,...)**
  Shows an input dialog displaying the fmt message with variable arguments.
Variables

- const char * fl_cancel = "Cancel"
  string pointer used in common dialogs, you can change it to another language
- const char * fl_close = "Close"
  string pointer used in common dialogs, you can change it to another language
- Fl_Font fl_message_font_ = FL_HELVETICA
- Fl_Fontsize fl_message_size_ = -1
- const char * fl_no = "No"
  string pointer used in common dialogs, you can change it to another language
- const char * fl_ok = "OK"
  string pointer used in common dialogs, you can change it to another language
- const char * fl_yes = "Yes"
  string pointer used in common dialogs, you can change it to another language

35.211.1 Detailed Description

Utility functions for common dialogs. This file defines the functions

- fl_alert()
- fl_beep()
- fl_message()
- fl_ask()
- fl_choice()
- fl_input()
- fl_input_str()
- fl_password()
- fl_password_str()

and some more functions to change their behavior (positioning, window title, and more). Since FLTK 1.4.0 a big part of these functions is implemented in class Fl_Message.

35.212 fl_boxtype.cxx File Reference

Drawing code for common box types.
#include <FL/Fl.H>
#include <FL/Fl_Widget.H>
#include <FL/fl_draw.H>
#include <config.h>

Macros

- #define D1 BORDER_WIDTH
- #define D2 (BORDER_WIDTH+BORDER_WIDTH)
- #define fl_border_box fl_rectbound
  allow consistent naming
Functions

• **void fl_border_frame** (int x, int y, int w, int h, Fl_Color c)
  Draws a frame of type FL_BORDER_FRAME.

• **void fl_down_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_DOWN_BOX.

• **void fl_down_frame** (int x, int y, int w, int h, Fl_Color)
  Draws a frame of type FL_DOWN_FRAME.

• **void fl_draw_box** (Fl_Boxtype t, int x, int y, int w, int h, Fl_Color c)
  Draws a box using given type, position, size and color.

• **void fl_embossed_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_EMBOSSED_BOX.

• **void fl_embossed_frame** (int x, int y, int w, int h, Fl_Color)
  Draws a frame of type FL_EMBOSSED_FRAME.

• **void fl_engraved_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_ENGRAVED_BOX.

• **void fl_engraved_frame** (int x, int y, int w, int h, Fl_Color)
  Draws a frame of type FL_ENGRAVED_FRAME.

• **void fl_flat_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_FLAT_BOX.

• **void fl_frame** (const char *s, int x, int y, int w, int h)
  Draws a series of line segments around the given box.

• **void fl_frame2** (const char *s, int x, int y, int w, int h)
  Draws a series of line segments around the given box.

• **const uchar* fl_gray_ramp ()**
  Sets the drawing function for a given box type.

• **void fl_no_box** (int, int, int, Fl_Color)
  Draws a box of type FL_NO_BOX.

• **void fl_rectbound (int x, int y, int w, int h, Fl_Color bgcolor)**
  Draws a bounded rectangle with a given position, size and color.

• **void fl_thin_down_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_THIN_DOWN_BOX.

• **void fl_thin_down_frame** (int x, int y, int w, int h, Fl_Color)
  Draws a frame of type FL_THIN_DOWN_FRAME.

• **void fl_thin_up_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_THIN_UP_BOX.

• **void fl_thin_up_frame** (int x, int y, int w, int h, Fl_Color)
  Draws a frame of type FL_THIN_UP_FRAME.

• **void fl_up_box** (int x, int y, int w, int h, Fl_Color c)
  Draws a box of type FL_UP_BOX.

• **void fl_up_frame** (int x, int y, int w, int h, Fl_Color)
  Draws a frame of type FL_UP_FRAME.

35.212.1 Detailed Description

Drawing code for common box types.

35.212.2 Function Documentation
35.212.2.1 fl_internal_boxtype()

void fl_internal_boxtype (  
    Fl_Boxtype t,  
    Fl_Box_Draw_P * f )

Sets the drawing function for a given box type.

Parameters

<table>
<thead>
<tr>
<th>in</th>
<th>t</th>
<th>box type</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>f</td>
<td>box drawing function</td>
</tr>
</tbody>
</table>

35.212.2.2 fl_rectbound()

void fl_rectbound (  
    int x,  
    int y,  
    int w,  
    int h,  
    Fl_Color bgcolor )

Draws a bounded rectangle with a given position, size and color.
Equivalent to drawing a box of type FL_BORDER_BOX.

35.213 fl_cmap.h

1 //
2 // DO NOT EDIT THIS FILE !
3 //
4 // This file must be generated by "util/cmap.cxx".
5 // See instructions in this file.
6 //
7 // Copyright 1998-2022 by Bill Spitzak and others.
8 //
9 // This library is free software. Distribution and use rights are outlined in
10 // the file "COPYING" which should have been included with this file. If this
11 // file is missing or damaged, see the license at:
12 //
13 // https://www.fltk.org/COPYING.php
14 //
15 // Please see the following page on how to report bugs and issues:
16 //
17 // https://www.fltk.org/bugs.php
18 //
19 0x00000000, // 0
20 0xff000000, // 1
21 0x00ff0000, // 2
22 0xffff0000, // 3
23 0x0000ff00, // 4
24 0xff00ff00, // 5
25 0x00ffff00, // 6
26 0xffffff00, // 7
27 0x55555500, // 8
28 0xc6717100, // 9
29 0x71c67100, // 10
30 0xe8a83800, // 11
31 0x7171c600, // 12
32 0x8e388e00, // 13
33 0x388e3800, // 14
34 0x0800a800, // 15
35 0xa8a89800, // 16
36 0xa8e8d800, // 17
37 0x68685800, // 18
38 0x98a8a800, // 19
39 0xd8e88e00, // 20
40 0x58666600, // 21
41 0x9c9c9c00, // 22
42 0xdecde800, // 23
43 0x5c5c5c00, // 24
44 0x9ca9ca00, // 25
45 0xde8dc00, // 26
46 0x5c685c00, // 27
35.213 fl_cmap.h

134 0x7f6d3f00, // 115
135 0x7f913f00, // 116
136 0x7f6e3f00, // 117
137 0x7fda3f00, // 118
138 0xff3f00, // 119
139 0xbff003f00, // 120
140 0xbf243f00, // 121
141 0xbf483f00, // 122
142 0xbf6d3f00, // 123
143 0xbf913f00, // 124
144 0xbf6e3f00, // 125
145 0xbfda3f00, // 126
146 0xbf3f00, // 127
147 0xff003f00, // 128
148 0xff243f00, // 129
149 0xff483f00, // 130
150 0xff6d3f00, // 131
151 0xff913f00, // 132
152 0xff6e3f00, // 133
153 0xffda3f00, // 134
154 0xff3f00, // 135
155 0x00007f00, // 136
156 0x00247f00, // 137
157 0x00487f00, // 138
158 0x006d7f00, // 139
159 0x00917f00, // 140
160 0x00b67f00, // 141
161 0x00da7f00, // 142
162 0x00ff7f00, // 143
163 0x3f007f00, // 144
164 0x3f247f00, // 145
165 0x3f487f00, // 146
166 0x3f6d7f00, // 147
167 0x3f917f00, // 148
168 0x3fb67f00, // 149
169 0x3fdabf00, // 150
170 0x3fffbf00, // 151
171 0x3f007f00, // 152
172 0x3f247f00, // 153
173 0x3f487f00, // 154
174 0x3f6d7f00, // 155
175 0x3f917f00, // 156
176 0x3fb67f00, // 157
177 0x3fdabf00, // 158
178 0x3fffbf00, // 159
179 0xbf007f00, // 160
180 0xbf247f00, // 161
181 0xbf487f00, // 162
182 0xbf6d7f00, // 163
183 0xbf917f00, // 164
184 0xbf6e3f00, // 165
185 0xbfda3f00, // 166
186 0xbff003f00, // 167
187 0xff007f00, // 168
188 0xff247f00, // 169
189 0xff487f00, // 170
190 0xff6d7f00, // 171
191 0xff917f00, // 172
192 0xffb67f00, // 173
193 0xffda3f00, // 174
194 0xff3f00, // 175
195 0x0000bf00, // 176
196 0x0024bf00, // 177
197 0x0048bf00, // 178
198 0x006dbf00, // 179
199 0x0091bf00, // 180
200 0x00b6bf00, // 181
201 0x00da7f00, // 182
202 0x00ff7f00, // 183
203 0x3f00bf00, // 184
204 0x3f24bf00, // 185
205 0x3f48bf00, // 186
206 0x3f6dbf00, // 187
207 0x3f91bf00, // 188
208 0x3fb6bf00, // 189
209 0x3fdabf00, // 190
210 0x3fffbf00, // 191
211 0x7f00bf00, // 192
212 0x7f24bf00, // 193
213 0x7f48bf00, // 194
214 0x7f6dbf00, // 195
215 0x7f91bf00, // 196
216 0x7fb6bf00, // 197
217 0x7fdabf00, // 198
218 0x7fffbf00, // 199
219 0xbf00bf00, // 200
220 0xbf24bf00, // 201

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Color handling.

```c++
#include <FL/Fl.H>
#include <FL/Fl_Device.H>
#include <FL/Fl_Graphics_Driver.H>
#include "fl_cmap.h"
```

### Functions

- **Fl_Color fl_color_average (Fl_Color color1, Fl_Color color2, float weight)**
  
  Returns the weighted average color between the two given colors.

- **Fl_Color fl_inactive (Fl_Color c)**
  
  Returns the inactive, dimmed version of the given color.
Variables

- unsigned fl_cmap[256]

35.214.1 Detailed Description

Color handling.

35.214.2 Variable Documentation

35.214.2.1 fl_cmap

unsigned fl_cmap[256]
Initial value:
= 

35.215 Fl_compose.cxx File Reference

Utility functions to support text input.
#include <FL/Fl.H>
#include "Fl_Screen_Driver.H"

35.215.1 Detailed Description

Utility functions to support text input.

35.216 fl_contrast.cxx File Reference

Color contrast handling.
#include <FL/Fl.H>
#include <math.h>

Functions

- Fl_Color fl_contrast (Fl_Color fg, Fl_Color bg, Fl_Fontsize fs, int context)
  Returns a color that contrasts with the background color.
- void fl_contrast_function (Fl_Contrast_Function *f)
  Register a custom contrast function.
- int fl_contrast_level ()
  Get the contrast level (sensitivity) of the fl_contrast() method.
- void fl_contrast_level (int level)
  Set the contrast level (sensitivity) of the fl_contrast() method.
- int fl_contrast_mode ()
  Return the current contrast algorithm (mode).
- void fl_contrast_mode (int mode)
  Set the contrast algorithm (mode).
- double fl_lightness (Fl_Color color)
  Return the perceived lightness of a color.
- double fl_luminance (Fl_Color color)
  Return the raw / physical luminance of a color.
- unsigned get_color (Fl_Color i)
Variables

- unsigned fl_cmap [256]

35.216.1 Detailed Description

Color contrast handling. Implementation of fl_contrast() and its variants.

35.217 \texttt{fl\_curve.cxx} File Reference

Utility for drawing Bézier curves, adding the points to the current fl_begin/fl_vertex/fl_end path.

```c
#include <FL/fl_draw.H>
#include <math.h>
```

35.217.1 Detailed Description

Utility for drawing Bézier curves, adding the points to the current fl_begin/fl_vertex/fl_end path. Incremental math implementation: I very much doubt this is optimal! From Foley/vanDam page 511. If anybody has a better algorithm, please send it!

35.218 \texttt{Fl\_Double\_Window.cxx} File Reference

\texttt{Fl\_Double\_Window} implementation.

```c
#include <FL/Fl.H>
#include <FL/platform.H>
#include <FL/Fl_Double_Window.H>
#include <FL/fl_draw.H>
#include "Fl\_Window\_Driver.H"
```

35.218.1 Detailed Description

\texttt{Fl\_Double\_Window} implementation.

35.219 \texttt{Fl\_GI\_Choice.H}

\begin{verbatim}
1 //
2 // OpenGL definitions for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //    https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //    https://www.fltk.org/bugs.php
15 //
16 //
17 // Internal interface to set up OpenGL.
18 //
19 // A "Fl\_GI\_Choice" is created from an OpenGL mode and holds information
20 // necessary to create a window (on X) and to create an OpenGL "context"
21 // (on both X and Win32).
22 //
23 // create_gl_context takes a window (necessary only on Win32) and an
24 // Fl\_GI\_Choice and returns a new OpenGL context. All contexts share
25 // display lists with each other.
26 //
27 // On X another create_gl_context is provided to create it for any
28 // X visual.
\end{verbatim}
// set_gl_context makes the given OpenGL context current and makes
// it draw into the passed window. It tracks the current one context
// to avoid calling the context switching code when the same context
// is used, though it is a mystery to me why the GLX/WGL libraries
// don't do this themselves...

// delete_gl_context destroys the context.

// This code is used by Fl_Gl_Window, gl_start(), and gl_visual()

#ifndef Fl_Gl_Choice_H
#define Fl_Gl_Choice_H

// Describes the platform-independent part of data needed to create a GLContext.
class Fl_Gl_Choice {
friend class Fl_Gl_Window_Driver;
int mode;
const int *alist;
Fl_Gl_Choice *next;
public:
Fl_Gl_Choice(int m, const int *alistp, Fl_Gl_Choice *n) : mode(m), alist(alistp), next(n) {}
};

#endif // Fl_Gl_Choice_H

// Definition of class Fl_Gl_Window_Driver, and of its platform-specific derived classes
// for the Fast Light Tool Kit (FLTK).

// Copyright 2016-2018 by Bill Spitzak and others.

// This library is free software. Distribution and use rights are outlined in
// the file "COPYING" which should have been included with this file. If this
// file is missing or damaged, see the license at:

// https://www.fltk.org/COPYING.php

// Please see the following page on how to report bugs and issues:

// https://www.fltk.org/bugs.php

#ifndef Fl_Gl_Window_Driver_H
#define Fl_Gl_Window_Driver_H

#include <FL/Fl_Gl_Window.H>
#include <FL/gl.h> // for GLint

class Fl_Gl_Choice;
class Fl_Font_Descriptor;

/* The constructor of each Fl_Gl_Window object creates also an object from a
platform-specific derived class from this class. */

class Fl_Gl_Window_Driver {
protected:
GLint current_prog;
Fl_Gl_Window *pWindow;

static GLContext cached_context;
static Fl_Gl_Window* cached_window;
static int nContext;
static GLContext *context_list;
static Fl_Gl_Choice *first;
static int copy;
static float gl_scale;
static GLContext gl_start_context;

Fl_Gl_Choice* g() { return pWindow->g; }
int mode() { return pWindow->mode_; }
void mode(int m) { pWindow->mode_ = m; }
const int *alist() { return pWindow->alist; }
void draw_overlay() { pWindow->draw_overlay(); }

Fl_Gl_Window_Driver(Fl_Gl_Window *win) : pWindow(win) {current_prog=0; }
virtual ~Fl_Gl_Window_Driver() {}

virtual Fl_Gl_Window_Driver* newGlWindowDriver() {}

virtual void before_show(int&) {}
};
virtual void after_show() {}
virtual void invalidate();
virtual int mode_(int /*m*/, const int * /*a*/) {return 0;}
virtual void make_current_before() {}
virtual void make_current_after() {}
virtual void swap_buffers() {}
virtual void resize(int /*is_a_resize*/, int /*w*/, int /*h*/) {}
virtual char swap_type();
virtual void swap_interval(int) { }
virtual int swap_interval() const { return -1; }
virtual int flush_begin(char&) {return 0;}
static Fl_Gl_Choice *find_begin(int m, const int *alistp);
static void add_context(GLContext ctx);
static void del_context(GLContext ctx);
Fl_Gl_Choice *find(int /*mode*/, const int * /*alistp*/) {return NULL;}
GLContext create_gl_context(Fl_Window *, const Fl_Gl_Choice*);
void set_gl_context(Fl_Window *, GLContext);
delete_gl_context(GLContext);
virtual void make_overlay(void * &o) {} // the default implementation may be enough
virtual void hide_overlay() {} // the default implementation may be enough
virtual void make_overlay_current() {}
virtual void redraw_overlay() {}
virtual void icn_do_overlay() { return 0; }
virtual void waitGL() {} // support for glFinish() function
virtual void glVisual(Fl_Gl_Choice *); // support for Fl::glVisual() function
virtual void glStart() {} // support for glStart() function
virtual void getProcAddress(const char * procName); // support for glutGetProcAddress()
static Fl_Gl_Choice *find_begin(char *); (return 0;)
void draw_string_legacy_get_list(const char * str, int n); // support for glDraw() without textures
virtual void glBitmapFont(Fl_Font_Descriptor *); // support for Fl::glBitmapFont() without textures
virtual void glSwitchToFlGlDriver(); // support for glSwitchToFlGlDriver() without textures
virtual Fl_Font_Descriptor ** fontnum_to_fontdescriptor(int fnum);
capture_gl_rectangle(int x, int y, int w, int h);
virtual Fl_RGB_Image * capture_gl_rectangle(int x, int y, int w, int h);
static inline Fl_Gl_Window_Driver * driver(const Fl_Gl_Window * win) { return win->pGlWindowDriver; }
// true means the platform uses glScissor() to make sure GL subwindows
// don’t leak outside their parent window
bool need_scissor() { return false; }
virtual void switch_to_GL1();
virtual void switch_back();

35.221 Fl_Graphics_Driver.cxx File Reference
Implementation of class Fl_Graphics_Driver.
#include <config.h>
#include <FL/Fl_Graphics_Driver.H>

Variables
- Fl_Graphics_Driver * fl_graphics.driver
  Points to the driver that currently receives all graphics requests.

35.221.1 Detailed Description
Implementation of class Fl_Graphics_Driver.

35.222 Fl_Grid.cxx File Reference
Implements the Fl_Grid container widget.
Detailed Description

Implements the Fl_Grid container widget.

Since

1.4.0

Fl_ImagedReader.h

#include <FL/Fl_Grid.H>
#include <FL/fl_draw.H>

Detailed Description

Implements the Fl_Grid container widget.

Since

1.4.0

Fl_ImagedReader.h

1 //
2 // Internal (Image) Reader class for the Fast Light Tool Kit (FLTK).
3 //
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5 //
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15 //
16 //
17 /*
18 This internal (undocumented) class reads data chunks from a file or from
19 memory in LSB-first byte order.
20
21 This class is used in Fl_GIF_Image and Fl_BMP_Image to avoid code
duplication and may be extended to be used in similar cases. Future
options might be to read data in MSB-first byte order or to add more
methods.
25 */
26
27 #ifndef FL_IMAGE_READER_H
28 #define FL_IMAGE_READER_H
29
30 #include <stdio.h>
31
32 class Fl_ImagedReader {
33 public:
34 // Create the reader.
35 Fl_ImagedReader();
36
37 // Initialize the reader to access the file system, filename is copied
38 // and stored.
39 int open(const char *filename);
40
41 // Initialize the reader for memory access, name is copied and stored
42 int open(const char *imagename, const unsigned char *data, const size_t datasize);
43
44 // Close and destroy the reader
45 ~Fl_ImagedReader();
46
47 // Read a single byte from memory or a file
48 unsigned char read_byte();
49
50 // Read a 16-bit unsigned integer, LSB-first
51 unsigned short read_word();
52
53 // Read a 32-bit signed integer, LSB-first
54 int read_long() { return (int)read_dword(); }
55
56 // Read a 32-bit unsigned integer, LSB-first
57 unsigned int read_dword();
58
59 // Read a 32-bit signed integer, LSB-first
60 int read_long() { return (int)read_dword(); }
61
// Move the current read position to a byte offset from the beginning
void seek(unsigned int n);

// Get the current file or memory offset from the beginning
long tell() const;

// Get the current EOF or error status of the file or data block
int error() const { return error_; }

// return the name or filename for this reader
const char *name() const { return name_; }

// skip a given number of bytes
void skip(unsigned int n) { seek((unsigned int)tell() + n); }

private:

// open() sets this if we read from a file
char is_file_;

// open() sets this if we read from memory
char is_data_;

// a pointer to the opened file
FILE *file_;

// a pointer to the current byte in memory
const unsigned char *data_;

// a pointer to the start of the image data
const unsigned char *start_;

// a pointer to the end of image data if reading from memory, otherwise undefined
const unsigned char *end_;

// a copy of the name associated with this reader
char *name_;

// a flag to store EOF or error status
int error_;
```cpp
Fl_Int_Vector &operator=(Fl_Int_Vector &o) {
    init();
    copy(o.arr_, o.size_);
    return *this;
}

int operator[](int x) const {
    return arr_[x];
}

int &operator[](int x) {
    return arr_[x];
}

unsigned int size() const {
    return size_;
}

void size(unsigned int count);

int pop_back() {
    int tmp = arr_[size_ - 1];
    size_--;
    return tmp;
}

void push_back(int val) {
    unsigned int x = size_;
    size(size_ + 1);
    arr_[x] = val;
}

int back() const {
    return arr_[size_ - 1];
}

bool empty() const {
    return (size_ == 0) ? true : false;
}
```

---

**Fl_Message.h**

```c
// Common dialog header file for the Fast Light Tool Kit (FLTK).
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#ifndef _src_Fl_Message_h_
#define _src_Fl_Message_h_

#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
#include <FL/fl_ask.H>

class Fl_Button;
class Fl_Input;

/* Note: Do not FL_EXPORT this class, it's for internal use only */

class Fl_Message_Box : public Fl_Box {
public:
    Fl_Message_Box(int X, int Y, int W, int H)
    : Fl_Box(X, Y, W, H) {}
    int handle(int e) FL_OVERRIDE;
};

/* Note: Do not FL_EXPORT this class, it's for internal use only */

class Fl_Message;
```
private:
static Fl_Box *message_icon_; // returned by Fl_Message::message_icon()
static const char *message_title_;
static const char *message_title_default_;
// icon label for next dialog [STR #2762]
static const char *message_icon_label_
// Note: since Fl_Message objects are destroyed before fl_input()
// and fl_password() return their input text, we *need* to store
// the text in an internal (static) buffer. :-(
static char *input_buffer_; // points to the allocated text buffer
static int input_size_; // size of allocated text buffer
// the callback for all buttons:
static void button_cb_(Fl_Widget *w, void *d);
// the window callback:
static void window_cb_(Fl_Widget *w, void *d);
// resize to make text and buttons fit
void resizeform();

public:
static Fl_Box *message_icon();
static void message_title(const char *title);
static void message_title_default(const char *title);
static void icon_label(const char *str);

static void message_position(const int x, const int y, const int center) {
form_x_ = x;
form_y_ = y;
form_position_ = center ? 2 : 1;
}
static void message_position(Fl_Widget *widget) {
int xo, yo;
Fl_Window *win = widget->top_window_offset(xo, yo);
form_x_ = xo + widget->w() / 2;
form_y_ = yo + widget->h() / 2;
if (win) {
form_x_ += win->x();
form_y_ += win->y();
}
form_position_ = 2;
}
static int message_position(int *x, int *y) {
if (x)
*x = form_position_ ? form_x_ : -1;
if (y)
*y = form_position_ ? form_y_ : -1;
return form_position_;
}
static void message_hotspot(int enable) { enable_hotspot_ = enable ? 1 : 0; }
static int message_hotspot() { return enable_hotspot_; }
int window_closed()const {
return window_closed_;}

private:
Fl_Widget *window_;
Fl_Message_Box *message_; Fl_Box *icon_; Fl_Button *button_[3];
Fl_Input *input_; int retval_; int window_closed_; // static (private) variables

// member variables and methods

// static (private) variables

public:
167 // Constructor
168 Fl_Message(const char *iconlabel);
169 ~Fl_Message() { delete window_; }
170
171 int innards(const char *fmt, va_list ap, const char *b0, const char *b1, const char *b2);
172 const char *input_innards(const char *fmt, va_list ap, const char *defstr, uchar type, int maxchar = -1, bool str = false);
173 }
174
175 typedef // _src_Fl_Message_h_

35.226 Fl_Native_File_Chooser_Kdialog.H

1 //
2 // FLTK native file chooser widget : KDE version
3 //
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15 //
16 #ifndef FL_KDIALOG_NATIVE_FILE_CHOOSER_H
17 #define FL_KDIALOG_NATIVE_FILE_CHOOSER_H 1
18
26 #include <FL/Fl_Native_File_Chooser.H>
27
28 class Fl_Kdialog_Native_File_Chooser_Driver : public Fl_Native_File_Chooser_FLTK_Driver {
29 friend class Fl_Native_File_Chooser;
30 friend class Fl_Zenity_Native_File_Chooser_Driver;
31 struct fnfc_pipe_struct {
32 char *all_files;
33 int fd;
34 }
35 static void fnfc_fd_cb(int fd, fnfc_pipe_struct *data);
36 char **_pathnames;
37 int _tpathnames;
38 char _directory;
39 char _preset_file;
40 char _title;
41 static bool did_find_kdialog;
42 static bool have_looked_for_kdialog;
43 Fl_Kdialog_Native_File_Chooser_Driver(int val);
44 ~Fl_Kdialog_Native_File_Chooser_Driver();
45 int count() const FL_OVERRIDE;
46 const char *filename() const FL_OVERRIDE;
47 const char *filename(int i) const FL_OVERRIDE;
48 virtual char *build_command();
49 int show() FL_OVERRIDE;
50 char *parse_filter(const char *f);
51 const char *filter() const FL_OVERRIDE;
52 void filter(const char *f) FL_OVERRIDE;
53 int filters() const FL_OVERRIDE;
54 void preset_file(const char *val) FL_OVERRIDE;
55 const char *preset_file() const FL_OVERRIDE;
56 void directory(const char *val) FL_OVERRIDE;
57 const char *directory() const FL_OVERRIDE;
58 void title(const char *val) FL_OVERRIDE;
59 const char *title() const FL_OVERRIDE;
60
61 #endif // FL_KDIALOG_NATIVE_FILE_CHOOSER_H

35.227 Fl_Native_File_Chooser_Zenity.H

1 //
2 // FLTK native file chooser widget : Zenity version
3 //
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// Please see the following page on how to report bugs and issues:
    // https://www.fltk.org/bugs.php

#ifndef FL_ZENITY_NATIVE_FILE_CHOOSER_H
#define FL_ZENITY_NATIVE_FILE_CHOOSER_H 1
#include "Fl_Native_File_Chooser_Kdialog.H"

class Fl_Zenity_Native_File_Chooser_Driver : public Fl_Kdialog_Native_File_Chooser_Driver {
friend class Fl_Native_File_Chooser;
static bool did_find_zenity;
static bool have_looked_for_zenity;
Fl_Zenity_Native_File_Chooser_Driver(int val);
char *build_command() FL_OVERRIDE;
};
#endif // FL_ZENITY_NATIVE_FILE_CHOOSER_H

#include <FL/Fl.H>
#include <FL/fl_draw.H>

// draw an arrow GUI element for the 'oxy' scheme
// bb bounding box
// t arrow type
// o orientation
// c arrow color
extern FL_EXPORT void oxy_arrow(Fl_Rect bb,
                                 Fl_Arrow_Type t, Fl_Orientation o,
                                 Fl_Color col);

#include "FL/Fl_Paged_Device.H"

Fl_Paged_Device.cxx File Reference

implementation of class Fl_Paged_Device.
#include <FL/Fl_Paged_Device.H>
#include <FL/Fl.H>
#include <FL/fl_draw.H>

Fl_rect.cxx File Reference

Drawing and clipping routines for rectangles.
#include <FL/platform.H>
#include <FL/Fl(Graphics_Driver.H)>

## Detailed Description

Drawing and clipping routines for rectangles.

### Fl_Screen_Driver.H

```cpp
1 //
2 // All screen related calls in a driver style class.
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
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12 // Please see the following page on how to report bugs and issues:
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14 //  https://www.fltk.org/bugs.php
15 //
16 ifndef FL_SCREEN_DRIVER_H
17 #define FL_SCREEN_DRIVER_H
18
19 #include <FL/fl_types.h>
20 #include <FL/Fl.H>  // for Fl_Timeout_Handler
21 #include <FL/Fl_Text_Editor.H>
22
23 // TODO: add text composition?
24 // TODO: add Fl::display
25 // TODO: add copy/paste, drag/drop?
26 // TODO: get key/get mouse?
27 // TODO: system colors/colormaps
28 // TODO: system menus?
29 // TODO: native file chooser
30 // TODO: native message boxes
31 // TODO: read screen to image
32 // TODO: application shortcuts
33
34 class Fl_Window;
35 class Fl_RGB_Image;
36 class Fl_Group;
37 class Fl_Input;
38 class Fl_System_Driver;
39
40 class Fl_Screen_Driver {
41
42 protected:
43 Fl_Screen_Driver();
44 virtual ~Fl_Screen_Driver();
45
46 static const int MAX_SCREENS = 16;
47
48 int num_screens;
49
50 static float fl_intersection(int x1, int y1, int w1, int h1,
51 int x2, int y2, int w2, int h2);
52
53 public:
54 static int keyboard_screen_scaling;  // true means ctrl/+/-/0/ resize windows
55 static char bg_set;
56 static char bg2_set;
57 static char fg_set;
58 static Fl_System_Driver *system_driver;
59
60 static const int fl_NoValue;
61 static const int fl_WidthValue;
62 static const int fl_HeightValue;
63 static const int fl_XValue;
64 static const int fl_YValue;
65 static const int fl_XNegative;
66 static const int fl_YNegative;
67
68 static int keyboard_screen_scaling;  // true means ctrl/+/-/0/ resize windows
69 static char bg_set;
70 static char bg2_set;
71 static char fg_set;
72 static Fl_System_Driver *system_driver;
73
74 // Next 2 are used when transient scale windows are implemented as popups
75 static Fl_Window *transient_scale_parent;
76
77 // key_table and key_table_size are used in fl_shortcut to translate key names
```


```c
struct Keyname {
    unsigned int key;
    const char * name;
};

virtual float scale(int) { return 1; }
virtual void scale(int /*n*/, float /*f*/) {}
static Fl_Screen_Driver *newScreenDriver();
// implement to process the -display argument and support the DISPLAY env var
virtual void display(const char *) {} // default implementation should be enough
virtual int XParseGeometry(const char * string, int* x, int* y, unsigned int* width, unsigned int* height);
// the default implementation is most probably enough
virtual void own_colormap() {}
// the default implementation of shortcut_add_key_name() is in src/flShortcut.cxx
virtual const char *shortcut_add_key_name(unsigned key, char *p, char *buf, const char **);
// implement functions telling whether a key is pressed
virtual int event_key(int) { return 0; }
virtual int get_key(int) { return 0; }
virtual int visual(int flags); // --- screen configuration
virtual void init() {}
virtual int x() { return 0; }
virtual int y() { return 0; }
virtual int w() { return 800; } // default, FL_OVERRIDE in driver!
virtual int h() { return 600; } // default, FL_OVERRIDE in driver!
virtual int screen_count();
void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my);
virtual void screen_xywh(int &X, int &Y, int &W, int &H, int /*n*/){}
X = 0;
Y = 0;
W = 800;
H = 600;
}
void screen_XYWH(int &X, int &Y, int &W, int &H, int mx, int my);
virtual void screen_XYWH(int &X, int &Y, int &W, int &H, int & /*n*/){}
X = 0;
Y = 0;
W = 800;
H = 600;
}
void screen_DPI(float &h, float &v, int n = 0) { // FL_OVERRIDE in driver!
h = 72;
v = 72;
(void)n;
}
void screen_work_area(int &X, int &Y, int &W, int &H, int mx, int my);
virtual void screen_work_area(int &X, int &Y, int &W, int &H, int &n) {}
screen_XYWH(X, Y, W, H, n);
}
// --- audible output
virtual void beep(int) {}
// --- global events
virtual void flush() {} // must FL_OVERRIDE
virtual void grab(Fl_Window *) {}
// --- global colors
virtual int parse_color(const char *p, uchar &r, uchar &g, uchar &b);
virtual const char *get_system_scheme();
// the default implementation of get_system_scheme() may be enough
virtual const char *get_system_scheme();
// if no keyboard is connected on a touch or pen device, the system on-screen keyboard is
virtual void request_keyboard() {}
```

---

**Generated by Doxygen**
virtual void release_keyboard() {}

virtual void release_keyboard() {} 

// we no longer need the on-screen keyboard; it's up to the system to hide it

virtual void release_keyboard() {} 

virtual void release_keyboard() {} 

if 'may_capture_subwins' is true, an implementation may or may not capture
also the content of subwindows embedded in 'win'. If subwindows were captured, 
'did_capture_subwins' is returned set to true. If read_win_rectangle() 
's' is called with 'may_capture_subwins' set to true, 'did_capture_subwins' should 
be set before the call to the address of a boolean set to false.

The implementation of this virtual function for the macOS platform has the 
capability of capturing subwindows when asked for.

A platform may also use its read_win_rectangle() implementation to capture
window decorations (e.g., title bar). In that case, it is called by
Fl_WINDOW_Driver::capture_titlebar_and_borders().

win is the window to capture from, or NULL to capture from the current offscreen

virtual Fl_RGB_Image *read_win_rectangle(int /*X*/, int /*Y*/, int /*w*/, int /*h*/, Fl_Window *,
bool may_capture_subwins = false,
bool *did_capture_subwins = NULL) {

(void)may_capture_subwins;
(void)did_capture_subwins;
return NULL;

static void write_image_inside(Fl_RGB_Image *to, Fl_RGB_Image *from, int to_x, int to_y);
static Fl_RGB_Image *traverse_to_gl_subwindows(Fl_Group *g, int x, int y, int w, int h,
Fl_RGB_Image *full_img);
static size_t convert_crlf(char *s, size_t len);

// optional platform-specific key handling for Fl_Input widget
virtual int input_widget_handle_key(int key, unsigned mods, unsigned shift, Fl_Input *input);

// implement to support Fl::get_mouse()
virtual int get_mouse(int &/*x*/, int &/*y*/) { return 0; }

// optional methods to enable/disable input methods for complex scripts
virtual void enable_im() {}
virtual void disable_im() {}

void rescale_all_windows_from_screen(int screen, float f);
static void transient_scale_display(float f, int nscreen);

enum APP_SCALING_CAPABILITY {
NO_APP_SCALING = 0,
SYSTEMWIDE_APP_SCALING,
PER_SCREEN_APP_SCALING
};

virtual APP_SCALING_CAPABILITY rescalable() { return NO_APP_SCALING; }


1 // Basic Fl_String header for the Fast Light Tool Kit (FLTK).
2 //
3 //

Generated by Doxygen
#ifndef _FL_Fl_String_H_
#define _FL_Fl_String_H_

#include <FL/Fl_Export.H>

// See: https://en.cppreference.com/w/cpp/string/basic_string/basic_string

class FL_EXPORT Fl_String {
private:
  char *buffer_;  
  int size_;  
  int capacity_; 
  void init_();
  void grow_(int n);
  void shrink_(int n);
  Fl_String &replace_(int at, int n_del, const char *src, int n_ins);

protected:
  static const char NUL;
  static const int npos;
public:
  static const int npos;
  Fl_String();
  Fl_String(const Fl_String &str);
  Fl_String(const char *cstr);
  Fl_String(const char *str, int size);
  ~Fl_String();
  Fl_String& operator=(const Fl_String &str);
  Fl_String& operator=(const char *cstr);
  Fl_String &assign(const Fl_String &str);
  Fl_String &assign(const char *str, int size);

  // ---- Element Access
  char at(int pos) const;
  char operator[](int n) const;
  char &operator[](int n);
  const char *data() const;
  char *data();
  const char *c_str() const;

  // ---- Capacity
  bool empty() const;
  int size() const;
  int capacity() const;
  void shrink_to_fit();

  // --- Operations
  void clear();
  Fl_String insert(int at, const char *src, int n_ins=npos);
  Fl_String insert(int at, const Fl_String &src);
  Fl_String erase(int at, int n_del);
  void push_back(char c);
  void pop_back();
  Fl_String append(const char *src, int n_ins=npos);
  Fl_String append(const Fl_String &src);
  Fl_String &operator+=(const char *src);
  Fl_String &operator+=(const Fl_String &src);
  Fl_String &operator+=(char c);
  int find(const Fl_String &needle, int start_pos=0) const;
  Fl_String &replace(int at, int n_del, const char *src, int n_ins=npos);
  Fl_String &replace(int at, int n_del, const Fl_String &src);
  Fl_String &replace(int at, int n_del, const Fl_String &src);
  Fl_String &operator+(char c);
  int find(const Fl_String &needle, int start_pos=0) const;
  Fl_String &replace(int at, int n_del, const Fl_String &src);
  Fl_String &replace(int at, int n_del, const Fl_String &src);
  Fl_String &operator+(char c);
  void resize(int n);
};

Generated by Doxygen
127 // --- Non Standard
128 int strlen() const;
129 void debug(const char *info = 0) const;
130 void hexdump(const char *info = 0) const;
131
132 }; // class Fl_String
133
134 // ---- Non-member functions
135 FL_EXPORT Fl_String operator+(const Fl_String& lhs, const Fl_String& rhs);
136 FL_EXPORT Fl_String operator+(const Fl_String& lhs, const char* rhs);
137 FL_EXPORT bool operator==(const Fl_String & lhs, const Fl_String & rhs);
138
139 #endif // _FL_Fl_String_H_

35.233 Fl_Sys_Menu_Bar_Driver.H

1 // system menu bar widget for the Fast Light Tool Kit (FLTK).
2 //
3 // Copyright 1998-2017 by Bill Spitzak and others.
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14 //
15 //
16 #ifndef Fl_Sys_Menu_Bar_Driver_H
17 #define Fl_Sys_Menu_Bar_Driver_H
18
19 #if !defined(FL_DOXYGEN)
20
21 #include <FL/Fl_Sys_Menu_Bar.H>
22
23 class Fl_Sys_Menu_Bar_Driver {
24 friend class Fl_Sys_Menu_Bar;
25 public:
26 static Fl_Sys_Menu_Bar::window_menu_style_enum window_menu_style();
27 static Fl_Sys_Menu_Bar_Driver *driver_; // to be assigned with a unique object of this class or of a
derived class
28 Fl_Sys_Menu_Bar *bar;
29 Fl_Sys_Menu_Bar_Driver();
30 virtual ~Fl_Sys_Menu_Bar_Driver();
31 virtual void update() {}
32 virtual void draw() { bar->Fl_Menu_Bar::draw();}
33 virtual void about(Fl_Callback *, void *) {}
34 virtual int add(const char * label, int shortcut, Fl_Callback *cb, void *user_data, int flags) {
35 return bar->Fl_Menu_Bar::add(label, shortcut, cb, void *user_data, flags);
36 }
37 virtual int add(const char * str) { return bar->Fl_Menu_Bar::add(str); }
38 virtual int insert(int index, const char * label, int shortcut, Fl_Callback *cb, void *user_data, int
flags) {
39 return bar->Fl_Menu_Bar::insert(index, label, shortcut, cb, user_data, flags);
40 }
41 virtual void menu(const Fl_Menu_Item *m) { return bar->Fl_Menu_Bar::menu(m); }
42 virtual void shortcut(int i, int s) { return bar->Fl_Menu_Bar::shortcut(i, s); }
43 virtual void setonly(Fl_Menu_Item *item) { return bar->Fl_Menu_Bar::setonly(item); }
44 virtual void clear() { return bar->Fl_Menu_Bar::clear(); }
45 virtual int clear_submenu(int index) { return bar->Fl_Menu_Bar::clear_submenu(index); }
46 virtual void remove(int index) { return bar->Fl_Menu_Bar::remove(index); }
47 virtual void replace(int index, const char *name) { return bar->Fl_Menu_Bar::replace(index, name); }
48 virtual void mode(int i, int fl) { return bar->Fl_Menu_Bar::mode(i, fl); }
49 virtual void create_window_menu() {}
50 static Fl_Sys_Menu_Bar::window_menu_style_enum window_menu_style() { return window_menu_style(); }
51 static void window_menu_style(Fl_Sys_Menu_Bar::window_menu_style_enum style) { window_menu_style_ =
style; }
52 }
53
54 #endif // !defined(FL_DOXYGEN)
55
56 #endif // Fl_Sys_Menu_Bar_Driver_H

35.234 Fl_System_Driver.H

1 // A base class for platform specific system calls
2 // for the Fast Light Tool Kit (FLTK).

Generated by Doxygen
/* Class hierarchy
 + Fl_System_Driver
 | + Fl_Posix_System_Driver
 | | + Fl_Unix_System_Driver
 | | + Fl_Darwin_System_Driver
 + Fl_WinAPI_System_Driver
 */

#ifndef FL_SYSTEM_DRIVER_H
#define FL_SYSTEM_DRIVER_H

#include <FL/Fl.H>
#include <FL/Fl_Export.H>
#include <FL/filename.H>
#include <FL/Fl_Preferences.H>
#include <stdio.h>
#include <stdlib.h>
#include <stdarg.h>
#include <string.h>
#include <time.h>

class Fl_File_Icon;
class Fl_File_Browser;
class Fl_Pixmap;
class Fl_Widget;
class Fl_Sys_Menu_Bar_Driver;
class Fl_System_Driver {
friend class Fl;
protected:
  // implement once for each platform
  static Fl_System_Driver *newSystemDriver();
  Fl_System_Driver();
  static bool awake_ring_empty();
public:
  virtual ~Fl_System_Driver();
  static int command_key;
  static int control_key;

  // implement if the system adds unwanted program argument(s)
  virtual int single_arg(const char *) { return 0; }

  // implement if the system adds unwanted program argument pair(s)
  virtual int arg_and_value(const char * /*name*/, const char * /*value*/) { return 0; }

  // implement to set the default effect of Fl::warning()
  static void warning(const char * format, ...);
  virtual void warning(const char * format, va_list args);

  // implement to set the default effect of Fl::error()
  static void error(const char * format, ...);
  virtual void error(const char * format, va_list args);

  // implement to set the default effect of Fl::fatal()
  static void fatal(const char * format, ...);
  virtual void fatal(const char * format, va_list args);

  // implement these to support cross-platform file operations
  virtual char *utf2mbcs(const char *s) {return (char*)s;}
  virtual char *getenv(const char *); {return NULL;}
  virtual int putenv(const char *); {return -1;}
  virtual int open(const char * /*f*/, int /*oflags*/, int /*pmode*/) {return -1;}
  virtual FILE *fopen(const char* f, const char *mode);
  virtual int system(const char *) {return -1;}
  virtual int execvp(const char * /*file*/, char *const * /*argv*/) {return -1;}
  virtual int chmod(const char * /*f*/, int /*mode*/) {return -1;}
  virtual int access(const char * /*f*/, int /*mode*/) { return -1;}
  virtual int fstat(const char * /*f*/, struct stat *) { return -1;}

  // implement these to support cross-platform string operations
  virtual char *strdup(const char *); {return NULL;}

  // Note: the default implementation ignores the 'binary' argument.
  // Some platforms [notably Windows] may use this argument.
  virtual int open_ext(const char * f, int /*binary*/, int oflags, int pmode) {
    return -1;
  }

  // implement one once for each platform
  static Fl_System_Driver *newSystemDriver();
  Fl_System_Driver();
  static bool awake_ring_empty();
public:
  virtual Fl_System_Driver();
  static int command_key;
  static int control_key;

  // implement if the system adds unwanted program argument(s)
  virtual int single_arg(const char *) { return 0; }

  // implement if the system adds unwanted program argument pair(s)
  virtual int arg_and_value(const char * /*name*/, const char * /*value*/) { return 0; }

  // implement to set the default effect of Fl::warning()
  static void warning(const char * format, ...);
  virtual void warning(const char * format, va_list args);

  // implement to set the default effect of Fl::error()
  static void error(const char * format, ...);
  virtual void error(const char * format, va_list args);

  // implement to set the default effect of Fl::fatal()
  static void fatal(const char * format, ...);
  virtual void fatal(const char * format, va_list args);

  // implement these to support cross-platform file operations
  virtual char *utf2mbcs(const char *s) {return (char*)s;}
  virtual char *getenv(const char *); {return NULL;}
  virtual int putenv(const char *); {return -1;}
  virtual int open(const char * /*f*/, int /*oflags*/, int /*pmode*/) {return -1;}
  virtual FILE *fopen(const char* f, const char *mode);
  virtual int system(const char *) {return -1;}
  virtual int execvp(const char * /*file*/, char *const * /*argv*/) {return -1;}
  virtual int chmod(const char * /*f*/, int /*mode*/) {return -1;}
  virtual int access(const char * /*f*/, int /*mode*/) { return -1;}
  virtual int fstat(const char * /*f*/, struct stat *) { return -1;}

Generated by Doxygen
virtual char *getcwd(char*, int) {return NULL;}
virtual int chdir(const char*) {return -1;}
virtual int unlink(const char*) {return -1;}
virtual int mkdir(const char*, int) {return -1;}
virtual int rmdir(const char*) {return -1;}
virtual int rename(const char*, const char*) {return -1;}
virtual int filename_list(const char*, dirent**); // implement scandir-like function
virtual int filename_isdir(const char*); // the default implementation of filename_isdir() is in src/filename_isdir.cxx and may be enough
virtual int filename_absolute(char*, int, const char*, const char*); // the default implementation of filename_absolute() is in src/filename_absolute.cxx and may be enough
virtual int filename_isdir_quick(const char*); // the default implementation of filename_isdir_quick() is in src/filename_isdir.cxx and may be enough
virtual const char* filename_name(const char*); // implement to support Fl_Filename::name()
virtual const char* filename_ext(const char*); // the default implementation of filename_ext() is in src/filename_ext.cxx and may be enough
virtual const char* filename_relative(char*, int, const char*, const char*); // the default implementation of filename_relative() is in src/filename_relative.cxx and may be enough
virtual int file_browser_load_filesystem(Fl_File_Browser*, char*, int, const char**, const char*); // implement to support Fl_File_Browser::load()
virtual int file_browser_load_directory(const char* directory, char* filename, size_t name_size, char* errmsg=NULL, int errmsg_sz=0); // the default implementation of file_browser_load_directory() should be enough
virtual const char* filesystem_label() { return "File Systems";} // the default implementation is most probably enough
virtual const char* home_directory_name() { return "";} // implement to return the user's home directory name
virtual const char* preference_rootnode(Fl_Preferences*, Fl_Preferences::Root, const char*, const char** application) {return NULL;} // implement to support Fl_Preferences
virtual int file_type(const char*); // implement to support Fl_File_Icon
virtual void *thread_message() {return NULL;} // implement to support threading
virtual void unlock() {}
virtual int lock() {return 1;}
virtual void awake(void*) {}
virtual int lock() {return 1;}
virtual void unlock();
virtual void thread_message(); // implement to support Fl_Thread
virtual char *preference_rootnode(Fl_Preferences*, Fl_Preferences::Root, const char*, const char** application) {return NULL;}
virtual int preferences_need_protection_check() {return 0;}
virtual void *load(const char*); // implement to support Fl_Plugin_Manager::load()
virtual void png_extra_rgba_processing(unsigned char* array, int, int); // the default implementation is most probably enough
virtual void *next_dir_sep(const char*); // return TRUE means \ as / in file names
virtual int backslash_as_slash() {return 0;} // return TRUE means : indicates a drive letter in file names
192 virtual int colon_is_drive() { return 0; }
193 // return TRUE means that files whose name begins with dot are hidden
194 virtual int dot_file_hidden() { return 0; }
195 // return TRUE when file names are case insensitive
196 virtual int case_insensitive_filenames() { return 0; }
197 // the implementations of local_to_latin1() and latin1_to_local() are in fl_encoding_latin1.cxx
198 virtual const char *local_to_latin1(const char *t, int n);
199 virtual const char *latin1_to_local(const char *t, int n);
200 // the implementations of local_to_mac_roman() and mac_roman_to_local() are in fl_encoding_mac_roman.cxx
201 virtual const char *local_to_mac_roman(const char *t, int n);
202 virtual const char *mac_roman_to_local(const char *t, int n);
203 // the default implementations of tree_openPixmap() and tree_closePixmap() are
204 // in FL_Tree_Prefs.cxx and can be enough
205 virtual Fl_Pixmap *tree_openPixmap();
206 virtual Fl_Pixmap *tree_closePixmap();
207 static const char *const tree_open_xpm[]; // used by tree_openPixmap()
208 static const char * const tree_close_xpm[]; // used by tree_closePixmap()
209 // the default implementation of tree_connector_style() is in FL_Tree_Prefs.cxx and can be enough
210 virtual int tree_connector_style();
211 virtual void add_fd(int fd, int when, Fl_FD_Handler cb, void * = 0);
212 virtual void remove_fd(int); // default implementation of tree_openPixmap() may be enough
213 virtual void remove_fd(int, int when);
214 virtual void remove_fd(int);
215 // the default implementation of open_callback() may be enough
216 virtual void open_callback(void (*)(const char *));
217 // The default implementation may be enough.
218 virtual void gettime(time_t *sec, int *usec);
219 // The default implementation of the next 4 functions may be enough.
220 virtual const char *shift_name() { return "Shift"; }
221 virtual const char *meta_name() { return "Meta"; }
222 virtual const char *alt_name() { return "Alt"; }
223 virtual const char *control_name() { return "Ctrl"; }
224 virtual Fl_Sys_Menu_Bar_Driver *sys_menu_bar_driver() { return NULL; }
225 virtual void lock_ring();
226 virtual void unlock_ring();
227 virtual double wait(double); // must FL_OVERRIDE
228 virtual int ready() { return 0; } // must FL_OVERRIDE
229 virtual int close_fd(int) { return -1; } // to close a file descriptor
230 ;
231 #endif // FL_SYSTEM_DRIVER_H
232
35.235 Fl_Timeout.cxx File Reference

#include "Fl_Timeout.h"
#include "Fl_System_Driver.H"
#include <stdio.h>
#include <math.h>

35.236 Fl_Timeout.h File Reference

Fl_Timeout handling.

#include <FL/FL.h>

Classes

• class Fl_Timeout

   The internal class Fl_Timeout handles all timeout related functions.

Macros

• #define FL_TIMEOUT_DEBUG 0

35.236.1 Detailed Description

Fl_Timeout handling.

This file contains implementations of:
• Fl::add_timeout()
• Fl::repeat_timeout()
• Fl::has_timeout()
• Fl::remove_timeout()

and related methods of class Fl_Timeout.

35.237 Fl_Timeout.h

Go to the documentation of this file.

1 //
2 // Header for timeout support functions for the Fast Light Tool Kit (FLTK).
3 //
4 // Author: Albrecht Schlosser
5 // Copyright 2021-2022 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 // https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 // https://www.fltk.org/bugs.php
16 //
17 ifndef _src_Fl_Timeout_h_
18 #define _src_Fl_Timeout_h_
19 #define __src_Fl_Timeout_h_
20
21 #include <FL/Fl.H>

23 #define FL_TIMEOUT_DEBUG 0 // 1 = include debugging features, 0 = no

24 class Fl_Timeout {
25
26 protected:
27
28 Fl_Timeout *next; // ** Link to next timeout
29 Fl_Timeout_Handler callback; // the user's callback
30 void *data; // the user's callback data
31 double time; // delay until timeout
32 int skip; // skip "new" (inserted) timers (issue #450)
33
34 // constructor
35 Fl_Timeout () { next = 0; callback = 0; data = 0; time = 0; skip = 0; }
36
37 // destructor
38 ~Fl_Timeout () {}
39
40 // get a new timer entry from the pool or allocate a new one
41 static Fl_Timeout *get (double time, Fl_Timeout_Handler cb, void *data);
42
43 // insert this timer into the active timer queue, sorted by expiration time
44 void insert ();
45
46 // remove this timer from the active timer queue and
47 // add it to the "current" timer stack
48 void make_current ();
49
50 // remove this timer from the current timer stack and
51 // add it to the list of free timers
52 void release ();
53
54 double delay () {
55 return time;
56 }
57
58 void delay (double t) {
59 time = t;
60 }
61
62 public:
63
64 Generated by Doxygen
// Returns whether the given timeout is active.
static int has_timeout(Fl_Timeout_Handler cb, void *data);

// Add or remove timeouts
static void add_timeout(double time, Fl_Timeout_Handler cb, void *data);
static void repeat_timeout(double time, Fl_Timeout_Handler cb, void *data);
static void remove_timeout(Fl_Timeout_Handler cb, void *data);

// Elapse timeouts, i.e. calculate new delay time of all timers.
static void elapse_timeouts();

// Elapse timeouts and call timer callbacks.
static void do_timeouts();

// Return the delay in seconds until the next timer expires.
static double time_to_wait(double ttw);

#if FL_TIMEOUT_DEBUG
// Write some statistics to stdout
static void debug(int level = 1);
#endif

protected:
static Fl_Timeout *current();
static Fl_Timeout *first_timeout;
static Fl_Timeout *free_timeout;
static Fl_Timeout *current_timeout; // list of "current" timeouts
}; // class Fl_Timeout

#endif // _src_Fl_Timeout_h_

35.238  fl_vertex.cxx File Reference

Portable drawing code for drawing arbitrary shapes with simple 2D transformations.
#include <FL/Fl_Graphics_Driver.H>
#include <FL/Fl.H>
#include <FL/math.h>
#include <stdlib.h>

35.238.1 Detailed Description

Portable drawing code for drawing arbitrary shapes with simple 2D transformations.

35.239  Fl_Window_Driver.H

1 //
2 // A base class for platform specific window handling code
3 // for the Fast Light Tool Kit (FLTK).
4 //
5 // Copyright 2010-2023 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 // https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 // https://www.fltk.org/bugs.php
16 //
17 #ifndef FL_WINDOW_DRIVER_H
18 #define FL_WINDOW_DRIVER_H
19 #include <FL/FL_Export.H>
20 #include <FL/Fl_Window.H>
21 #include <FL/Fl_Overlay_Window.H>
22 //
23 #endif // FL_WINDOW_DRIVER_H
24 #include <FL/Fl_Export.h>
25 #include <FL/Fl_Window.h>
26 #include <FL/Fl_Overlay_Window.h>
27 //
28 Generated by Doxygen
```cpp
#include <stdlib.h>

class Fl_X;
class Fl_Image;
class Fl_RGB_Image;
class Fl_Image_Surface;

class Fl_Window_Driver {
friend class Fl_Window;
private:
static bool is_a_rescale_; // true when a top-level window is being rescaled

protected:
Fl_Window *pWindow;
int screen_num_; // number of screen where window is mapped

public:
Fl_Window_Driver(Fl_Window *);
virtual ~Fl_Window_Driver();
static Fl_Window_Driver *newWindowDriver(Fl_Window *);
static fl_uintptr_t xid(const Fl_Window *win);
static Fl_Window *find(fl_uintptr_t xid);
int wait_for_expose_value;
Fl_Image_Surface *other_xid; // offscreen bitmap (overlay and double-buffered windows)
int screen_num();
void screen_num(int n) { screen_num_ = n; }

// --- frequently used accessors to public window data
int x() const { return pWindow->x(); }
int y() const { return pWindow->y(); }
int w() const { return pWindow->w(); }
int h() const { return pWindow->h(); }
int border() const { return pWindow->border(); }
int visible() const { return pWindow->visible(); }
int visible_r() const { return pWindow->visible_r(); }
int shown() const { return pWindow->shown(); }
Fl_Group *parent() const { return pWindow->parent(); }

// --- accessors to private window data
int minw();
int minh();
int maxw();
int maxh();
int dw();
int dh();
int aspect();
unsigned char size_range_set();
int is_resizable() { return pWindow->is_resizable(); }
void is_a_rescale(bool b) { is_a_rescale_ = b; }

// --- window data
virtual int decorated_w() { return w(); } // default, should be overridden by driver
virtual int decorated_h() { return h(); }
virtual const Fl_Image* shape() { return NULL; }

// --- window management
virtual void take_focus();
virtual void flush(); // the default implementation may be enough
virtual void flush_double();
virtual void flush_overlay();

void current(Fl_Window *c);
void x(int X);
void y(int Y);
void current(Fl_Window *c);
char show_iconic() { return Fl_Window::show_next_window_iconic(); }
void show_iconic(char c) { Fl_Window::show_next_window_iconic(c); }
void flx(Fl_X *x) { pWindow->flx_ = x; }
Fl_Cursor cursor_default() { return pWindow->cursor_default; }
void destroy_double_buffer();
Fl_Window *overlay() {
return pWindow->as_overlay_window() ? pWindow->as_overlay_window()->overlay_ : NULL;
}
void resize_after_scale_change(int ns, float old_f, float new_f);

// --- window data

// --- window management

void resize_after_scale_change(int ns, float old_f, float new_f);
virtual int decorated_w() { return w(); } // default, should be overridden by driver
virtual int decorated_h() { return h(); }
virtual const Fl_Image* shape() { return NULL; }

// --- window management

virtual void take_focus();
virtual void flush(); // the default implementation may be enough
virtual void flush_double();
virtual void flush_overlay();
```
virtual void draw_begin();
virtual void draw_end();
void draw();
virtual void make_current();
virtual void label(const char *name, const char *mininame);
virtual void makeWindow() {}
virtual void wait_for_expose();
virtual void show();
virtual void resize(int /*X*/, int /*Y*/, int /*W*/, int /*H*/) {}
virtual void hide_common();
virtual void map() {}
virtual void unmap() {}
virtual void fullscreen_on() {}
virtual void fullscreen_off(int /*X*/, int /*Y*/, int /*W*/, int /*H*/) {}
virtual void maximize();
virtual void un_maximize();
virtual bool maximize_needs_hide() { return false; }
void is_maximized(bool b) { pWindow->is_maximized(b); }
virtual void use_border();
virtual void size_range();
virtual void iconize() {}
virtual void decoration_sizes(int *top, int *left, int *right, int *bottom) {
    *top = *left = *right = *bottom = 0;
}
virtual void show_with_args_begin() {}
virtual void show_with_args_end(int /*argc*/, char ** /*argv*/) {}
virtual int can_do_overlay();
virtual void redraw_overlay();
virtual int set_cursor(Fl_Cursor);
virtual int set_cursor(const Fl_RGB_Image *, int, int);
virtual void shape_pixmap_(Fl_Image * pixmap); // platform-independent, support function
virtual void shape(const Fl_Image *) {}
virtual void shape_alpha_(Fl_Image *, int /*offset*/) {}
virtual void icons(const Fl_RGB_Image * /*icons*/[], int /*count*/) {}
virtual const void *icon() const { return NULL; }
virtual void icon(const void *) {}
virtual void free_icons() {}
virtual fl_uintptr_t os_id() { return 0; }
};

#endif // FL_WINDOW_DRIVER_H

35.240 fl_write_png.cxx File Reference

PNG image support functions.

#include <config.h>
#include <FL/FL_PNG_Image.H>
#include <FL/FL_RGB_Image.H>

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35.240 fl_write_png.cxx File Reference

#include <FL/fl_string_functions.h>
#include <FL/fl_utf8.h>
#include <stdio.h>
#include <time.h>

Functions

- int fl_write_png (const char *filename, const char *pixels, int w, int h, int d, int ld)
  
  Write raw image data to a PNG image file.

- int fl_write_png (const char *filename, const unsigned char *pixels, int w, int h, int d, int ld)
  
  Write raw image data to a PNG image file.

- int fl_write_png (const char *filename, Fl_RGB_Image *img)
  
  Write an RGB(A) image to a PNG image file.

35.240.1 Detailed Description

PNG image support functions.

35.240.2 Function Documentation

35.240.2.1 fl_write_png() [1/3]

int fl_write_png {
    const char * filename,
    const char * pixels,
    int w,
    int h,
    int d,
    int ld }

Write raw image data to a PNG image file.

This is a very basic and restricted function to create a PNG image file from raw image data, e.g. a screenshot.

The image data must be aligned w/o gaps after each row (ld = 0 or ld = w * d) or ld must be the total length of each row, i.e. w * d + gapsize. If ld == 0 then ld = w * d is assumed.

The total data size must be (w * d + gapsize) * h = ld' * h where ld' = w * d if ld == 0.

For further restrictions and return values please see fl_write_png(const char *filename, Fl_RGB_Image *img).

Parameters

| in   | filename | Output filename, extension should be '.png' |
|      | pixels   | Image data                                    |
|      | w        | Image data width                             |
|      | h        | Image data height                            |
|      | d        | Image depth: 1 = GRAY, 2 = GRAY + alpha, 3 = RGB, 4 = RGBA |
| in   | ld       | Line delta: default (0) = w * d               |

Returns

success (0) or error code, see ...

See also

fl_write_png(const char *filename, Fl_RGB_Image *img)
35.240.2.2 fl_write_png() [2/3]

```c
int fl_write_png (const char * filename, const unsigned char * pixels, int w, int h, int d, int ld)
```

Write raw image data to a PNG image file.

See also

```c
fl_write_png(const char *filename, const char *pixels, int w, int h, int d, int ld)
```

35.240.2.3 fl_write_png() [3/3]

```c
int fl_write_png (const char * filename, Fl_RGB_Image * img )
```

Write an RGB(A) image to a PNG image file.

This is a very basic and restricted function to create a PNG image file from an RGB image (`Fl_RGB_Image`). The image data must be aligned w/o gaps, i.e. ld() MUST be zero or equal to data_w() * data_h(). The image file is always written with the original image size data_w() and data_h(), even if the image has been scaled.

Image depth 1 (gray), 2 (gray + alpha channel), 3 (RGB) and 4 (RGBA) are supported.

Note

Currently there is no error handling except for errors when opening the file. This may be changed in the future.

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>filename</code></td>
<td>Output filename, extension should be <code>.png</code></td>
</tr>
<tr>
<td><code>img</code></td>
<td>RGB image to be written</td>
</tr>
</tbody>
</table>

**Returns**

success (0) or error code: negative values are errors

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>success, file has been written</td>
</tr>
<tr>
<td>-1</td>
<td>png or zlib library not available</td>
</tr>
<tr>
<td>-2</td>
<td>file open error</td>
</tr>
</tbody>
</table>

See also

```c
fl_write_png(const char *, int, int, int, const unsigned char *)
```

35.241 Fl_XColor.H

1 //
2 // X-specific color definitions for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
#include <config.h>
#include <FL/Enumerations.H>

// one of these for each color in fltk's "colormap":
// if overlays are enabled, another one for the overlay
struct Fl_XColor {
    unsigned char r, g, b; // actual color used by X
    unsigned char mapped; // true when XAllocColor done
    unsigned long pixel; // the X pixel to use
};

extern Fl_XColor fl_xmap[/*overlay*/][256];

// mask & shifts to produce xcolor for truecolor visuals:
extern unsigned char fl_redmask, fl_greenmask, fl_bluemask;
extern int fl_redshift, fl_greenshift, fl_blueshift, fl_extrashift;

#define flstring_h

#define strcasecmp(s,t) _stricmp((s), (t))
# define strncasecmp(s,t,n) _strnicmp((s), (t), (n))
#if _MIN32 && ...
#endif

#ifdef __cplusplus
extern "C" {
#endif

FL_EXPORT extern int fl_snprintf(char *, size_t, const char *, ...);
#ifndef HAVE_SNPRINTF
#define snprintf fl_snprintf
#endif

FL_EXPORT extern int fl_vsnprintf(char *, size_t, const char *, va_list ap);
#ifndef HAVE_VSNPRINTF
#define vsnprintf fl_vsnprintf
#endif

/*
 * strlcpy() and strlcat() are some really useful BSD string functions
 * that work the way strncpy() and strncat() *should* have worked.
 */

FL_EXPORT extern size_t fl_strlcat(char *, const char *, size_t);
#ifndef HAVE_STRLCAT
#define strlcat fl_strlcat
#endif

FL_EXPORT extern size_t fl_strlcpy(char *, const char *, size_t);
#ifndef HAVE_STRLCPY
#define strlcpy fl_strlcpy
#endif

/*
 * Locale independent ASCII string compare function,
 * does not introduce locale issues as with strcasecmp()
 */

FL_EXPORT extern int fl_ascii_strcasecmp(const char *s, const char *t);

#ifdef __cplusplus
}
#endif

#endif /* !flstring_h */

35.243  freeglut_teapot_data.h

/*
 * freeglut_teapot_data.h
 *
 * The freeglut library teapot data include file.
 *
 * Permission is hereby granted, free of charge, to any person obtaining a
 * copy of this software and associated documentation files (the "Software"),
 * to deal in the Software without restriction, including without limitation
 * the rights to use, copy, modify, merge, publish, distribute, sublicense,
 * and/or sell copies of the Software, and to permit persons to whom the
 * Software is furnished to do so, subject to the following conditions:
 *
 * The above copyright notice and this permission notice shall be included
 * in all copies or substantial portions of the Software.
 *
 * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
 * OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
 * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.  IN NO EVENT SHALL
 * PAWEL W. OLSZTA BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER
 * IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN
 * CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
 */

#ifndef FREEGLUT_TEAPOT_DATA_H
#define FREEGLUT_TEAPOT_DATA_H

/*
 * Original teapot code copyright follows:
 */

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/*
Rim, body, lid, and bottom data must be reflected in x and y; handle and spout data across the y axis only.
*/

static int patchdata[16] =
{ 102, 103, 104, 105, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 }, /* rim */
{ 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 }, /* body */
{ 24, 25, 26, 27, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40 },
{ 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 }, /* bottom */
{ 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68 }, /* handle */
{ 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83 }, /* spout */
{ 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95 };

static double cpdata[3] =
{ 0.2, 0.2, 0.2 }, { -0.3, -0.3, 0.2 }, { 0.0, 0.0, 0.0 },
{ 0.2, 0.2, 0.2 }, { -0.3, -0.3, 0.2 }, { 0.0, 0.0, 0.0 },
{ 0.2, 0.2, 0.2 }, { -0.3, -0.3, 0.2 }, { 0.0, 0.0, 0.0 }
};
### mediumarrow.h

1 #define mediumarrow_width 16
2 #define mediumarrow_height 16
3 static const unsigned char mediumarrow_bits[] = {
  4 0x40, 0x00, 0x60, 0x00, 0x70, 0x00, 0x78, 0x00, 0xfc, 0x3f, 0x78, 0x00,
  5 0x70, 0x00, 0x60, 0x02, 0x40, 0x06, 0x00, 0x0e, 0x00, 0x1e, 0xfc, 0x3f,
  6 0x00, 0x1e, 0x00, 0x0e, 0x00, 0x06, 0x00, 0x0e, 0x00, 0x1e, 0x0f, 0x3f,
  7 0x0e, 0x00, 0x06, 0x00, 0x0e, 0x00, 0x06, 0x00, 0x0e, 0x00, 0x1e};

### numericsort.c File Reference

#include <ctype.h>
#include <stdlib.h>
#include <string.h>
#include <FL/platform_types.h>
#include <FL/filename.H>
#include <FL/fl_utf8.h>

### Functions

- int fl_casenumericsort (struct dirent **A, struct dirent **B)
  
  Compares directory entries alphanumerically (case-insensitive).

- int fl_numericsort (struct dirent **A, struct dirent **B)
  
  Compares directory entries alphanumerically (case-sensitive).

### fl_casenumericsort()

int fl_casenumericsort {
  struct dirent ** A,
  struct dirent ** B )

Compares directory entries alphanumerically (case-insensitive).

**Note**

This comparison is UTF-8 aware.

**See also**

fl_numericsort()
### 35.245.1.2 fl_numericsort()

```c
int fl_numericsort (  
    struct dirent ** A,  
    struct dirent ** B  
)
```

Compares directory entries alphanumerically (case-sensitive). Numbers are compared without sign, i.e. "-" is not taken as a sign of following numerical values. The following list of files would be in ascending order (examples are ASCII and numbers only for simplicity):

1. 1zzz.txt  
2. 2xxx.txt  
3. 19uuu.txt  
4. 100aaa.txt  
5. file1z.txt  
6. file5a.txt  
7. file5z.txt  
8. file30z.txt  
9. file200a.txt  
10. temp+5.txt ("+" is lexically lower than ")  
11. temp-5.txt ("-" is not a sign)  
12. temp-100.txt (100 is bigger than 5, no sign)

**Parameters**

<table>
<thead>
<tr>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
</tbody>
</table>

**Returns**

comparison result (-1, 0, or +1)

**Return values**

<table>
<thead>
<tr>
<th>-1</th>
<th>A &lt; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A == B</td>
</tr>
<tr>
<td>+1</td>
<td>A &gt; B</td>
</tr>
</tbody>
</table>

**Note**

This comparison is UTF-8 aware.

**See also**

fl_case_numeric_sort()

### 35.246 print_button.h

1 //
2 // Header for "Print Window" functions for the Fast Light Tool Kit (FLTK).
3 //

Generated by Doxygen
```c
#ifndef _SRC_FL_PRINT_BUTTON_H_
#define _SRC_FL_PRINT_BUTTON_H_

#include <FL/Fl_Window.H>

// These are all internal functions, do not FL_EXPORT these functions!
// These functions are implemented in src/print_button.cxx

// Create and initialize the "Print/copy front window" dialog window
int fl_create_print_window();

// Print a window or copy its contents to the clipboard.
int fl_print_or_copy_window(Fl_Window *win, bool grab_decoration, int mode);

#endif // _SRC_FL_PRINT_BUTTON_H_

35.247 print_panel.h

1 //
2 // Print panel for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16 // This is a temporary file. It is only for development and will
17 // probably be removed later.
18 //
19 #ifndef print_panel_h
20 #define print_panel_h
21 #include <FL/Fl.H>
22 #include <FL/Fl_Double_Window.H>
23 #include <FL/Fl_Group.H>
24 #include <FL/Fl_Choice.H>
25 #include <FL/Fl_Button.H>
26 #include <FL/Fl_Box.H>
27 #include <FL/Fl_Round_Button.H>
28 #include <FL/Fl_Input.H>
29 #include <FL/Fl_Spinner.H>
30 #include <FL/Fl_Check_Button.H>
31 #include <FL/Fl_Return_Button.H>
32 #include <FL/Fl_Progress.H>
33 enum printing_style {SystemV, BSD};
34 static Fl_Double_Window* make_print_panel();
35 static void print_cb(Fl_Return_Button *, void *);
36 static printing_style print_load();
37 static void print_update_status();
38 #endif
```

```c
35.248 slowarrow.h

1 #define slowarrow_width 16
2 #define slowarrow_height 16
3 static const unsigned char slowarrow_bits[] = {
4 0x40, 0x00, 0x40, 0x00, 0x60, 0x00, 0x60, 0x00, 0x00, 0x00, 0x0f, 0x0f, 0x00, 0x0f,
5 0x00, 0x40, 0x00, 0x40, 0x00, 0x40, 0x00, 0x02, 0x00, 0x00, 0x00, 0x06, 0x0f, 0x0f,
```
35.249 utf8_internal.h

1 /*
2 * Internal UTF-8 header file for the Fast Light Tool Kit (FLTK).
3 */
4
5 * Copyright 1998-2016 by Bill Spitzak and others.
6 *
7 * This library is free software. Distribution and use rights are outlined in
8 * the file "COPYING" which should have been included with this file. If this
9 * file is missing or damaged, see the license at:
10 * https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 * https://www.fltk.org/bugs.php
15 */
16
17 /*----------------
18 Note to editors:
19 ----------------
20 *
21 * This file may only contain common, platform-independent function
22 * declarations used internally in FLTK. It may be #included everywhere
23 * in source files in the library, but not in public header files.
24 */
25
26 #ifndef _SRC__FL_UTF8_H
27 #define _SRC__FL_UTF8_H
28
29 # ifdef __cplusplus
30 extern "C"
31 {
32 # endif
33
34 unsigned short
35 XUtf8IsNonSpacing(
36 unsigned int ucs);
37
38 unsigned short
39 XUtf8IsRightToLeft(
40 unsigned int ucs);
41
42 int
43 XUtf8Tolower(
44 int ucs);
45
46 int
47 XUtf8Toupper(
48 int ucs);
49
50 # ifdef __cplusplus
51 }
52 # endif
53
54 #endif /* _SRC__FL_UTF8_H */

35.250 vsnprintf.c File Reference

Portable vsnprintf() implementation.
#include <stdio.h>
#include "flstring.h"

Functions

• int fl_snprintf (char *str, size_t size, const char *fmt,...)
• int fl_vsnprintf (char *buffer, size_t bufsize, const char *format, va_list ap)

FLTK’s platform independent wrapper for the vsnprintf() C library function.

Generated by Doxygen
### 35.250.1 Detailed Description

Portable vsnprintf() implementation.

### 35.250.2 Function Documentation

#### 35.250.2.1 fl_vsnprintf()

```c
int fl_vsnprintf (char * buffer, size_t bufsize, const char * format, va_list ap)
```

FLTK's platform independent wrapper for the vsnprintf() C library function.

This function guarantees:

- access to vsnprintf(), even on systems that don't have it (FLTK's own built-in code is used)
- Guarantees NUL termination. Even if string expands larger than the buffer, a terminating NUL is included, unlike some implementations of vsnprintf(), notably Microsoft Visual Studio (pre-2015), which can leave the string unterminated when truncated.

If the build environment for FLTK has vsnprintf(), `fl_vsnprintf()` is just a wrapper around the compiler's provided function. Otherwise, if the function is NOT available, FLTK's own built-in version is provided.

The FLTK built in provides these style options:

- `%[+-#]`
- `*` – padding width
- `.*` – precision width
- Data types: h, l, ll, L
- Floating point formats: E, G, e, f, g
- Integer formats: B, X, b, d, i, o, u, x
- Pointer format: p
- String/char: c, s, n

### 35.251 Xutf8.h

```c
/*
 * Author: Jean-Marc Lienher ( http://oksid.ch )
 * Copyright 2000-2010 by O'ksi'D.
 *
 * This library is free software. Distribution and use rights are outlined in
 * the file "COPYING" which should have been included with this file. If this
 * file is missing or damaged, see the license at:
 * https://www.fltk.org/COPYING.php
 *
 * Please see the following page on how to report bugs and issues:
 * https://www.fltk.org/bugs.php
 */

#ifndef _Xutf8_h
#define _Xutf8_h

#include <X11/X.h>
#include <X11/Xlib.h>

#endif
```

Generated by Doxygen
#include <X11/Xlocale.h>
#include <X11/Xutil.h>
#include <FL/Fl_Export.H>

typedef struct {
    int nb_font;
    char **font_name_list;
    int *encodings;
    XFontStruct **fonts;
    Font fid;
    int ascent;
    int descent;
    int *ranges;
} XUtf8FontStruct;

XUtf8FontStruct *
XCreateUtf8FontStruct (
    Display *dpy,
    const char *base_font_name_list);

void
XUtf8DrawString(
    Display *display,
    Drawable d,
    XUtf8FontStruct *font_set,
    GC gc,
    int x,
    int y,
    const char *string,
    int num_bytes);

void
XUtf8_measure_extents(
    Display *display,
    Drawable d,
    XUtf8FontStruct *font_set,
    GC gc,
    int *xx,
    int *yy,
    int *ww,
    int *hh,
    const char *string,
    int num_bytes);

void
XUtf8DrawRtlString(
    Display *display,
    Drawable d,
    XUtf8FontStruct *font_set,
    GC gc,
    int x,
    int y,
    const char *string,
    int num_bytes);

void
XUtf8DrawImageString(
    Display *display,
    Drawable d,
    XUtf8FontStruct *font_set,
    GC gc,
    int x,
    int y,
    const char *string,
    int num_bytes);

int
XUtf8TextWidth(
    XUtf8FontStruct *font_set,
    const char *string,
    int num_bytes);

int
XUtf8UcsWidth(
    XUtf8FontStruct *font_set,
    unsigned int ucs);

FL_EXPORT int
fl_XGetUtf8FontAndGlyph(
    XUtf8FontStruct *font_set,
    unsigned int ucs,
    XFontStruct **font,
    unsigned short *id);

void
XFreeUtf8FontStruct(
    Display *dpy,
    XUtf8FontStruct *font_set);
int XConvertUtf8ToUcs(
    const unsigned char *buf,
    int len,
    unsigned int *ucs);

int XConvertUcsToUtf8(
    unsigned int ucs,
    char *buf);

int XUtf8CharByteLen(
    const unsigned char *buf,
    int len);

int XCountUtf8Char(
    const unsigned char *buf,
    int len);

int XFastConvertUtf8ToUcs(
    const unsigned char *buf,
    int len,
    unsigned int *ucs);

long XKeysymToUcs(
    KeySym keysym);

#ifdef X_HAVE_UTF8_STRING
#define XUtf8LookupString Xutf8LookupString
#else
int XUtf8LookupString(
    XIC ic,
    XKeyPressedEvent *event,
    char *buffer_return,
    int bytes_buffer,
    KeySym *keysym,
    Status *status_return);
#endif

#endif

35.252 case.h

/* spacing */

static const unsigned short ucs_table_0041[] = {
    /* U+0041 */ 0x0061,
    /* U+0042 */ 0x0062,
    /* U+0043 */ 0x0063,
    /* U+0044 */ 0x0064,
    /* U+0045 */ 0x0065,
    /* U+0046 */ 0x0066,
    /* U+0047 */ 0x0067,
    /* U+0048 */ 0x0068,
    /* U+0049 */ 0x0069,
    /* U+004A */ 0x006A,
    /* U+004B */ 0x006B,
    /* U+004C */ 0x006C,
    /* U+004D */ 0x006D,
    /* U+004E */ 0x006E,
    /* U+004F */ 0x006F,
    /* U+0050 */ 0x0070,
    /* U+0051 */ 0x0071,
    /* U+0052 */ 0x0072,
    /* U+0053 */ 0x0073,
    /* U+0054 */ 0x0074,
    /* U+0055 */ 0x0075,
    /* U+0056 */ 0x0076,
    /* U+0057 */ 0x0077,
    /* U+0058 */ 0x0078,
    /* U+0059 */ 0x0079,
    /* U+005A */ 0x007A,
    0x00,
    0x00,
119 \texttt{0x00},
120 \texttt{0x00},
121 \texttt{0x00},
122 \texttt{0x00},
123 \texttt{0x00},
124 \texttt{0x00},
125 \texttt{0x00},
126 \texttt{0x00},
127 \texttt{0x00},
128 \texttt{0x00},
129 \texttt{0x00},
130 \texttt{0x00},
131 \texttt{0x00E0},
132 \texttt{0x00E1},
133 \texttt{0x00E2},
134 \texttt{0x00E3},
135 \texttt{0x00E4},
136 \texttt{0x00E5},
137 \texttt{0x00E6},
138 \texttt{0x00E7},
139 \texttt{0x00E8},
140 \texttt{0x00E9},
141 \texttt{0x00EA},
142 \texttt{0x00EB},
143 \texttt{0x00EC},
144 \texttt{0x00ED},
145 \texttt{0x00EE},
146 \texttt{0x00EF},
147 \texttt{0x00F0},
148 \texttt{0x00F1},
149 \texttt{0x00F2},
150 \texttt{0x00F3},
151 \texttt{0x00F4},
152 \texttt{0x00F5},
153 \texttt{0x00F6},
154 \texttt{0x00F7},
155 \texttt{0x00F8},
156 \texttt{0x00F9},
157 \texttt{0x00FA},
158 \texttt{0x00FB},
159 \texttt{0x00FC},
160 \texttt{0x00FD},
161 \texttt{0x00FE},
162 \texttt{0x00},
163 \texttt{0x00},
164 \texttt{0x00},
165 \texttt{0x00},
166 \texttt{0x00},
167 \texttt{0x00},
168 \texttt{0x00},
169 \texttt{0x00},
170 \texttt{0x00},
171 \texttt{0x00},
172 \texttt{0x00},
173 \texttt{0x00},
174 \texttt{0x00},
175 \texttt{0x00},
176 \texttt{0x00},
177 \texttt{0x00},
178 \texttt{0x00},
179 \texttt{0x00},
180 \texttt{0x00},
181 \texttt{0x00},
182 \texttt{0x00},
183 \texttt{0x00},
184 \texttt{0x00},
185 \texttt{0x00},
186 \texttt{0x00},
187 \texttt{0x00},
188 \texttt{0x00},
189 \texttt{0x00},
190 \texttt{0x00},
191 \texttt{0x00},
192 \texttt{0x00},
193 \texttt{0x00},
194 \texttt{0x00},
195 \texttt{0x0101},
196 \texttt{0x0102},
197 \texttt{0x0103},
198 \texttt{0x0104},
199 \texttt{0x0105},
200 \texttt{0x0106},
201 \texttt{0x0107},
202 \texttt{0x0108},
203 \texttt{0x0109},
204 \texttt{0x010A}.
206 0x00,
207 /* U+010D */ 0x010D,
208 0x00,
209 /* U+010F */ 0x010F,
210 0x00,
211 /* U+0111 */ 0x0111,
212 0x00,
213 /* U+0113 */ 0x0113,
214 /* U+0115 */ 0x0115,
215 /* U+0117 */ 0x0117,
216 0x00,
217 /* U+0119 */ 0x0119,
218 0x00,
219 /* U+011B */ 0x011B,
220 /* U+011D */ 0x011D,
221 /* U+011F */ 0x011F,
222 /* U+0121 */ 0x0121,
223 /* U+0123 */ 0x0123,
224 /* U+0125 */ 0x0125,
225 /* U+0127 */ 0x0127,
226 /* U+0129 */ 0x0129,
227 /* U+012B */ 0x012B,
228 /* U+012D */ 0x012D,
229 /* U+012F */ 0x012F,
230 /* U+0131 */ 0x0131,
231 /* U+0133 */ 0x0133,
232 /* U+0135 */ 0x0135,
233 /* U+0137 */ 0x0137,
234 /* U+0139 */ 0x0139,
235 /* U+013B */ 0x013B,
236 /* U+013D */ 0x013D,
237 /* U+013F */ 0x013F,
238 /* U+0141 */ 0x0141,
239 /* U+0143 */ 0x0143,
240 /* U+0145 */ 0x0145,
241 /* U+0147 */ 0x0147,
242 /* U+0149 */ 0x0149,
243 /* U+014B */ 0x014B,
244 /* U+014D */ 0x014D,
245 /* U+014F */ 0x014F,
246 /* U+0151 */ 0x0151,
247 /* U+0153 */ 0x0153,
248 /* U+0155 */ 0x0155,
249 /* U+0157 */ 0x0157,
250 /* U+0159 */ 0x0159,
251 /* U+015B */ 0x015B,
252 /* U+015D */ 0x015D,
554 0x00,
555 0x00,
556 0x00,
557 /* U+026A */ 0x0,
558 0x00,
559 0x00,
560 0x00,
561 0x00,
562 0x00,
563 0x00,
564 0x00,
565 0x00,
566 0x00,
567 /* U+0274 */ 0x0,
568 0x00,
569 /* U+0276 */ 0x0,
570 0x00,
571 0x00,
572 0x00,
573 0x00,
574 0x00,
575 0x00,
576 0x00,
577 0x00,
578 0x00,
579 /* U+0280 */ 0x0,
580 /* U+0281 */ 0x0,
581 0x00,
582 0x00,
583 0x00,
584 0x00,
585 0x00,
586 0x00,
587 0x00,
588 0x00,
589 0x00,
590 0x00,
591 0x00,
592 0x00,
593 0x00,
594 /* U+028F */ 0x0,
595 /* U+0299 */ 0x0,
596 0x00,
597 0x00,
598 0x00,
599 0x00,
600 0x00,
601 0x00,
602 0x00,
603 0x00,
604 /* U+0299 */ 0x0,
605 0x00,
606 /* U+029B */ 0x0,
607 /* U+029C */ 0x0,
608 0x00,
609 0x00,
610 /* U+029F */ 0x0,
611 0x00,
612 0x00,
613 0x00,
614 0x00,
615 0x00,
616 0x00,
617 0x00,
618 0x00,
619 0x00,
620 0x00,
621 0x00,
622 0x00,
623 0x00,
624 0x00,
625 0x00,
626 0x00,
627 0x00,
628 0x00,
629 0x00,
630 0x00,
631 0x00,
632 0x00,
633 /* U+02B6 */ 0x0,
634 });
635
636 static const unsigned short ucs_table_0386[] = {
637 /* U+0386 */ 0x03AC,
638 /* U+0388 */ 0x03AD,
639 /* U+0389 */ 0x03AE,
640 /* U+038F */ 0x03AF,
/* U+038A */ 0x03AF,
/* U+038C */ 0x03CC,
/* U+038E */ 0x03CD,
/* U+038F */ 0x03CE,
/* U+0391 */ 0x03B1,
/* U+0392 */ 0x03B2,
/* U+0393 */ 0x03B3,
/* U+0394 */ 0x03B4,
/* U+0395 */ 0x03B5,
/* U+0396 */ 0x03B6,
/* U+0397 */ 0x03B7,
/* U+0398 */ 0x03B8,
/* U+0399 */ 0x03B9,
/* U+039A */ 0x03BA,
/* U+039B */ 0x03BB,
/* U+039C */ 0x03BC,
/* U+039D */ 0x03BD,
/* U+039E */ 0x03BE,
/* U+039F */ 0x03BF,
/* U+03A0 */ 0x03C0,
/* U+03A1 */ 0x03C1,
/* U+03A3 */ 0x03C3,
/* U+03A4 */ 0x03C4,
/* U+03A5 */ 0x03C5,
/* U+03A6 */ 0x03C6,
/* U+03A7 */ 0x03C7,
/* U+03A8 */ 0x03C8,
/* U+03A9 */ 0x03C9,
/* U+03AA */ 0x03CA,
/* U+03AB */ 0x03CB,
/* U+03D2 */ 0x03D2,
/* U+03D3 */ 0x03D3,
728 0x00, 729 / U+03E2 */ 0x03E3, 730 0x00, 731 / U+03E4 */ 0x03E5, 732 0x00, 733 / U+03E6 */ 0x03E7, 734 0x00, 735 / U+03E8 */ 0x03E9, 736 0x00, 737 / U+03EA */ 0x03EB, 738 0x00, 739 / U+03EC */ 0x03ED, 740 0x00, 741 / U+03EE */ 0x03EF, 742 0x00, 743 0x00, 744 0x00, 745 0x00, 746 0x00, 747 0x00, 748 0x00, 749 0x00, 750 0x00, 751 0x00, 752 0x00, 753 0x00, 754 0x00, 755 0x00, 756 0x00, 757 0x00, 758 0x00, 759 0x00, 760 / U+0401 */ 0x0451, 761 / U+0402 */ 0x0452, 762 / U+0403 */ 0x0453, 763 / U+0404 */ 0x0454, 764 / U+0405 */ 0x0455, 765 / U+0406 */ 0x0456, 766 / U+0407 */ 0x0457, 767 / U+0408 */ 0x0458, 768 / U+0409 */ 0x0459, 769 / U+040A */ 0x045A, 770 / U+040B */ 0x045B, 771 / U+040C */ 0x045C, 772 0x00, 773 / U+040D */ 0x045D, 774 / U+040E */ 0x045E, 775 / U+040F */ 0x045F, 776 / U+0410 */ 0x0460, 777 / U+0411 */ 0x0461, 778 / U+0412 */ 0x0462, 779 / U+0413 */ 0x0463, 780 / U+0414 */ 0x0464, 781 / U+0415 */ 0x0465, 782 / U+0416 */ 0x0466, 783 / U+0417 */ 0x0467, 784 / U+0418 */ 0x0468, 785 / U+0419 */ 0x0469, 786 / U+041A */ 0x046A, 787 / U+041B */ 0x046B, 788 / U+041C */ 0x046C, 789 / U+041D */ 0x046D, 790 / U+041E */ 0x046E, 791 / U+041F */ 0x046F, 792 / U+0420 */ 0x0470, 793 / U+0421 */ 0x0471, 794 / U+0422 */ 0x0472, 795 / U+0423 */ 0x0473, 796 / U+0424 */ 0x0474, 797 / U+0425 */ 0x0475, 798 / U+0426 */ 0x0476, 799 / U+0427 */ 0x0477, 800 / U+0428 */ 0x0478, 801 / U+0429 */ 0x0479, 802 / U+042A */ 0x047A, 803 / U+042B */ 0x047B, 804 / U+042C */ 0x047C, 805 / U+042D */ 0x047D, 806 / U+042E */ 0x047E, 807 0x00, 808 0x00, 809 0x00, 810 0x00, 811 0x00, 812 0x00, 813 0x00, 814 0x00,
35.252 case.h

902 0x00,
903 / / \U0490 */ 0x0491,
904 0x00,
905 / / \U0492 */ 0x0493,
906 0x00,
907 / / \U0494 */ 0x0495,
908 0x00,
909 / / \U0496 */ 0x0497,
910 0x00,
911 / / \U0498 */ 0x0499,
912 0x00,
913 / / \U049A */ 0x049B,
914 0x00,
915 / / \U049C */ 0x049D,
916 0x00,
917 / / \U049E */ 0x049F,
918 0x00,
919 / / \U04A0 */ 0x04A1,
920 0x00,
921 / / \U04A2 */ 0x04A3,
922 0x00,
923 / / \U04A4 */ 0x04A5,
924 0x00,
925 / / \U04A6 */ 0x04A7,
926 0x00,
927 / / \U04A8 */ 0x04A9,
928 0x00,
929 / / \U04AA */ 0x04AB,
930 0x00,
931 / / \U04AC */ 0x04AD,
932 0x00,
933 / / \U04AE */ 0x04AF,
934 0x00,
935 / / \U04B0 */ 0x04B1,
936 0x00,
937 / / \U04B2 */ 0x04B3,
938 0x00,
939 / / \U04B4 */ 0x04B5,
940 0x00,
941 / / \U04B6 */ 0x04B7,
942 0x00,
943 / / \U04B8 */ 0x04B9,
944 0x00,
945 / / \U04BA */ 0x04BB,
946 0x00,
947 / / \U04BC */ 0x04BD,
948 0x00,
949 / / \U04BE */ 0x04BF,
950 0x00,
951 0x00,
952 / / \U04C1 */ 0x04C2,
953 0x00,
954 / / \U04C3 */ 0x04C4,
955 0x00,
956 0x00,
957 0x00,
958 / / \U04C7 */ 0x04C8,
959 0x00,
960 0x00,
961 0x00,
962 / / \U04CB */ 0x04CC,
963 0x00,
964 0x00,
965 0x00,
966 0x00,
967 / / \U04D0 */ 0x04D1,
968 0x00,
969 / / \U04D2 */ 0x04D3,
970 0x00,
971 / / \U04D4 */ 0x04D5,
972 0x00,
973 / / \U04D6 */ 0x04D7,
974 0x00,
975 / / \U04D8 */ 0x04D9,
976 0x00,
977 / / \U04DA */ 0x04DB,
978 0x00,
979 / / \U04DC */ 0x04DD,
980 0x00,
981 / / \U04DE */ 0x04DF,
982 0x00,
983 / / \U04E0 */ 0x04E1,
984 0x00,
985 / / \U04E2 */ 0x04E3,
986 0x00,
987 / / \U04E4 */ 0x04E5,
988 0x00,
989 /* U+04E6 */ 0x04E6, 0x00, 0x00, 0x04E8, 0x00, 0x00, 0x04EA, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x04EE, 0x00, 0x00, 0x04F0, 0x00, 0x00, 0x04F2, 0x00, 0x00, 0x04F4, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x0531, 0x0532, 0x0533, 0x0534, 0x0535, 0x0536, 0x0537, 0x0538, 0x0539, 0x053A, 0x053B, 0x053C, 0x053D, 0x053E, 0x053F, 0x0540, 0x0541, 0x0542, 0x0543, 0x0544, 0x0545, 0x0546, 0x0547, 0x0548, 0x0549, 0x054A, 0x054B, 0x054C, 0x054D, 0x054E, 0x054F, 0x0550, 0x0551, 0x0552, 0x0553, 0x0554, 0x0555, 0x0556, 0x0557, 0x0558, 0x0559, 0x055A, 0x055B, 0x055C, 0x055D, 0x055E, 0x055F, 0x0560, 0x0561, 0x0562, 0x0563, 0x0564, 0x0565, 0x0566, 0x0567, 0x0568, 0x0569, 0x056A, 0x056B, 0x056C, 0x056D, 0x056E, 0x056F, 0x0570, 0x0571, 0x0572, 0x0573, 0x0574, 0x0575, 0x0576, 0x0577, 0x0578, 0x0579, 0x057A, 0x057B, 0x057C, 0x057D, 0x057E, 0x057F, 0x0580, 0x0581, 0x0582, 0x0583, 0x0584, 0x0585, 0x0586, 0x0587, 0x0588, 0x0589, 0x058A, 0x058B, 0x058C, 0x058D, 0x058E, 0x058F, 0x0590, 0x0591, 0x0592, 0x0593, 0x0594, 0x0595, 0x0596, 0x0597, 0x0598, 0x0599, 0x059A, 0x059B, 0x059C, 0x059D, 0x059E, 0x059F, 0x05A0, 0x05A1, 0x05A2, 0x05A3, 0x05A4, 0x05A5, 0x05A6, 0x05A7, 0x05A8, 0x05A9, 0x05AA, 0x05AB, 0x05AC, 0x05AD, 0x05AE, 0x05AF, 0x05B0, 0x05B1, 0x05B2, 0x05B3, 0x05B4, 0x05B5, 0x05B6, 0x05B7, 0x05B8, 0x05B9, 0x05BA, 0x05BB, 0x05BC, 0x05BD, 0x05BE, 0x05BF, 0x05C0, 0x05C1, 0x05C2, 0x05C3, 0x05C4, 0x05C5, 0x05C6, 0x05C7, 0x05C8, 0x05C9, 0x05CA, 0x05CB, 0x05CC, 0x05CD, 0x05CE, 0x05CF, 0x05D0, 0x05D1, 0x05D2, 0x05D3, 0x05D4, 0x05D5, 0x05D6, 0x05D7, 0x05D8, 0x05D9, 0x05DA, 0x05DB, 0x05DC, 0x05DD, 0x05DE, 0x05DF, 0x05E0, 0x05E1, 0x05E2, 0x05E3, 0x05E4, 0x05E5, 0x05E6, 0x05E7, 0x05E8, 0x05E9, 0x05EA, 0x05EB, 0x05EC, 0x05ED, 0x05EE, 0x05EF, 0x05F0, 0x05F1, 0x05F2, 0x05F3, 0x05F4, 0x05F5, 0x05F6, 0x05F7, 0x05F8, 0x05F9, 0x05FA, 0x05FB, 0x05FC, 0x05FD, 0x05FE, 0x05FF.
1076 /* U+053D */ 0x056D,
1077 /* U+053E */ 0x056E,
1078 /* U+053F */ 0x056F,
1079 /* U+0540 */ 0x0570,
1080 /* U+0541 */ 0x0571,
1081 /* U+0542 */ 0x0572,
1082 /* U+0543 */ 0x0573,
1083 /* U+0544 */ 0x0574,
1084 /* U+0545 */ 0x0575,
1085 /* U+0546 */ 0x0576,
1086 /* U+0547 */ 0x0577,
1087 /* U+0548 */ 0x0578,
1088 /* U+0549 */ 0x0579,
1089 /* U+054A */ 0x057A,
1090 /* U+054B */ 0x057B,
1091 /* U+054C */ 0x057C,
1092 /* U+054D */ 0x057D,
1093 /* U+054E */ 0x057E,
1094 /* U+054F */ 0x057F,
1095 /* U+0550 */ 0x0580,
1096 /* U+0551 */ 0x0581,
1097 /* U+0552 */ 0x0582,
1098 /* U+0553 */ 0x0583,
1099 /* U+0554 */ 0x0584,
1100 /* U+0555 */ 0x0585,
1101 /* U+0556 */ 0x0586,
1102
1103 static const unsigned short ucs_table_10A0[] = {
1104 /* U+10A0 */ 0x10D0,
1105 /* U+10A1 */ 0x10D1,
1106 /* U+10A2 */ 0x10D2,
1107 /* U+10A3 */ 0x10D3,
1108 /* U+10A4 */ 0x10D4,
1109 /* U+10A5 */ 0x10D5,
1110 /* U+10A6 */ 0x10D6,
1111 /* U+10A7 */ 0x10D7,
1112 /* U+10A8 */ 0x10D8,
1113 /* U+10A9 */ 0x10D9,
1114 /* U+10AA */ 0x10DA,
1115 /* U+10AB */ 0x10DB,
1116 /* U+10AC */ 0x10DC,
1117 /* U+10AD */ 0x10DD,
1118 /* U+10AE */ 0x10DE,
1119 /* U+10AF */ 0x10DF,
1120 /* U+10B0 */ 0x10E0,
1121 /* U+10B1 */ 0x10E1,
1122 /* U+10B2 */ 0x10E2,
1123 /* U+10B3 */ 0x10E3,
1124 /* U+10B4 */ 0x10E4,
1125 /* U+10B5 */ 0x10E5,
1126 /* U+10B6 */ 0x10E6,
1127 /* U+10B7 */ 0x10E7,
1128 /* U+10B8 */ 0x10E8,
1129 /* U+10B9 */ 0x10E9,
1130 /* U+10BA */ 0x10EA,
1131 /* U+10BB */ 0x10EB,
1132 /* U+10BC */ 0x10EC,
1133 /* U+10BD */ 0x10ED,
1134 /* U+10BE */ 0x10EE,
1135 /* U+10BF */ 0x10EF,
1136 /* U+10C0 */ 0x10F0,
1137 /* U+10C1 */ 0x10F1,
1138 /* U+10C2 */ 0x10F2,
1139 /* U+10C3 */ 0x10F3,
1140 /* U+10C4 */ 0x10F4,
1141 /* U+10C5 */ 0x10F5,
1142
1143 static const unsigned short ucs_table_1E00[] = {
1144 /* U+1E00 */ 0x1E01,
1145 /* U+1E02 */ 0x1E03,
1146 /* U+1E04 */ 0x1E05,
1147 /* U+1E06 */ 0x1E07,
1148 /* U+1E08 */ 0x1E09,
1149 /* U+1E0A */ 0x1E0B,
1150 /* U+1E0C */ 0x1E0D,
1151 /* U+1E0E */ 0x1E0F,
1152 /* U+1E10 */ 0x1E11,
1163 0x00,
1164 /\ U+1E12 /* 0x1E13,
1165 0x00,
1166 /\ U+1E14 /* 0x1E15,
1167 0x00,
1168 /\ U+1E16 /* 0x1E17,
1169 0x00,
1170 /\ U+1E18 /* 0x1E19,
1171 0x00,
1172 /\ U+1E1A /* 0x1E1B,
1173 0x00,
1174 /\ U+1E1C /* 0x1E1D,
1175 0x00,
1176 /\ U+1E1E /* 0x1E1F,
1177 0x00,
1178 /\ U+1E20 /* 0x1E21,
1179 0x00,
1180 /\ U+1E22 /* 0x1E23,
1181 0x00,
1182 /\ U+1E24 /* 0x1E25,
1183 0x00,
1184 /\ U+1E26 /* 0x1E27,
1185 0x00,
1186 /\ U+1E28 /* 0x1E29,
1187 0x00,
1188 /\ U+1E2A /* 0x1E2B,
1189 0x00,
1190 /\ U+1E2C /* 0x1E2D,
1191 0x00,
1192 /\ U+1E2E /* 0x1E2F,
1193 0x00,
1194 /\ U+1E30 /* 0x1E31,
1195 0x00,
1196 /\ U+1E32 /* 0x1E33,
1197 0x00,
1198 /\ U+1E34 /* 0x1E35,
1199 0x00,
1200 /\ U+1E36 /* 0x1E37,
1201 0x00,
1202 /\ U+1E38 /* 0x1E39,
1203 0x00,
1204 /\ U+1E3A /* 0x1E3B,
1205 0x00,
1206 /\ U+1E3C /* 0x1E3D,
1207 0x00,
1208 /\ U+1E3E /* 0x1E3F,
1209 0x00,
1210 /\ U+1E40 /* 0x1E41,
1211 0x00,
1212 /\ U+1E42 /* 0x1E43,
1213 0x00,
1214 /\ U+1E44 /* 0x1E45,
1215 0x00,
1216 /\ U+1E46 /* 0x1E47,
1217 0x00,
1218 /\ U+1E48 /* 0x1E49,
1219 0x00,
1220 /\ U+1E4A /* 0x1E4B,
1221 0x00,
1222 /\ U+1E4C /* 0x1E4D,
1223 0x00,
1224 /\ U+1E4E /* 0x1E4F,
1225 0x00,
1226 /\ U+1E50 /* 0x1E51,
1227 0x00,
1228 /\ U+1E52 /* 0x1E53,
1229 0x00,
1230 /\ U+1E54 /* 0x1E55,
1231 0x00,
1232 /\ U+1E56 /* 0x1E57,
1233 0x00,
1234 /\ U+1E58 /* 0x1E59,
1235 0x00,
1236 /\ U+1E5A /* 0x1E5B,
1237 0x00,
1238 /\ U+1E5C /* 0x1E5D,
1239 0x00,
1240 /\ U+1E5E /* 0x1E5F,
1241 0x00,
1242 /\ U+1E60 /* 0x1E61,
1243 0x00,
1244 /\ U+1E62 /* 0x1E63,
1245 0x00,
1246 /\ U+1E64 /* 0x1E65,
1247 0x00,
1248 /\ U+1E66 /* 0x1E67,
1249 0x00,
1250 /* U+1E68 */ 0x1E69,
1251 0x00,
1252 /* U+1E6A */ 0x1E6B,
1253 0x00,
1254 /* U+1E6C */ 0x1E6D,
1255 0x00,
1256 /* U+1E6E */ 0x1E70,
1257 0x00,
1258 /* U+1E72 */ 0x1E73,
1259 0x00,
1260 /* U+1E74 */ 0x1E75,
1261 0x00,
1262 /* U+1E76 */ 0x1E77,
1263 0x00,
1264 /* U+1E78 */ 0x1E79,
1265 0x00,
1266 /* U+1E7A */ 0x1E7B,
1267 0x00,
1268 /* U+1E7C */ 0x1E7D,
1269 0x00,
1270 /* U+1E7E */ 0x1E7F,
1271 0x00,
1272 /* U+1E80 */ 0x1E81,
1273 0x00,
1274 /* U+1E82 */ 0x1E83,
1275 0x00,
1276 /* U+1E84 */ 0x1E85,
1277 0x00,
1278 /* U+1E86 */ 0x1E87,
1279 0x00,
1280 /* U+1E88 */ 0x1E89,
1281 0x00,
1282 /* U+1E8A */ 0x1E8B,
1283 0x00,
1284 /* U+1E8C */ 0x1E8D,
1285 0x00,
1286 /* U+1E8E */ 0x1E8F,
1287 0x00,
1288 /* U+1EA0 */ 0x1EA1,
1289 0x00,
1290 /* U+1EA2 */ 0x1EA3,
1291 0x00,
1292 /* U+1EA4 */ 0x1EA5,
1293 0x00,
1294 /* U+1EA6 */ 0x1EA7,
1295 0x00,
1296 0x00,
1297 0x00,
1298 0x00,
1299 0x00,
1300 0x00,
1301 0x00,
1302 0x00,
1303 0x00,
1304 0x00,
1305 0x00,
1306 /* U+1E90 */ 0x1E91,
1307 0x00,
1308 /* U+1E92 */ 0x1E93,
1309 0x00,
1310 /* U+1E94 */ 0x1E95,
1311 0x00,
1312 /* U+1E96 */ 0x1E97,
1313 0x00,
1314 /* U+1E98 */ 0x1E99,
1315 0x00,
1316 /* U+1E9A */ 0x1E9B,
1317 0x00,
1318 /* U+1E9C */ 0x1E9D,
1319 0x00,
1320 /* U+1E9E */ 0x1EEF,
1321 0x00,
1322 /* U+1EB0 */ 0x1EB1,
1323 0x00,
1324 /* U+1EB2 */ 0x1EB3,
1325 0x00,
1337 0x00,
1338 */ 0x1EC0 */ 0x1EC1,
1339 0x00,
1340 */ 0x1EC2 */ 0x1EC3,
1341 0x00,
1342 */ 0x1EC4 */ 0x1EC5,
1343 0x00,
1344 */ 0x1EC6 */ 0x1EC7,
1345 0x00,
1346 */ 0x1EC8 */ 0x1EC9,
1347 0x00,
1348 */ 0x1ECA */ 0x1ECB,
1349 0x00,
1350 */ 0x1EC2 */ 0x1EC3,
1351 0x00,
1352 */ 0x1EC5 */ 0x1ECF,
1353 0x00,
1354 */ 0x1ED0 */ 0x1ED1,
1355 0x00,
1356 */ 0x1ED2 */ 0x1ED3,
1357 0x00,
1358 */ 0x1ED4 */ 0x1ED5,
1359 0x00,
1360 */ 0x1ED6 */ 0x1ED7,
1361 0x00,
1362 */ 0x1ED8 */ 0x1ED9,
1363 0x00,
1364 */ 0x1EDA */ 0x1EB0,
1365 0x00,
1366 */ 0x1EDC */ 0x1EDD,
1367 0x00,
1368 */ 0x1EDE */ 0x1EDF,
1369 0x00,
1370 */ 0x1EE0 */ 0x1EE1,
1371 0x00,
1372 */ 0x1EE2 */ 0x1EE3,
1373 0x00,
1374 */ 0x1EE4 */ 0x1EE5,
1375 0x00,
1376 */ 0x1EE6 */ 0x1EE7,
1377 0x00,
1378 */ 0x1EE8 */ 0x1EE9,
1379 0x00,
1380 */ 0x1EEA */ 0x1EEB,
1381 0x00,
1382 */ 0x1EEC */ 0x1EED,
1383 0x00,
1384 */ 0x1EED */ 0x1EEE,
1385 0x00,
1386 */ 0x1EEF */ 0x1EF0,
1387 0x00,
1388 */ 0x1EF1 */ 0x1EF2,
1389 0x00,
1390 */ 0x1EF3 */ 0x1EF4,
1391 0x00,
1392 */ 0x1EF5 */ 0x1EF6,
1393 0x00,
1394 */ 0x1EF7 */ 0x1EF8,
1395 0x00,
1396 0x00,
1397 0x00,
1398 0x00,
1399 0x00,
1400 0x00,
1401 0x00,
1402 0x00,
1403 0x00,
1404 0x00,
1405 0x00,
1406 0x00,
1407 0x00,
1408 0x00,
1409 0x00,
1410 */ 0x1F00 */ 0x1F00,
1411 */ 0x1F01 */ 0x1F02,
1412 */ 0x1F03 */ 0x1F04,
1413 */ 0x1F05 */ 0x1F06,
1414 */ 0x1F07 */ 0x1F08,
1415 */ 0x1F09 */ 0x1F0A,
1416 */ 0x1F0B */ 0x1F0C,
1417 */ 0x1F0D */ 0x1F0E,
1418 0x00,
1419 0x00,
1420 0x00,
1421 0x00,
1422 0x00,
1424 0x00,
1425 0x00,
1426 /* U+1F18 */ 0x1F10,
1427 /* U+1F19 */ 0x1F11,
1428 /* U+1F1A */ 0x1F12,
1429 /* U+1F1B */ 0x1F13,
1430 /* U+1F1C */ 0x1F14,
1431 /* U+1F1D */ 0x1F15,
1432 0x00,
1433 0x00,
1434 0x00,
1435 0x00,
1436 0x00,
1437 0x00,
1438 0x00,
1439 0x00,
1440 0x00,
1441 0x00,
1442 /* U+1F28 */ 0x1F20,
1443 /* U+1F29 */ 0x1F21,
1444 /* U+1F2A */ 0x1F22,
1445 /* U+1F2B */ 0x1F23,
1446 /* U+1F2C */ 0x1F24,
1447 /* U+1F2D */ 0x1F25,
1448 /* U+1F2E */ 0x1F26,
1449 /* U+1F2F */ 0x1F27,
1450 0x00,
1451 0x00,
1452 0x00,
1453 0x00,
1454 0x00,
1455 0x00,
1456 0x00,
1457 0x00,
1458 /* U+1F38 */ 0x1F30,
1459 /* U+1F39 */ 0x1F31,
1460 /* U+1F3A */ 0x1F32,
1461 /* U+1F3B */ 0x1F33,
1462 /* U+1F3C */ 0x1F34,
1463 /* U+1F3D */ 0x1F35,
1464 /* U+1F3E */ 0x1F36,
1465 /* U+1F3F */ 0x1F37,
1466 0x00,
1467 0x00,
1468 0x00,
1469 0x00,
1470 0x00,
1471 0x00,
1472 0x00,
1473 0x00,
1474 /* U+1F48 */ 0x1F40,
1475 /* U+1F49 */ 0x1F41,
1476 /* U+1F4A */ 0x1F42,
1477 /* U+1F4B */ 0x1F43,
1478 /* U+1F4C */ 0x1F44,
1479 /* U+1F4D */ 0x1F45,
1480 0x00,
1481 0x00,
1482 0x00,
1483 0x00,
1484 0x00,
1485 0x00,
1486 0x00,
1487 0x00,
1488 0x00,
1489 0x00,
1490 0x00,
1491 /* U+1F58 */ 0x1F51,
1492 0x00,
1493 /* U+1F59 */ 0x1F53,
1494 0x00,
1495 /* U+1F5A */ 0x1F55,
1496 0x00,
1497 /* U+1F5B */ 0x1F57,
1498 0x00,
1499 0x00,
1500 0x00,
1501 0x00,
1502 0x00,
1503 0x00,
1504 0x00,
1505 0x00,
1506 /* U+1F68 */ 0x1F60,
1507 /* U+1F69 */ 0x1F61,
1508 /* U+1F6A */ 0x1F62,
1509 /* U+1F6B */ 0x1F63,
1510 /* U+1F6C */ 0x1F64,
1511  /* U+1F6D */ 0x1F65,
1512  /* U+1F6E */ 0x1F66,
1513  /* U+1F6F */ 0x1F67,
1514  0x00,
1515  0x00,
1516  0x00,
1517  0x00,
1518  0x00,
1519  0x00,
1520  0x00,
1521  0x00,
1522  0x00,
1523  0x00,
1524  0x00,
1525  0x00,
1526  0x00,
1527  0x00,
1528  0x00,
1529  0x00,
1530  0x00,
1531  0x00,
1532  0x00,
1533  0x00,
1534  0x00,
1535  0x00,
1536  0x00,
1537  0x00,
1538  /* U+1F88 */ 0x0,
1539  /* U+1F89 */ 0x0,
1540  /* U+1F8A */ 0x0,
1541  /* U+1F8B */ 0x0,
1542  /* U+1F8C */ 0x0,
1543  /* U+1F8D */ 0x0,
1544  /* U+1F8E */ 0x0,
1545  /* U+1F8F */ 0x0,
1546  0x00,
1547  0x00,
1548  0x00,
1549  0x00,
1550  0x00,
1551  0x00,
1552  0x00,
1553  0x00,
1554  /* U+1F98 */ 0x0,
1555  /* U+1F99 */ 0x0,
1556  /* U+1F9A */ 0x0,
1557  /* U+1F9B */ 0x0,
1558  /* U+1F9C */ 0x0,
1559  /* U+1F9D */ 0x0,
1560  /* U+1F9E */ 0x0,
1561  /* U+1F9F */ 0x0,
1562  0x00,
1563  0x00,
1564  0x00,
1565  0x00,
1566  0x00,
1567  0x00,
1568  0x00,
1569  0x00,
1570  /* U+1FA8 */ 0x0,
1571  /* U+1FA9 */ 0x0,
1572  /* U+1FAA */ 0x0,
1573  /* U+1FAB */ 0x0,
1574  /* U+1FAC */ 0x0,
1575  /* U+1FAD */ 0x0,
1576  /* U+1FAE */ 0x0,
1577  /* U+1FAF */ 0x0,
1578  0x00,
1579  0x00,
1580  0x00,
1581  0x00,
1582  0x00,
1583  0x00,
1584  0x00,
1585  0x00,
1586  /* U+1FB8 */ 0x1FB0,
1587  /* U+1FB9 */ 0x1FB1,
1588  /* U+1FBA */ 0x1F70,
1589  /* U+1FBB */ 0x1F71,
1590  /* U+1FBC */ 0x0,
1591  0x00,
1592  0x00,
1593  0x00,
1594  0x00,
1595  0x00,
1596  0x00,
1597  0x00,
static const unsigned short ucs_table_2102[] = {
    /* U+2102 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+210B */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2110 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+211D */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+211E */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2120 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2123 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2124 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2126 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2127 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2128 */ 0x0,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+2129 */ 0x0,
    0x00,
1685 /* U+211D */ 0x0,
1686 0x00,
1687 0x00,
1688 0x00,
1689 0x00,
1690 0x00,
1691 0x00,
1692 /* U+2124 */ 0x0,
1693 0x00,
1694 0x00,
1695 0x00,
1696 /* U+2128 */ 0x0,
1697 0x00,
1698 0x00,
1699 0x00,
1700 /* U+212C */ 0x212F,
1701 /* U+212D */ 0x0,
1702 0x00,
1703 0x00,
1704 /* U+2130 */ 0x0,
1705 /* U+2131 */ 0x0,
1706 /* U+2132 */ 0x0,
1707 /* U+2133 */ 0x0,
1708 */
1709 1710 static const unsigned short ucs_table_24B6[] = {
1711 /* U+24B6 */ 0x24D0,
1712 /* U+24B7 */ 0x24D1,
1713 /* U+24B8 */ 0x24D2,
1714 /* U+24B9 */ 0x24D3,
1715 /* U+24BA */ 0x24D4,
1716 /* U+24BB */ 0x24D5,
1717 /* U+24BC */ 0x24D6,
1718 /* U+24BD */ 0x24D7,
1719 /* U+24BE */ 0x24D8,
1720 /* U+24BF */ 0x24D9,
1721 /* U+24C0 */ 0x24DA,
1722 /* U+24C1 */ 0x24DB,
1723 /* U+24C2 */ 0x24DC,
1724 /* U+24C3 */ 0x24DD,
1725 /* U+24C4 */ 0x24DE,
1726 /* U+24C5 */ 0x24DF,
1727 /* U+24C6 */ 0x24E0,
1728 /* U+24C7 */ 0x24E1,
1729 /* U+24C8 */ 0x24E2,
1730 /* U+24C9 */ 0x24E3,
1731 /* U+24CA */ 0x24E4,
1732 /* U+24CB */ 0x24E5,
1733 /* U+24CC */ 0x24E6,
1734 /* U+24CD */ 0x24E7,
1735 /* U+24CE */ 0x24E8,
1736 /* U+24CF */ 0x24E9,
1737 *
1738 1739 static const unsigned short ucs_table_33CE[] = {
1740 /* U+33CE */ 0x0,
1741 */
1742 1743 static const unsigned short ucs_table_FF21[] = {
1744 /* U+FF21 */ 0xFF41,
1745 /* U+FF22 */ 0xFF42,
1746 /* U+FF23 */ 0xFF43,
1747 /* U+FF24 */ 0xFF44,
1748 /* U+FF25 */ 0xFF45,
1749 /* U+FF26 */ 0xFF46,
1750 /* U+FF27 */ 0xFF47,
1751 /* U+FF28 */ 0xFF48,
1752 /* U+FF29 */ 0xFF49,
1753 /* U+FF2A */ 0xFF4A,
1754 /* U+FF2B */ 0xFF4B,
1755 /* U+FF2C */ 0xFF4C,
1756 /* U+FF2D */ 0xFF4D,
1757 /* U+FF2E */ 0xFF4E,
1758 /* U+FF2F */ 0xFF4F,
1759 /* U+FF30 */ 0xFF50,
1760 /* U+FF31 */ 0xFF51,
1761 /* U+FF32 */ 0xFF52,
1762 /* U+FF33 */ 0xFF53,
1763 /* U+FF34 */ 0xFF54,
1764 /* U+FF35 */ 0xFF55,
1765 /* U+FF36 */ 0xFF56,
1766 /* U+FF37 */ 0xFF57,
1767 /* U+FF38 */ 0xFF58,
1768 /* U+FF39 */ 0xFF59,
1769 /* U+FF3A */ 0xFF5A,
1770 */
1771 */
1772 Generated by Doxygen
1773
35.253  dingbats_.h

1 /* dingbats */
2
3 static const char unicode_to_dingbats_1b_0020[] = {
4 */ U+0020 */ 0x20,
5 0x00,
6 0x00,
7 0x00,
8 0x00,
9 0x00,
10 0x00,
11 0x00,
12 0x00,
13 0x00,
14 0x00,
15 0x00,
16 0x00,
17 0x00,
18 0x00,
19 0x00,
20 0x00,
21 0x00,
22 0x00,
23 0x00,
24 0x00,
25 0x00,
26 0x00,
27 0x00,
28 0x00,
29 0x00,
30 0x00,
31 0x00,
32 0x00,
33 0x00,
34 0x00,
35 0x00,
36 0x00,
37 0x00,
38 0x00,
39 0x00,
40 0x00,
41 0x00,
42 0x00,
43 0x00,
44 0x00,
45 0x00,
46 0x00,
47 0x00,
48 0x00,
49 0x00,
50 0x00,
51 0x00,
52 0x00,
53 0x00,
54 0x00,
55 0x00,
56 0x00,
57 0x00,
58 0x00,
59 0x00,
60 0x00,
61 0x00,
62 0x00,
63 0x00,
64 0x00,
65 0x00,
66 0x00,
67 0x00,
68 0x00,
69 0x00,
70 0x00,
71 0x00,
72 0x00,
73 0x00,
74 0x00,
75 0x00,
76 0x00,
77 0x00,
78 0x00,
79 0x00,
80 0x00,
81 0x00,
82 0x00,
83 0x00,
84 0x00,
85 0x00,
static const char unicode_to_dingbats_1b_2192[] = {
    /* U+2192 */ (char)0xD5,
    /* U+2194 */ (char)0xD6,
    /* U+2195 */ (char)0xD7,
};

static const char unicode_to_dingbats_1b_2460[] = {
    /* U+2460 */ (char)0xAC,
    /* U+2461 */ (char)0xAD,
    /* U+2462 */ (char)0xAE,
    /* U+2463 */ (char)0xAF,
    /* U+2464 */ (char)0xB0,
    /* U+2465 */ (char)0xB1,
    /* U+2466 */ (char)0xB2,
    /* U+2467 */ (char)0xB3,
    /* U+2468 */ (char)0xB4,
    /* U+2469 */ (char)0xB5,
};

static const char unicode_to_dingbats_1b_25A0[] = {
    /* U+25A0 */ 0x6E,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
};
"U+25B2" 0x73,
186 0x00,
187 0x00,
188 0x00,
189 0x00,
190 0x00,
191 0x00,
192 0x00,
193 0x00,
194 /* U+25BC */ 0x74,
195 0x00,
196 0x00,
197 0x00,
198 0x00,
199 0x00,
200 0x00,
201 0x00,
202 0x00,
203 /* U+25CF */ 0x6C,
204 0x00,
205 0x00,
206 0x00,
207 0x00,
208 0x00,
209 0x00,
210 0x00,
211 /* U+25D7 */ 0x77,
212 0x00,
213 0x00,
214 0x00,
215 0x00,
216 0x00,
217 0x00,
218 0x00,
219 0x00,
220 0x00,
221 0x00,
222 0x00,
223 0x00,
224 0x00,
225 0x00,
226 0x00,
227 0x00,
228 0x00,
229 0x00,
230 0x00,
231 0x00,
232 0x00,
233 0x00,
234 0x00,
235 0x00,
236 0x00,
237 0x00,
238 0x00,
239 0x00,
240 0x00,
241 0x00,
242 0x00,
243 0x00,
244 0x00,
245 0x00,
246 0x00,
247 0x00,
248 0x00,
249 0x00,
250 0x00,
251 0x00,
252 0x00,
253 0x00,
254 0x00,
255 0x00,
260 0x00,  
261 0x00,  
262 0x00,  
263 0x00,  
264 0x00,  
265 0x00,  
266 /* U+260E */ 0x25,  
267 0x00,  
268 0x00,  
269 0x00,  
270 0x00,  
271 0x00,  
272 0x00,  
273 0x00,  
274 0x00,  
275 0x00,  
276 0x00,  
277 0x00,  
278 0x00,  
279 /* U+261B */ 0x2A,  
280 0x00,  
281 0x00,  
282 /* U+261E */ 0x2B,  
283 0x00,  
284 0x00,  
285 0x00,  
286 0x00,  
287 0x00,  
288 0x00,  
289 0x00,  
290 0x00,  
291 0x00,  
292 0x00,  
293 0x00,  
294 0x00,  
295 0x00,  
296 0x00,  
297 0x00,  
298 0x00,  
299 0x00,  
300 0x00,  
301 0x00,  
302 0x00,  
303 0x00,  
304 0x00,  
305 0x00,  
306 0x00,  
307 0x00,  
308 0x00,  
309 0x00,  
310 0x00,  
311 0x00,  
312 0x00,  
313 0x00,  
314 0x00,  
315 0x00,  
316 0x00,  
317 0x00,  
318 0x00,  
319 0x00,  
320 0x00,  
321 0x00,  
322 0x00,  
323 0x00,  
324 0x00,  
325 0x00,  
326 0x00,  
327 0x00,  
328 0x00,  
329 0x00,  
330 0x00,  
331 0x00,  
332 0x00,  
333 0x00,  
334 0x00,  
335 0x00,  
336 0x00,  
337 0x00,  
338 0x00,  
339 0x00,  
340 0x00,  
341 0x00,  
342 0x00,  
343 0x00,  
344 0x00,  
345 0x00,  
346 0x00,
35.253  dingbats_.h  1599

    347 0x00,
    348  // U+2660 /* (char)0xA8,
    349  0x00,
    350  0x00,
    351  // U+2663 /* (char)0xA8,
    352  0x00,
    353  // U+2665 /* (char)0xAA,
    354  // U+2666 /* (char)0xA9,
    355  
    356 // static const char unicode_to_dingbats_1b_2701[] = {
    357  // U+2701 /* 0x21,
    358  // U+2702 /* 0x22,
    359  // U+2703 /* 0x23,
    360  // U+2704 /* 0x24,
    361  0x00,
    362  0x00,
    363  // U+2706 /* 0x26,
    364  // U+2707 /* 0x27,
    365  // U+2708 /* 0x28,
    366  // U+2709 /* 0x29,
    367  0x00,
    368  0x00,
    369  // U+270C /* 0x2C,
    370  // U+270D /* 0x2D,
    371  // U+270E /* 0x2E,
    372  // U+270F /* 0x2F,
    373  // U+2710 /* 0x30,
    374  // U+2711 /* 0x31,
    375  // U+2712 /* 0x32,
    376  // U+2713 /* 0x33,
    377  // U+2714 /* 0x34,
    378  // U+2715 /* 0x35,
    379  // U+2716 /* 0x36,
    380  // U+2717 /* 0x37,
    381  // U+2718 /* 0x38,
    382  // U+2719 /* 0x39,
    383  // U+271A /* 0x3A,
    384  // U+271B /* 0x3B,
    385  // U+271C /* 0x3C,
    386  // U+271D /* 0x3D,
    387  // U+271E /* 0x3E,
    388  // U+271F /* 0x3F,
    389  // U+2720 /* 0x40,
    390  // U+2721 /* 0x41,
    391  // U+2722 /* 0x42,
    392  // U+2723 /* 0x43,
    393  // U+2724 /* 0x44,
    394  // U+2725 /* 0x45,
    395  // U+2726 /* 0x46,
    396  // U+2727 /* 0x47,
    397  0x00,
    398  // U+2729 /* 0x49,
    399  // U+272A /* 0x4A,
    400  // U+272B /* 0x4B,
    401  // U+272C /* 0x4C,
    402  // U+272D /* 0x4D,
    403  // U+272E /* 0x4E,
    404  // U+272F /* 0x4F,
    405  // U+2730 /* 0x50,
    406  // U+2731 /* 0x51,
    407  // U+2732 /* 0x52,
    408  // U+2733 /* 0x53,
    409  // U+2734 /* 0x54,
    410  // U+2735 /* 0x55,
    411  // U+2736 /* 0x56,
    412  // U+2737 /* 0x57,
    413  // U+2738 /* 0x58,
    414  // U+2739 /* 0x59,
    415  // U+273A /* 0x5A,
    416  // U+273B /* 0x5B,
    417  // U+273C /* 0x5C,
    418  // U+273D /* 0x5D,
    419  // U+273E /* 0x5E,
    420  // U+273F /* 0x5F,
    421  // U+2740 /* 0x60,
    422  // U+2741 /* 0x61,
    423  // U+2742 /* 0x62,
    424  // U+2743 /* 0x63,
    425  // U+2744 /* 0x64,
    426  // U+2745 /* 0x65,
    427  // U+2746 /* 0x66,
    428  // U+2747 /* 0x67,
    429  // U+2748 /* 0x68,
    430  // U+2749 /* 0x69,
    431  // U+274A /* 0x6A,
    432  // U+274B /* 0x6B,
    433  0x00,
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434 /* U+274D */ 0x6D,
435 0x00,
436 /* U+274F */ 0x6F,
437 /* U+2750 */ 0x70,
438 /* U+2751 */ 0x71,
439 /* U+2752 */ 0x72,
440 0x00,
441 0x00,
442 0x00,
443 /* U+2756 */ 0x76,
444 /* U+2758 */ 0x78,
445 /* U+2759 */ 0x79,
446 /* U+275A */ 0x7A,
447 /* U+275B */ 0x7B,
448 /* U+275C */ 0x7C,
449 /* U+275D */ 0x7D,
450 /* U+275E */ 0x7E,
451 0x00,
452 0x00,
453 0x00,
454 /* U+2761 */ (char)0xA1,
455 /* U+2762 */ (char)0xA2,
456 /* U+2763 */ (char)0xA3,
457 /* U+2764 */ (char)0xA4,
458 /* U+2765 */ (char)0xA5,
459 /* U+2766 */ (char)0xA6,
460 /* U+2767 */ (char)0xA7,
461 0x00,
462 0x00,
463 0x00,
464 0x00,
465 0x00,
466 0x00,
467 0x00,
468 0x00,
469 0x00,
470 0x00,
471 0x00,
472 0x00,
473 0x00,
474 0x00,
475 /* U+2776 */ (char)0xB6,
476 /* U+2777 */ (char)0xB7,
477 /* U+2778 */ (char)0xB8,
478 /* U+2779 */ (char)0xB9,
479 /* U+277A */ (char)0xBA,
480 /* U+277B */ (char)0xBB,
481 /* U+277C */ (char)0xBC,
482 /* U+277D */ (char)0xBD,
483 /* U+277E */ (char)0xBE,
484 /* U+277F */ (char)0xBF,
485 /* U+2780 */ (char)0xC0,
486 /* U+2781 */ (char)0xC1,
487 /* U+2782 */ (char)0xC2,
488 /* U+2783 */ (char)0xC3,
489 /* U+2784 */ (char)0xC4,
490 /* U+2785 */ (char)0xC5,
491 /* U+2786 */ (char)0xC6,
492 /* U+2787 */ (char)0xC7,
493 /* U+2788 */ (char)0xC8,
494 /* U+2789 */ (char)0xC9,
495 /* U+278A */ (char)0xCA,
496 /* U+278B */ (char)0xCB,
497 /* U+278C */ (char)0xCC,
498 /* U+278D */ (char)0xCD,
499 /* U+278E */ (char)0xCE,
500 /* U+278F */ (char)0xCF,
501 /* U+2790 */ (char)0xD0,
502 /* U+2791 */ (char)0xD1,
503 /* U+2792 */ (char)0xD2,
504 /* U+2793 */ (char)0xD3,
505 /* U+2794 */ (char)0xD4,
506 0x00,
507 0x00,
508 0x00,
509 /* U+2798 */ (char)0xD8,
510 /* U+2799 */ (char)0xD9,
511 /* U+279A */ (char)0xDA,
512 /* U+279B */ (char)0xDB,
513 /* U+279C */ (char)0xDC,
514 /* U+279D */ (char)0xDD,
515 /* U+279E */ (char)0xDE,
516 /* U+279F */ (char)0xDF,
517 /* U+27A0 */ (char)0xE0,
518 /* U+27A1 */ (char)0xE1,
519 /* U+27A2 */ (char)0xE2,
520 /* U+27A3 */ (char)0xE3,

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35.254 spacing.h

521 /* U+27A4 */ (char)0xE4,
522 /* U+27A5 */ (char)0xE5,
523 /* U+27A6 */ (char)0xE6,
524 /* U+27A7 */ (char)0xE7,
525 /* U+27A8 */ (char)0xE8,
526 /* U+27A9 */ (char)0xE9,
527 /* U+27AA */ (char)0xEA,
528 /* U+27AB */ (char)0xEB,
529 /* U+27AC */ (char)0xEC,
530 /* U+27AD */ (char)0xED,
531 /* U+27AE */ (char)0xEE,
532 /* U+27AF */ (char)0xEF,
533 0x00,
534 /* U+27B1 */ (char)0xF1,
535 /* U+27B2 */ (char)0xF2,
536 /* U+27B3 */ (char)0xF3,
537 /* U+27B4 */ (char)0xF4,
538 /* U+27B5 */ (char)0xF5,
539 /* U+27B6 */ (char)0xF6,
540 /* U+27B7 */ (char)0xF7,
541 /* U+27B8 */ (char)0xF8,
542 /* U+27B9 */ (char)0xF9,
543 /* U+27BA */ (char)0xFA,
544 /* U+27BB */ (char)0xFB,
545 /* U+27BC */ (char)0xFC,
546 /* U+27BD */ (char)0xFD,
547 /* U+27BE */ (char)0xFE,
548 });
549
550 static const char unicode_to_dingbats_1b_F8D7[] = {
551 /* U+F8D7 */ (char)0x80,
552 /* U+F8D8 */ (char)0x81,
553 /* U+F8D9 */ (char)0x82,
554 /* U+F8DA */ (char)0x83,
555 /* U+F8DB */ (char)0x84,
556 /* U+F8DC */ (char)0x85,
557 /* U+F8DD */ (char)0x86,
558 /* U+F8DE */ (char)0x87,
559 /* U+F8DF */ (char)0x88,
560 /* U+F8E0 */ (char)0x89,
561 /* U+F8E1 */ (char)0x8A,
562 /* U+F8E2 */ (char)0x8B,
563 /* U+F8E3 */ (char)0x8C,
564 /* U+F8E4 */ (char)0x8D,
565 });

35.254 spacing.h

1 /* spacing */
2 3 static const unsigned short ucs_table_0300[] = {
4 /* U+0300 */ 0x0060,
5 /* U+0301 */ 0x00B4,
6 /* U+0302 */ 0x005E,
7 /* U+0303 */ 0x203E,
8 /* U+0304 */ 0x02D8,
9 /* U+0305 */ 0x02D9,
10 /* U+0306 */ 0x00A8,
11 /* U+0307 */ 0x0309,
12 /* U+0308 */ 0x02DA,
13 /* U+0309 */ 0x02DD,
14 /* U+030A */ 0x030C,
15 /* U+030B */ 0x030D,
16 /* U+030C */ 0x030E,
17 /* U+030D */ 0x030F,
18 /* U+030E */ 0x0310,
19 /* U+030F */ 0x0311,
20 /* U+0310 */ 0x0312,
21 /* U+0311 */ 0x0313,
22 /* U+0312 */ 0x0314,
23 /* U+0313 */ 0x0315,
24 /* U+0314 */ 0x0316,
25 /* U+0315 */ 0x0317,
26 /* U+0316 */ 0x0318,
27 /* U+0317 */ 0x0319,
28 /* U+0318 */ 0x031A,
29 /* U+0319 */ 0x031B,
30 /* U+031A */ 0x031C,
31 /* U+031B */ 0x031D,
32 /* U+031C */ 0x031D,
33 /* U+031D */ 0x031E,
34 /* U+031E */ 0x031F,
35 /* U+031F */ 0x0320,
36 /* U+0320 */ 0x0321,
37 /* U+0321 */ 0x0322,
/* U+0322 */ 0x0322,  0x00,
/* U+0323 */ 0x0323,  0x00,
/* U+0324 */ 0x0324,  0x00,
/* U+0325 */ 0x0325,  0x00,
/* U+0326 */ 0x0326,  0x00,
/* U+0327 */ 0x00B8,  0x00,
/* U+0328 */ 0x02DB,  0x00,
/* U+0329 */ 0x0329,  0x00,
/* U+032A */ 0x032A,  0x00,
/* U+032B */ 0x032B,  0x00,
/* U+032C */ 0x032C,  0x00,
/* U+032D */ 0x032D,  0x00,
/* U+032E */ 0x032E,  0x00,
/* U+032F */ 0x032F,  0x00,
/* U+0330 */ 0x0330,  0x00,
/* U+0331 */ 0x0331,  0x00,
/* U+0332 */ 0x0332,  0x00,
/* U+0333 */ 0x005F,  0x00,
/* U+0334 */ 0x2017,  0x00,
/* U+0335 */ 0x0335,  0x00,
/* U+0336 */ 0x0336,  0x00,
/* U+0337 */ 0x0337,  0x00,
/* U+0338 */ 0x0338,  0x00,
/* U+0339 */ 0x0339,  0x00,
/* U+033A */ 0x033A,  0x00,
/* U+033B */ 0x033B,  0x00,
/* U+033C */ 0x033C,  0x00,
/* U+033D */ 0x033D,  0x00,
/* U+033E */ 0x033E,  0x00,
/* U+033F */ 0x033F,  0x00,
/* U+0340 */ 0x1FC0,  0x00,
/* U+0341 */ 0x0341,  0x00,
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/* U+0345 */ 0x0345,  0x00,
/* U+0346 */ 0x0346,  0x00,
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/* U+035A */ 0x035A,  0x00,
/* U+035B */ 0x035B,  0x00,
/* U+035C */ 0x035C,  0x00,
/* U+035D */ 0x035D,  0x00,
static const unsigned short ucs_table_064B[] = {
    /* U+064B */ 0xFE70,
    /* U+064C */ 0xFE72,
    /* U+064D */ 0xFE74,
    /* U+064E */ 0xFE76,
    /* U+064F */ 0xFE78,
    /* U+0650 */ 0xFE7A,
    /* U+0651 */ 0xFE7C,
    /* U+0652 */ 0xFE7E,
    /* U+0653 */ 0xFE80,
    /* U+0654 */ 0xFE82,
    /* U+0655 */ 0xFE84,
    /* U+0656 */ 0xFE86,
    /* U+0657 */ 0xFE88,
    /* U+0658 */ 0xFE8A,
    /* U+0659 */ 0xFE8C,
    /* U+065A */ 0xFE8E,
    /* U+065B */ 0xFE90,
    /* U+065C */ 0xFE92,
    /* U+065D */ 0xFE94,
    /* U+065E */ 0xFE96,
    /* U+065F */ 0xFE98,
    /* U+0660 */ 0xFE9A,
    /* U+0661 */ 0xFE9C,
    /* U+0662 */ 0xFEA0,
    /* U+0663 */ 0xFEA2,
    /* U+0664 */ 0xFEA4,
    /* U+0665 */ 0xFEA6,
    /* U+0666 */ 0xFEA8,
    /* U+0667 */ 0xFEAA,
    /* U+0668 */ 0xFEAC,
    /* U+0669 */ 0xFEAE,
    /* U+066A */ 0xFEAF,
    /* U+066B */ 0xFEBA,
    /* U+066C */ 0xFEBC,
    /* U+066D */ 0xFEBD,
    /* U+066E */ 0xFEBE,
    /* U+066F */ 0xFEBF,
    /* U+0670 */ 0xFEC0,
    /* U+0671 */ 0xFEC2,
    /* U+0672 */ 0xFEC4,
    /* U+0673 */ 0xFEC6,
    /* U+0674 */ 0xFEC8,
    /* U+0675 */ 0xFEC9,
    /* U+0676 */ 0xFECA,
    /* U+0677 */ 0xFECB,
    /* U+0678 */ 0xFECC,
    /* U+0679 */ 0xFECD,
    /* U+067A */ 0xFECE,
    /* U+067B */ 0xFECF,
    /* U+067C */ 0xFED0,
    /* U+067D */ 0xFED2,
    /* U+067E */ 0xFED4,
    /* U+067F */ 0xFED6,
static const unsigned short ucs_table_0901[] = {
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537 /* U+09CD */ 0x09CD,
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558 /* U+09E2 */ 0x09E2,
559 /* U+09E3 */ 0x09E3,
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1199 0x00
1200 0x00
1201 0x00

1202 Generated by Doxygen
995 0x00,
996 0x00,
997 0x00,
998 0x00,
999 0x00,
1000 0x00,
1001 0x00,
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1003 0x00,
1004 0x00,
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1007 0x00,
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1009 0x00,
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1075 0x00,
1076 0x00,
1077 0x00,
1078 0x00,
1079 0x00,
1080 0x00,
1081 0x00,
35.254 spacing.h

1169 0x00,
1170 /* U+0C46 */ 0x0C46,
1171 /* U+0C47 */ 0x0C47,
1172 /* U+0C48 */ 0x0C48,
1173 0x00,
1174 /* U+0C4A */ 0x0C4A,
1175 /* U+0C4B */ 0x0C4B,
1176 /* U+0C4C */ 0x0C4C,
1177 /* U+0C4D */ 0x0C4D,
1178 0x00,
1179 0x00,
1180 0x00,
1181 0x00,
1182 0x00,
1183 0x00,
1184 0x00,
1185 /* U+0C55 */ 0x0C55,
1186 /* U+0C56 */ 0x0C56,
1187 0x00,
1188 0x00,
1189 0x00,
1190 0x00,
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1199 0x00,
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1284 0x00,
1285 0x00,
1286 0x00,
1287 0x00,
1288 0x00,
1289 0x00,
1290 0x00,
1291 /* U+0CBF */ 0x0CBF,
1292 0x00,
1293 0x00,
1294 0x00,
1295 0x00,
1296 0x00,
1297 0x00,
1298 /* U+0CC6 */ 0x0CC6,
1299 0x00,
1300 0x00,
1301 0x00,
1302 0x00,
1303 0x00,
1304 /* U+0CCC */ 0x0CCC,
1305 /* U+0CCD */ 0x0CCD,
1306 0x00,
1307 0x00,
1308 0x00,
1309 0x00,
1310 0x00,
1311 0x00,
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1371 0x00,
1372 0x00,
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1410 0x00,
1411 0x00,
1412 0x00,
1413 0x00,
1414 0x00,
1415 0x00,
1416 0x00,
1417 0x00,
1418 0x00,
1419 0x00,
1420 0x00,
1421 /* U+0D41 */ 0x0D41,
1422 /* U+0D42 */ 0x0D42,
1423 /* U+0D43 */ 0x0D43,
1424 0x00,
1425 0x00,
1426 0x00,
1427 0x00,
1428 0x00,
1429 0x00,
static const unsigned short ucs_table_0E31[] = {
    /* U+0E31 */ 0x0E31,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+0E34 */ 0x0E34,
    /* U+0E35 */ 0x0E35,
    /* U+0E36 */ 0x0E36,
    /* U+0E37 */ 0x0E37,
    /* U+0E38 */ 0x0E38,
    /* U+0E39 */ 0x0E39,
    /* U+0E3A */ 0x0E3A,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
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    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    /* U+0E47 */ 0x0E47,
    /* U+0E48 */ 0x0E48,
    /* U+0E49 */ 0x0E49,
    /* U+0E4A */ 0x0E4A,
    /* U+0E4B */ 0x0E4B,
    /* U+0E4C */ 0x0E4C,
    /* U+0E4D */ 0x0E4D,
    /* U+0E4E */ 0x0E4E,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
    0x00,
1517 0x00,
1518 0x00,
1519 0x00,
1520 0x00,
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1524 0x00,
1525 0x00,
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1556 0x00,
1557 0x00,
1558 0x00,
1559 0x00,
1560 0x00,
1561 0x00,
1562 0x00,
1563 0x00,
1564 0x00,
1565 /* U+0EB1 */ 0x0EB1,
1566 0x00,
1567 0x00,
1568 /* U+0EB4 */ 0x0EB4,
1569 /* U+0EB5 */ 0x0EB5,
1570 /* U+0EB6 */ 0x0EB6,
1571 /* U+0EB7 */ 0x0EB7,
1572 /* U+0EB8 */ 0x0EB8,
1573 /* U+0EB9 */ 0x0EB9,
1574 0x00,
1575 /* U+0EBB */ 0x0EBB,
1576 /* U+0EBC */ 0x0EBC,
1577 0x00,
1578 0x00,
1579 0x00,
1580 0x00,
1581 0x00,
1582 0x00,
1583 0x00,
1584 0x00,
1585 0x00,
1586 0x00,
1587 0x00,
1588 /* U+0EC8 */ 0x0EC8,
1589 /* U+0EC9 */ 0x0EC9,
1590 /* U+0ECA */ 0x0ECA,
1591 /* U+0ECB */ 0x0ECB,
1592 /* U+0ECC */ 0x0ECC,
1593 /* U+0ECD */ 0x0ECD,
1594 0x00,
1595 0x00,
1596 0x00,
1597 0x00,
1598 0x00,
1599 0x00,
1600 0x00,
1601 0x00,
1602 0x00,
1603 0x00,
1691 0x00,
1692 0x00,
1693 0x00,
1694 0x00,
1695 0x00,
1696 0x00,
1697 /* U+0F35 */ 0x0F35,
1698 0x00,
1699 /* U+0F37 */ 0x0F37,
1700 0x00,
1701 /* U+0F39 */ 0x0F39,
1702 0x00,
1703 0x00,
1704 0x00,
1705 0x00,
1706 0x00,
1707 0x00,
1708 0x00,
1709 0x00,
1710 0x00,
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1712 0x00,
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1741 0x00,
1742 0x00,
1743 0x00,
1744 0x00,
1745 0x00,
1746 0x00,
1747 0x00,
1748 0x00,
1749 0x00,
1750 0x00,
1751 0x00,
1752 0x00,
1753 0x00,
1754 0x00,
1755 0x00,
1756 0x00,
1757 /* U+0F71 */ 0xF71,
1758 /* U+0F72 */ 0xF72,
1759 /* U+0F73 */ 0xF73,
1760 /* U+0F74 */ 0xF74,
1761 /* U+0F75 */ 0xF75,
1762 /* U+0F76 */ 0xF76,
1763 /* U+0F77 */ 0xF77,
1764 /* U+0F78 */ 0xF78,
1765 /* U+0F79 */ 0xF79,
1766 /* U+0F7A */ 0xF7A,
1767 /* U+0F7B */ 0xF7B,
1768 /* U+0F7C */ 0xF7C,
1769 /* U+0F7D */ 0xF7D,
1770 /* U+0F7E */ 0xF7E,
1771 0x00,
1772 /* U+0F80 */ 0xF80,
1773 /* U+0F81 */ 0xF81,
1774 /* U+0F82 */ 0xF82,
1775 /* U+0F83 */ 0xF83,
1776 /* U+0F84 */ 0xF84,
1777 0x00,
1778 /* U+0F86 */ 0x0F86,
1779 /* U+0F87 */ 0x0F87,
1780 0x00,
1781 0x00,
1782 0x00,
1783 0x00,
1784 0x00,
1785 0x00,
1786 0x00,
1787 0x00,
1788 /* U+0F90 */ 0x0F90,
1789 /* U+0F91 */ 0x0F91,
1790 /* U+0F92 */ 0x0F92,
1791 /* U+0F93 */ 0x0F93,
1792 /* U+0F94 */ 0x0F94,
1793 /* U+0F95 */ 0x0F95,
1794 0x00,
1795 /* U+0F97 */ 0x0F97,
1796 0x00,
1797 /* U+0F99 */ 0x0F99,
1798 /* U+0F9A */ 0x0F9A,
1799 /* U+0F9B */ 0x0F9B,
1800 /* U+0F9C */ 0x0F9C,
1801 /* U+0F9D */ 0x0F9D,
1802 /* U+0F9E */ 0x0F9E,
1803 /* U+0F9F */ 0x0F9F,
1804 /* U+0FA0 */ 0x0FA0,
1805 /* U+0FA1 */ 0x0FA1,
1806 /* U+0FA2 */ 0x0FA2,
1807 /* U+0FA3 */ 0x0FA3,
1808 /* U+0FA4 */ 0x0FA4,
1809 /* U+0FA5 */ 0x0FA5,
1810 /* U+0FA6 */ 0x0FA6,
1811 /* U+0FA7 */ 0x0FA7,
1812 /* U+0FA8 */ 0x0FA8,
1813 /* U+0FA9 */ 0x0FA9,
1814 /* U+0FAA */ 0x0FAA,
1815 /* U+0FAB */ 0x0FAB,
1816 /* U+0FAC */ 0x0FAC,
1817 /* U+0FAD */ 0x0FAD,
1818 0x00,
1819 0x00,
1820 0x00,
1821 /* U+0F81 */ 0x0F81,
1822 /* U+0F82 */ 0x0F82,
1823 /* U+0F83 */ 0x0F83,
1824 /* U+0F84 */ 0x0F84,
1825 /* U+0F85 */ 0x0F85,
1826 /* U+0F86 */ 0x0F86,
1827 /* U+0F87 */ 0x0F87,
1828 0x00,
1829 /* U+0F89 */ 0x0F89,
1830 ];
1831
1832 static const unsigned short ucs_table_20D0[] = {
1833 /* U+20D0 */ 0x20D0,
1834 /* U+20D1 */ 0x20D1,
1835 /* U+20D2 */ 0x20D2,
1836 /* U+20D3 */ 0x20D3,
1837 /* U+20D4 */ 0x20D4,
1838 /* U+20D5 */ 0x20D5,
1839 /* U+20D6 */ 0x20D6,
1840 /* U+20D7 */ 0x20D7,
1841 /* U+20D8 */ 0x20D8,
1842 /* U+20D9 */ 0x20D9,
1843 /* U+20DA */ 0x20DA,
1844 /* U+20DB */ 0x20DB,
1845 /* U+20DC */ 0x20DC,
1846 0x00,
1847 0x00,
1848 0x00,
1849 0x00,
1850 /* U+20E1 */ 0x20E1,
1851 ];
1852
1853 static const unsigned short ucs_table_302A[] = {
1854 /* U+302A */ 0x302A,
1855 /* U+302B */ 0x302B,
1856 /* U+302C */ 0x302C,
1857 /* U+302D */ 0x302D,
1858 /* U+302E */ 0x302E,
1859 /* U+302F */ 0x302F,
1860 0x00,
1861 0x00,
1862 0x00,
1863 0x00,
1864 0x00,
1952 0x00,
1953 0x00,
1954 0x00,
1955 0x00,
1956 0x00,
1957 0x00,
1958 0x00,
1959 0x00,
1960 0x00,
1961 0x00,
1962 0x00,
1963 0x00,
1964 0x00,
1965 /* U+3099 */ 0x309B,
1966 /* U+309A */ 0x309C,
1967 {;
1968 1969 static const unsigned short ucs_table_FB1E[] = {
1970 /* U+FB1E */ 0xFB1E,
1971 };
1972 1973 static const unsigned short ucs_table_FE20[] = {
1974 /* U+FE20 */ 0xFE20,
1975 /* U+FE21 */ 0xFE21,
1976 /* U+FE22 */ 0xFE22,
1977 /* U+FE23 */ 0xFE23,
1978 };

35.255  symbol.h

1 /* symbol */
2
3 static const char unicode_to_symbol_1b_0020[] = {
4 /* U+0020 */ 0x20,
5 /* U+0021 */ 0x21,
6 0x00,
7 /* U+0023 */ 0x23,
8 0x00,
9 /* U+0025 */ 0x25,
10 /* U+0026 */ 0x26,
11 0x00,
12 /* U+0028 */ 0x28,
13 /* U+0029 */ 0x29,
14 0x00,
15 /* U+002B */ 0x2B,
16 /* U+002C */ 0x2C,
17 0x00,
18 /* U+002E */ 0x2E,
19 /* U+002F */ 0x2F,
20 /* U+0030 */ 0x30,
21 /* U+0031 */ 0x31,
22 /* U+0032 */ 0x32,
23 /* U+0033 */ 0x33,
24 /* U+0034 */ 0x34,
25 /* U+0035 */ 0x35,
26 /* U+0036 */ 0x36,
27 /* U+0037 */ 0x37,
28 /* U+0038 */ 0x38,
29 /* U+0039 */ 0x39,
30 /* U+003A */ 0x3A,
31 /* U+003B */ 0x3B,
32 /* U+003C */ 0x3C,
33 /* U+003D */ 0x3D,
34 /* U+003E */ 0x3E,
35 /* U+003F */ 0x3F,
36 0x00,
37 0x00,
38 0x00,
39 0x00,
40 0x00,
41 0x00,
42 0x00,
43 0x00,
44 0x00,
45 0x00,
46 0x00,
47 0x00,
48 0x00,
49 0x00,
50 0x00,
51 0x00,
52 0x00,
53 0x00,
54 0x00,
55 0x00,
35.255 symbol_.h

56 0x00,
57 0x00,
58 0x00,
59 0x00,
60 0x00,
61 0x00,
62 0x00,
63 /* U+005B */ 0x5B,
64 0x00,
65 /* U+005D */ 0x5D,
66 0x00,
67 /* U+005F */ 0x5F,
68 0x00,
69 0x00,
70 0x00,
71 0x00,
72 0x00,
73 0x00,
74 0x00,
75 0x00,
76 0x00,
77 0x00,
78 0x00,
79 0x00,
80 0x00,
81 0x00,
82 0x00,
83 0x00,
84 0x00,
85 0x00,
86 0x00,
87 0x00,
88 0x00,
89 0x00,
90 0x00,
91 0x00,
92 0x00,
93 0x00,
94 0x00,
95 /* U+007B */ 0x7B,
96 /* U+007C */ 0x7C,
97 /* U+007D */ 0x7D,
98 0x00,
99 0x00,
100 0x00,
101 0x00,
102 0x00,
103 0x00,
104 0x00,
105 0x00,
106 0x00,
107 0x00,
108 0x00,
109 0x00,
110 0x00,
111 0x00,
112 0x00,
113 0x00,
114 0x00,
115 0x00,
116 0x00,
117 0x00,
118 0x00,
119 0x00,
120 0x00,
121 0x00,
122 0x00,
123 0x00,
124 0x00,
125 0x00,
126 0x00,
127 0x00,
128 0x00,
129 0x00,
130 0x00,
131 0x00,
132 /* U+00A0 */ 0x20,
143 0x00,
144 /* U+06AC */ (char)0xD8,
145 0x00,
146 0x00,
147 0x00,
148 /* U+06B0 */ (char)0xB0,
149 /* U+06B1 */ (char)0xB1,
150 0x00,
151 0x00,
152 0x00,
153 /* U+06B5 */ 0x6D,
154 0x00,
155 0x00,
156 0x00,
157 0x00,
158 0x00,
159 0x00,
160 0x00,
161 0x00,
162 0x00,
163 0x00,
164 0x00,
165 0x00,
166 0x00,
167 0x00,
168 0x00,
169 0x00,
170 0x00,
171 0x00,
172 0x00,
173 0x00,
174 0x00,
175 0x00,
176 0x00,
177 0x00,
178 0x00,
179 0x00,
180 0x00,
181 0x00,
182 0x00,
183 0x00,
184 0x00,
185 0x00,
186 0x00,
187 /* U+06D7 */ (char)0xB4,
188 0x00,
189 0x00,
190 0x00,
191 0x00,
192 0x00,
193 0x00,
194 0x00,
195 0x00,
196 0x00,
197 0x00,
198 0x00,
199 0x00,
200 0x00,
201 0x00,
202 0x00,
203 0x00,
204 0x00,
205 0x00,
206 0x00,
207 0x00,
208 0x00,
209 0x00,
210 0x00,
211 0x00,
212 0x00,
213 0x00,
214 0x00,
215 0x00,
216 0x00,
217 0x00,
218 0x00,
219 /* U+06F7 */ (char)0xB8,
220 );
221
222 static const char unicode_to_symbol_1b_0192[] = {
223 /* U+0192 */ (char)0xA6,
224 };
225
226 static const char unicode_to_symbol_1b_0391[] = {
227 /* U+0391 */ 0xA6,
228 /* U+0392 */ 0xA2,
229 /* U+0393 */ 0xA7,
35.255 symbol_.h

```c
230 /* U+0394 */ 0x44,
231 /* U+0395 */ 0x45,
232 /* U+0396 */ 0x5A,
233 /* U+0397 */ 0x48,
234 /* U+0398 */ 0x51,
235 /* U+0399 */ 0x49,
236 /* U+039A */ 0x4B,
237 /* U+039B */ 0x4C,
238 /* U+039C */ 0x4D,
239 /* U+039D */ 0x4E,
240 /* U+039E */ 0x58,
241 /* U+039F */ 0x4F,
242 /* U+03A0 */ 0x50,
243 /* U+03A1 */ 0x52,
244 0x00,
245 /* U+03A3 */ 0x53,
246 /* U+03A4 */ 0x54,
247 /* U+03A5 */ 0x55,
248 /* U+03A6 */ 0x46,
249 /* U+03A7 */ 0x43,
250 /* U+03A8 */ 0x59,
251 /* U+03A9 */ 0x57,
252 0x00,
253 0x00,
254 0x00,
255 0x00,
256 0x00,
257 0x00,
258 0x00,
259 /* U+03B1 */ 0x61,
260 /* U+03B2 */ 0x62,
261 /* U+03B3 */ 0x67,
262 /* U+03B4 */ 0x64,
263 /* U+03B5 */ 0x65,
264 /* U+03B6 */ 0x7A,
265 /* U+03B7 */ 0x68,
266 /* U+03B8 */ 0x71,
267 /* U+03B9 */ 0x69,
268 /* U+03BA */ 0x6B,
269 /* U+03BB */ 0x6C,
270 /* U+03BC */ 0x6D,
271 /* U+03BD */ 0x65,
272 /* U+03BE */ 0x78,
273 /* U+03BF */ 0x6F,
274 /* U+03C0 */ 0x70,
275 /* U+03C1 */ 0x72,
276 /* U+03C2 */ 0x56,
277 /* U+03C3 */ 0x73,
278 /* U+03C4 */ 0x74,
279 /* U+03C5 */ 0x75,
280 /* U+03C6 */ 0x64,
281 /* U+03C7 */ 0x63,
282 /* U+03C8 */ 0x79,
283 /* U+03C9 */ 0x77,
284 0x00,
285 0x00,
286 0x00,
287 0x00,
288 0x00,
289 0x00,
290 0x00,
291 /* U+03D1 */ 0x4A,
292 /* U+03D2 */ (char)0xA1,
293 0x00,
294 0x00,
295 /* U+03D5 */ 0x6A,
296 /* U+03D6 */ 0x74,
297 */
298 static const char unicode_to_symbol_1b_2022[] = {
299 0x00,
300 /* U+2022 */ (char)0xB7,
301 0x00,
302 0x00,
303 0x00,
304 /* U+2026 */ (char)0xBC,
305 0x00,
306 0x00,
307 0x00,
308 0x00,
309 0x00,
310 0x00,
311 0x00,
312 0x00,
313 0x00,
314 0x00,
315 0x00,
316 /* U+2032 */ (char)0xA2,
```
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```c
/* U+2033 */ (char)0xB2,
0x00,
0x00,
0x00,
0x00,
0x00,
0x00,
0x00,
0x00,
0x00,
0x00,
0x00,
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429 0x00,
430 0x00,
431 0x00,
432 0x00,
433 0x00,
434 0x00,
435 0x00,
436 0x00,
437 0x00,
438 /* U+20AC */ (char)0xA0,
/* U+2111 */ (char)0xC1,
430 0x00,
431 0x00,
432 0x00,
433 0x00,
434 0x00,
435 0x00,
436 /* U+2118 */ (char)0xC3,
437 0x00,
438 0x00,
439 0x00,
440 /* U+211C */ (char)0xC2,
441 0x00,
442 0x00,
443 0x00,
444 0x00,
445 0x00,
446 0x00,
447 0x00,
448 0x00,
449 0x00,
450 /* U+2126 */ 0x57,
451 0x00,
452 0x00,
453 0x00,
454 0x00,
455 0x00,
456 0x00,
457 0x00,
458 0x00,
459 0x00,
460 /* U+2135 */ (char)0xC0,
461 0x00,
35.255 symbol_h

```c
752 0x00,
753 0x00,
754 0x00,
755 0x00,
756 0x00,
757 0x00,
758 0x00,
759 0x00,
760 0x00,
761 0x00,
762 0x00,
763 0x00,
764 0x00,
765 0x00,
766 0x00,
767 0x00,
768 0x00,
769 0x00,
770 0x00,
771 0x00,
772 0x00,
773 0x00,
774 0x00,
775 0x00,
776 0x00,
777 0x00,
778 / * U+2200 */ 0x22,
779 0x00,
780 / * U+2202 */ (char)0xB6,
781 / * U+2203 */ 0x24,
782 0x00,
783 / * U+2205 */ (char)0xC6,
784 / * U+2206 */ 0x44,
785 / * U+2207 */ (char)0xD1,
786 / * U+2208 */ (char)0xCE,
787 / * U+2209 */ (char)0xCF,
788 0x00,
789 / * U+220B */ 0x27,
790 0x00,
791 0x00,
792 0x00,
793 / * U+220F */ (char)0xD5,
794 0x00,
795 / * U+2211 */ (char)0xE5,
796 / * U+2212 */ 0x2D,
797 0x00,
798 0x00,
799 / * U+2215 */ (char)0xA4,
800 0x00,
801 / * U+2217 */ 0x2A,
802 0x00,
803 0x00,
804 / * U+221A */ (char)0xD6,
805 0x00,
806 0x00,
807 / * U+221D */ (char)0xB5,
808 / * U+221E */ (char)0xA5,
809 0x00,
810 / * U+2220 */ (char)0xD0,
811 0x00,
812 0x00,
813 0x00,
814 0x00,
815 0x00,
816 0x00,
817 / * U+2227 */ (char)0xD9,
818 / * U+2228 */ (char)0xDA,
819 / * U+2229 */ (char)0xC7,
820 / * U+222A */ (char)0xC8,
821 / * U+222B */ (char)0xF2,
822 0x00,
823 0x00,
824 0x00,
825 0x00,
826 0x00,
827 0x00,
828 0x00,
829 0x00,
830 / * U+2234 */ 0x5C,
831 0x00,
832 0x00,
833 0x00,
834 0x00,
835 0x00,
836 0x00,
837 0x00,
838 / * U+223C */ 0x7E,
```

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```c
#define U+2245 */ 0x40,
#define U+2248 */ (char)0xBB,
#define U+2260 */ (char)0xB9,
#define U+2261 */ (char)0xBA,
#define U+2264 */ (char)0xA3,
#define U+2265 */ (char)0xB3,
#define U+2282 */ (char)0xCC,
#define U+2283 */ (char)0xC9,
#define U+2284 */ (char)0xCB,
#define U+2286 */ (char)0xCD,
#define U+2287 */ (char)0xCA,
#define U+2288 */ (char)0xC9,
```
35.255 symbol.h

926 0x00,
927 /* U+2295 */ (char)0xC5,
928 0x00,
929 /* U+2297 */ (char)0xC4,
930 0x00,
931 0x00,
932 0x00,
933 0x00,
934 0x00,
935 0x00,
936 0x00,
937 0x00,
938 0x00,
939 0x00,
940 0x00,
941 0x00,
942 0x00,
943 /* U+22A5 */ 0x5E,
944 0x00,
945 0x00,
946 0x00,
947 0x00,
948 0x00,
949 0x00,
950 0x00,
951 0x00,
952 0x00,
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955 0x00,
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957 0x00,
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959 0x00,
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961 0x00,
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963 0x00,
964 0x00,
965 0x00,
966 0x00,
967 0x00,
968 0x00,
969 0x00,
970 0x00,
971 0x00,
972 0x00,
973 0x00,
974 0x00,
975 /* U+22C5 */ (char)0xD7,
976 0x00,
977 0x00,
978 0x00,
979 0x00,
980 0x00,
981 0x00,
982 0x00,
983 0x00,
984 0x00,
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987 0x00,
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989 0x00,
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1000 0x00,
1001 0x00,
1002 0x00,
1003 0x00,
1004 0x00,
1005 0x00,
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1008 0x00,
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1010 0x00,
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1016 0x00,
1017 0x00,
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1021 0x00,
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1038 0x00,
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1055 0x00,
1056 0x00,
1057 0x00,
1058 0x00,
1059 0x00,
1060 0x00,
1061 0x00,
1062 0x00,
1063 0x00,
1064 0x00,
1065 0x00,
1066 /\ U+2320 */ (char)0xF3,
1067 /\ U+2321 */ (char)0xF5,
1068 0x00,
1069 0x00,
1070 0x00,
1071 0x00,
1072 0x00,
1073 0x00,
1074 0x00,
1075 /\ U+2329 */ (char)0xE1,
1076 /\ U+232A */ (char)0xF1,
1077 };
1078
1079 static const char unicode_to_symbol_1b_25CA[] = {
1080 /\ U+25CA */ (char)0xE0,
1081 };
1082
1083 static const char unicode_to_symbol_1b_2660[] = {
1084 /\ U+2660 */ (char)0xAA,
1085 0x00,
1086 0x00,
1087 /\ U+2663 */ (char)0xA7,
1088 0x00,
1089 /\ U+2665 */ (char)0xA9,
1090 /\ U+2666 */ (char)0xA8,
1091 };
1092
1093 static const char unicode_to_symbol_1b_F6D9[] = {
1094 /\ U+F6D9 */ (char)0xD3,
1095 /\ U+F6DA */ (char)0xD2,
1096 /\ U+F6DB */ (char)0xD4,
1097 };
1098
1099 static const char unicode_to_symbol_1b_F8E5[] = {
/* ARMSCII-8 */
static const unsigned short armscii_8_2uni[96] = {
    0x00a0, 0xfffd, 0x0587, 0x0589, 0x0029, 0x0028, 0x00bb, 0x00ab,
    0x2014, 0x002e, 0x055d, 0x002c, 0x002d, 0x058a, 0x2026, 0x055c,
    0x055b, 0x055e, 0x0531, 0x0561, 0x0532, 0x0562, 0x0533, 0x0563,
    0x0534, 0x0564, 0x0535, 0x0565, 0x0536, 0x0566, 0x0537, 0x0567,
    0x0538, 0x0568, 0x0539, 0x0569, 0x053a, 0x056a, 0x053b, 0x056b,
    0x053c, 0x056c, 0x053d, 0x056d, 0x053e, 0x056e, 0x053f, 0x056f,
    0x0540, 0x0570, 0x0541, 0x0571, 0x0542, 0x0572, 0x0543, 0x0573,
    0x0544, 0x0574, 0x0545, 0x0575, 0x0546, 0x0576, 0x0547, 0x0577,
    0x0548, 0x0578, 0x0549, 0x0579, 0x054a, 0x057a, 0x054b, 0x057b,
    0x054c, 0x057c, 0x054d, 0x057d, 0x054e, 0x057e, 0x054f, 0x057f,
    0x0550, 0x0580, 0x0551, 0x0581, 0x0552, 0x0582, 0x0553, 0x0583,
    0x0554, 0x0584, 0x0555, 0x0585, 0x0556, 0x0586, 0x055a, 0xfffd,
};

static int armscii_8_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
    unsigned char c = *s;
    if (c < 0xa0) {
        *pwc = (ucs4_t) c;
        return 1;
    } else {
        unsigned short wc = armscii_8_2uni[c-0xa0];
        if (wc != 0xfffd) {
            *pwc = (ucs4_t) wc;
            return 1;
        }
    }
    return RET_ILSEQ;
}

static const unsigned char armscii_8_page00[8] = {
    0xa5, 0xa4, 0xa2, 0x2b, 0x2a, 0x2f, 0x28, 0x29,
};

static const unsigned char armscii_8_page00_1[32] = {
    0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
};

static const unsigned char armscii_8_page05[96] = {
    0x28, 0x29, 0x2a, 0x2b, 0x2c, 0x2d, 0x2e, 0x2f,
};

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56 0x00, 0xb2, 0xb4, 0xb6, 0xb8, 0xba, 0xbc, 0xbe, /* 0x30-0x37 */
57 0xc0, 0xc2, 0xc4, 0xc6, 0xc8, 0xca, 0xcc, 0xce, /* 0x38-0x3f */
58 0xd0, 0xd2, 0xd4, 0xd6, 0xd8, 0xda, 0xdc, 0xde, /* 0x40-0x47 */
59 0xe0, 0xe2, 0xe4, 0xe6, 0xe8, 0xea, 0xec, 0xee, /* 0x48-0x4f */
60 0xf0, 0xf2, 0xf4, 0xf6, 0xf8, 0xfa, 0xfc, 0x00, /* 0x50-0x57 */
61 0x00, 0xb0, 0xbf, 0x0a, 0x0b, 0x0c, 0x0d, 0x0e, /* 0x58-0x5f */
62 0xc1, 0xc3, 0xc5, 0xc7, 0xc9, 0xcb, 0xcd, 0xce, /* 0x60-0x67 */
63 0xd1, 0xd3, 0xd5, 0xd7, 0xd9, 0xdb, 0xdd, 0xdf, /* 0x68-0x6f */
64 0xe1, 0xe3, 0xe5, 0xe7, 0xe9, 0xeb, 0xed, 0xef, /* 0x70-0x77 */
65 0xf1, 0xf3, 0xf5, 0xf7, 0xff, 0xfb, 0xfd, 0xfe, /* 0x78-0x7f */
66 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
67 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
68 
69 static const unsigned char armscii_8_page20[24] = {
70 0x00, 0x00, 0x00, 0x00, 0xa8, 0x00, 0x00, 0x00, /* 0x10-0x17 */
71 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
72 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
73 
74 static int
75 armscii_8_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
76 { 
77 if (wc < 0x0028) {
78 *r = wc;
79 return 1;
80 }
81 else if (wc >= 0x0028 && wc < 0x0030)
82 c = armscii_8_page00[wc-0x0028];
83 else if (wc >= 0x0030 && wc < 0x00a0)
84 c = wc;
85 else if (wc >= 0x0530 && wc < 0x0590)
86 c = armscii_8_page05[wc-0x0530];
87 else if (wc >= 0x2010 && wc < 0x2028)
88 c = armscii_8_page20[wc-0x2010];
89 if (c != 0) {
90 *r = c;
91 return 1;
92 }
93 return RET_ILSEQ;
94 }
95 
96 static int
97 ascii_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
98 { 
99 unsigned char c = 0;
100 if (c < 0x80) {
101 *pwc = (ucs4_t) c;
102 return 1;
103 }
104 else if (wc >= 0x0028 && wc < 0x0030)
105 c = armscii_8_page00[wc-0x0028];
106 else if (wc >= 0x0030 && wc < 0x00a0)
107 c = wc;
108 else if (wc >= 0x0530 && wc < 0x0590)
109 c = armscii_8_page05[wc-0x0530];
110 else if (wc >= 0x2010 && wc < 0x2028)
111 c = armscii_8_page20[wc-0x2010];
112 if (c != 0) {
113 *pwc = (ucs4_t) c;
114 return 1;
115 }
116 return RET_ILSEQ;
117 }
118 
119 static int
120 ascii_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
121 { 
122 if (wc < 0x0080) {
123 *r = wc;
124 return 1;
125 }
126 return RET_ILSEQ;
127 }
128 
35.257 ascii.h

2 
3 /* ASCII */
4 
5 7 static int
6 ascii_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
7 { 
8 unsigned char c = 0;
9 if (c < 0x80) {
10 *pwc = (ucs4_t) c;
11 return 1;
12 }
13 else if (wc >= 0x0028 && wc < 0x0030)
14 c = armscii_8_page00[wc-0x0028];
15 else if (wc >= 0x0030 && wc < 0x00a0)
16 c = wc;
17 else if (wc >= 0x0530 && wc < 0x0590)
18 c = armscii_8_page05[wc-0x0530];
19 else if (wc >= 0x2010 && wc < 0x2028)
20 c = armscii_8_page20[wc-0x2010];
21 if (c != 0) {
22 *pwc = (ucs4_t) c;
23 return 1;
24 }
25 return RET_ILSEQ;
26 }

35.258 big5.h

1 /* $XFree86: xc/lib/X11/lcUniConv/big5.h,v 1.2 2003/05/27 22:26:28 tsi Exp $ */
2 
3 /* BIG5 */
4 
5 7 static const unsigned char armscii_8_page20[24] = {
6 Generated by Doxygen

7 0x00, 0x00, 0x00, 0x00, 0xa8, 0x00, 0x00, 0x00, /* 0x10-0x17 */
8 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
9 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
10 
11 static int
12 ascii_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
13 { 
14 unsigned char c = 0;
15 if (c < 0x80) {
16 *pwc = (ucs4_t) c;
17 return 1;
18 }
19 else if (wc >= 0x0028 && wc < 0x0030)
20 c = armscii_8_page00[wc-0x0028];
21 else if (wc >= 0x0030 && wc < 0x00a0)
22 c = wc;
23 else if (wc >= 0x0530 && wc < 0x0590)
24 c = armscii_8_page05[wc-0x0530];
25 else if (wc >= 0x2010 && wc < 0x2028)
26 c = armscii_8_page20[wc-0x2010];
27 if (c != 0) {
28 *pwc = (ucs4_t) c;
29 return 1;
30 }
31 return RET_ILSEQ;
32 }
33 
34 static int
35 ascii_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
36 { 
37 if (wc < 0x0080) {
38 *r = wc;
39 return 1;
40 }
41 return RET_ILSEQ;
42 }
43 
44 static const unsigned char armscii_8_page20[24] = {
45 Generated by Doxygen


/* 0xa5 */
0x595, 0x7259, 0x725b, 0x72ac, 0x738b, 0x4e19,
0x66f0, 0x6708, 0x6728, 0x6b20, 0x6b62, 0x6b79, 0x6bcd,
0x571f, 0x6e10, 0x529b, 0x513f, 0x5165, 0x516b, 0x51e0,
0x5315, 0x5341, 0x535c, 0x53c8, 0x4e09, 0x4e0b, 0x4e08,
0x7387, 0x7388, 0x7389, 0x738a, 0x738b, 0x738c, 0x738d,
0x592b, 0x592a, 0x592d, 0x5b54, 0x5c11, 0x5c24, 0x5c3a,
0x4e2b, 0x4e38, 0x51e1, 0x4e45, 0x4e48, 0x4e57, 0x4e6e, 0x4e8e,
0x7381, 0x7382, 0x7383, 0x7384, 0x7385, 0x7386, 0x7387,
0x51e1, 0x4e45, 0x4e48, 0x4e57, 0x4e6e, 0x4e8e,
0x4e09, 0x4e0b, 0x4e08, 0x4e0a, 0x4e2b, 0x4e38, 0x51e1,
0x5140, 0x5141, 0x4e91, 0x4e95, 0x4e92, 0x4e94, 0x4ea2,
0x03c6, 0x03c7, 0x03c8, 0x03c9, 0x3105, 0x3106, 0x3107,
0x339c, 0x339d, 0x33ce, 0x33a1, 0x338e, 0x338f, 0x33c4,
0x4e0a, 0x4e0b, 0x4e08, 0x4e0a, 0x4e2b, 0x4e38, 0x51e1,
0x5140, 0x5141, 0x4e91, 0x4e95, 0x4e92, 0x4e94, 0x4ea2,
0x4e2b, 0x4e38, 0x51e1, 0x4e45, 0x4e48, 0x4e57, 0x4e6e, 0x4e8e,
1835 0x6b19, 0x6b17, 0x6b1a, 0x7062, 0x7226, 0x72a3, 0x77d8, 0x77d9,
1836 0x7939, 0x7c6f, 0xc7c6, 0x7e9a,
1837 /* 0x9f */
1838 #endif /* NEED_TOWC */
1839 }
1840 #endif /* NEED_TOWC */
1841 else {
1842 if (i < 13932)
1843 } else {
1844 unsigned short wc = 0xfffd;
1845 if ((c2 >= 0x40 && c2 < 0x7f) || (c2 >= 0xa1 && c2 < 0xff)) {
1846 unsigned char c2 = s[1];
1847 }
1848 if (n >= 2) {
1849 if ((c1 >= 0xa1 && c1 <= 0xc7) || (c1 >= 0xc9 && c1 <= 0xf9)) {
1850 unsigned short wc = 0xffffd;
1851 if (i < 6280) {
1852 if (i < 13932)
1853 wc = big5_2uni_pagec9[0];
1854 } else {
1855 if (i < 6280) {
1856 wc = big5_2uni_pagec9[0];
1857 }
1858 if (wc != 0xfffd) {
1859 return RET_ILSEQ;
1860 }
1861 return RET_TOOFEW(0);
1862 }
1863 return RET_TOOFEW(0);
1864 }
1865 }
1866 return RET_ILSEQ;
1867 }
1868 return RET_ILSEQ;
1869 }
1870 return RET_ILSEQ;
1871 }
1872 if (wc != 0xfffd) {
1873 wc = (ucs4_t) wc;
1874 return 2;
1875 }
1876 return RET_ILSEQ;
1877 }
1878 return RET_ILSEQ;
1879 }
1880 }
1881 return RET_ILSEQ;
1882 }
1883 }
1884 
1885 ifdef NEED_TOMB
1886 static const unsigned short big5_2charset[13703] = {
1887 0x8a2e, 0xa2bf, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8, 0xa2b9,
1888 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1889 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1890 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1891 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1892 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1893 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1894 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1895 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1896 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1897 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1898 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1899 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1900 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1901 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
1902 0xa2b7, 0xa2b7, 0xa2b1, 0xa2b5, 0xa2bc, 0xa2ba, 0xa2b5, 0xa2b8,
Generated by Doxygen
static int big5_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    (void)conv;
    if (n >= 2) {
        const Summary16 *summary = NULL;
        if (wc < 0x0100)
            summary = &big5_uni2indx_page00[(wc»4)];
        else if (wc >= 0x0200 && wc < 0x0460)
            summary = &big5_uni2indx_page02[(wc»4)-0x020];
        else if (wc >= 0x2000 && wc < 0x22c0)
            summary = &big5_uni2indx_page20[(wc»4)-0x200];
        else if (wc >= 0x2400 && wc < 0x2650)
            summary = &big5_uni2indx_page24[(wc»4)-0x240];
        else if (wc >= 0x3000 && wc < 0x33e0)
            summary = &big5_uni2indx_page30[(wc»4)-0x300];
        else if (wc >= 0x4e00 && wc < 0x9fb0)
            summary = &big5_uni2indx_page4e[(wc»4)-0xe00];
        else if (wc >= 0xfa00 && wc < 0xfa10)
            summary = &big5_uni2indx_pagefa[(wc»4)-0xfa0];
        else if (wc >= 0xfe00 && wc < 0xff70)
            summary = &big5_uni2indx_pagefe[(wc»4)-0xfe0];
        if (summary) {
            unsigned short used = summary->used;
            unsigned int i = wc & 0x0f;
            if (used & ((unsigned short) 1 « i)) {
                unsigned short c;
                /* Keep in 'used' only the bits 0..i-1. */
                used &= ((unsigned short) 1 « i) - 1;
                /* Add 'summary->indx' and the number of bits set in 'used'. */
                used = (used & 0x5555) + ((used & 0xaaaa) » 1);
                used = (used & 0xaaaa) + ((used & 0xcccc) » 2);
                used = (used & 0xcccc) + ((used & 0xf0f0) » 4);
                used = (used & 0x00ff) + (used » 8);
                c = big5_2charset[summary->indx + used];
                r[0] = (c » 8); r[1] = (c & 0xff);
                return 2;
            }
        }
        return RET_ILSEQ;
    }
    return RET_TOOSMALL;
}
#endif /* NEED_TOMB */
33 \textit{Invariant:}
34 157 \times (s_1 - 0xC9) + (s_2 < 0x80 ? s_2 - 0x40 : s_2 - 0x62)
35 = 94 \times (c_1 - 0x21) + (c_2 - 0x21)
36 Conversion \((s_1, s_2) \rightarrow (c_1, c_2):
37 t := 157 \times (s_1 - 0xC9) + (s_2 < 0x80 ? s_2 - 0x40 : s_2 - 0x62)
38 c_1 := (t \text{ div} 94) + 0x21
39 c_2 := (t \text{ mod} 94) + 0x21
40 Conversion \((c_1, c_2) \rightarrow (s_1, s_2):
41 t := 94 \times (c_1 - 0x21) + (c_2 - 0x21)
42 s_1 := (t \text{ div} 157) + 0xC9
43 s_2 := (t < 0x3F ? t + 0x40 : t + 0x62)
44 */
45
46 \textbf{static int}
47 big5_0_mbtowc \((\text{conv}_t \text{ conv, ucs4}_t \star \text{pwc, const unsigned char } *s, \text{int } n)\)
48 { 0
49 \text{signed char } c_1 = s[0];
50 if (c_1 >= 0x21 \&\& c_1 <= 0x62) { 1
51 if (n >= 2) { 2
52 \text{unsigned char } c_2 = s[1];
53 if (c_2 >= 0x21 \&\& c_2 <= 0x7e) { 3
54 \text{unsigned int } i = 94 \times (c_1 - 0x21) + (c_2 - 0x21);
55 if (0) { 4
56 /* Unoptimized. */ 5
57 \text{unsigned char } buf[2];
58 buf[0] = (i / 157) + 0x40;
59 i = i \% 157;
60 buf[1] = i + (i < 0x3F ? 0x40 : 0x62);
61 \text{return } \text{big5}_\text{mbtowc}(\text{conv, pwc, buf, } 2); 6
62 } else { 7
63 /* Inline the implementation of big5_mbtowc. */ 8
64 if (i < 6121) { 9
65 \text{unsigned short } wc = \text{big5}_\text{uni_pagea1}[i];
66 if (wc != 0xfffd) { 10
67 \text{pwc} = (\text{ucs4}_t) wc;
68 return 2; 11
69 } 12
70 } 13
71 } 14
72 } 15
73 } 16
74 } 17
75 \text{return } \text{RET_ILSEQ};
76 } 18
77 \text{return } \text{RET_TOOFEW}[0];
78 } 19
79 \text{return } \text{RET_ILSEQ};
80 } 20
21
22 \textbf{static int}
23 big5_1_mbtowc \((\text{conv}_t \text{ conv, ucs4}_t \star \text{pwc, const unsigned char } *s, \text{int } n)\)
24 { 25
26 \text{unsigned char } c_1 = s[0];
27 if (c_1 >= 0x21 \&\& c_1 <= 0x72) { 28
29 if (n >= 2) { 30
30 \text{unsigned char } c_2 = s[1];
31 if (c_2 >= 0x21 \&\& c_2 <= 0x7e) { 32
32 \text{unsigned int } i = 94 \times (c_1 - 0x21) + (c_2 - 0x21);
33 if (0) { 34
34 /* Unoptimized. */ 35 \text{unsigned char } buf[2];
36 buf[0] = (i / 157) + 0xc9;
37 i = i \% 157;
38 buf[1] = i + (i < 0x3F ? 0x40 : 0x62);
39 return \text{big5}_\text{mbtowc}(\text{conv, pwc, buf, } 2); 40 } else { 41 /* Inline the implementation of big5_mbtowc. */ 42 if (i < 7652) { 43 \text{unsigned short } wc = \text{big5}_\text{uni_pagec9}[i];
44 if (wc != 0xfffd) { 45 \text{pwc} = (\text{ucs4}_t) wc;
46 return 2; 47 } 48 } 49
50 } 51
52 } 53
53 return \text{RET_ILSEQ};
54 } 54
55 \text{return } \text{RET_TOOFEW}[0];
56 } 55
57 \text{return } \text{RET_ILSEQ};
58 } 56
59 \text{return } \text{RET_ILSEQ};
60 } 57
61
62 \textbf{static int}
63 big5_0_wctomb \((\text{conv}_t \text{ conv, unsigned char } *r, \text{ucs4}_t \star \text{wc, int } n)\)
64 { 65
66 \text{unsigned char } c_1 = r[0];
67 if (c_1 >= 0x21 \&\& c_1 <= 0x72) { 68
69 if (n >= 2) { 70
70 \text{unsigned char } c_2 = r[1];
71 if (c_2 >= 0x21 \&\& c_2 <= 0x7e) { 72
72 \text{unsigned int } i = 94 \times (c_1 - 0x21) + (c_2 - 0x21);
73 if (0) { 74
74 /* Unoptimized. */ 75 \text{unsigned char } buf[2];
76 buf[0] = (i / 157) + 0xc9;
77 i = i \% 157;
78 buf[1] = i + (i < 0x3F ? 0x40 : 0x62);
79 return \text{big5}_\text{mbtowc}(\text{conv, pwc, buf, } 2); 80 } else { 81 /* Inline the implementation of big5_mbtowc. */ 82 if (i < 6121) { 83 \text{unsigned short } wc = \text{big5}_\text{uni_pagea1}[i];
84 if (wc != 0xfffd) { 85 \text{pwc} = (\text{ucs4}_t) wc;
86 return 2; 87 } 88 } 89
90 } 91
91 return \text{RET_ILSEQ};
92 } 92
93 \text{return } \text{RET_TOOFEW}[0];
94 } 93
95 \text{return } \text{RET_ILSEQ};
96 } 94
95
96 \textbf{static int}
97 big5_0_wctomb \((\text{conv}_t \text{ conv, unsigned char } *r, \text{ucs4}_t \star \text{wc, int } n)\)
98 { 99 return RET_ILSEQ;
100 } 100
101 return RET_TOOFEW[0];
102 } 101
103 return RET_ILSEQ;
104 } 102
105
106
107
108
109\text{return RET_ILSEQ;}
110} 109
111 return RET_TOOFEW[0];
112\} 110
113 return RET_ILSEQ;
114\} 111
115
116\textbf{static int}
117 big5_0_wctomb \((\text{conv}_t \text{ conv, unsigned char } *r, \text{ucs4}_t \star \text{wc, int } n)\)
118 { 119 if (n >= 2) { 120

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```c
120 unsigned char buf[2];
121 if (ret != RET_ILSEQ) {
122 unsigned char s1, s2;
123 if (ret != 2) abort();
124 s1 = buf[0];
125 s2 = buf[1];
126 if (!((s1 >= 0xa1) || (s2 >= 0xa1 && s2 <= 0xfe))) abort();
127 if (s1 < 0xc9) {
128 unsigned int t = 157 * (s1 - 0xa1) + s2 - (s2 < 0x80 ? 0x40 : 0x62);
129 r[0] = (t / 94) + 0x21;
130 r[1] = (t % 94) + 0x21;
131 return 2;
132 }
133 }
134 return RET_ILSEQ;
135 }
136 return RET_TOOSMALL;
137 }
138
139 static int
140 big5_1_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
141 { if (n >= 2) { 142 unsigned char buf[2];
143 int ret = big5_wctomb(conv,buf,wc,2);
144 if (ret != RET_ILSEQ) {
145 unsigned char s1, s2;
146 if (ret != 2) abort();
147 s1 = buf[0];
148 s2 = buf[1];
149 if (!((s1 <= 0xf9) || (s2 >= 0x40 && s2 <= 0x7e) || (s2 >= 0xa1 && s2 <= 0xfe))) abort();
150 unsigned int t = 157 * (s1 - 0xc9) + s2 - (s2 < 0x80 ? 0x40 : 0x62);
151 r[0] = (t / 94) + 0x21;
152 r[1] = (t % 94) + 0x21;
153 return 2;
154 }
155 return RET_ILSEQ;
156 return RET_TOOSMALL;
157 }
158
159 static const unsigned short cp1133_2uni_1[64] = {
160 / * 0xa0 */
161 0x00a0, 0x0e81, 0x0e82, 0x0e84, 0x0e87, 0x0e88, 0x0eaa, 0x0e8a,
162 / * 0xb0 */
163 0x0e9c, 0x0e9d, 0x0e9e, 0x0e9f, 0x0ea1, 0x0ea2, 0x0ea3, 0x0ea5,
164 / * 0xc0 */
165 0x0eb0, 0x0eb2, 0x0eb3, 0x0eb4, 0x0eb5, 0x0eb6, 0x0eb7, 0x0eb8,
166 / * 0xd0 */
167 0x0ec0, 0x0ec1, 0x0ec2, 0x0ec3, 0x0ec4, 0x0ec6, 0x0ec7, 0x0ec8,
168 / * 0xe0 */
169 0x0ec9, 0x0ecb, 0x0ecd, 0x0ecf, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
170 }; 21 static const unsigned short cp1133_2uni_2[16] = {
171 0x0ed0, 0x0ed1, 0x0ed2, 0x0ed3, 0x0ed4, 0x0ed5, 0x0ed6, 0x0ed7,
172 0x0ed8, 0x0ed9, 0xfffd, 0xfffd, 0x00a2, 0x00ac, 0x00a6, 0xfffd,
173 }; 26 static int
174 cp1133_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
175 { if (c != 0xa0) {
176 *pwc = (ucs4_t) c;
177 return 1;
178 }
179 else if (c < 0xa0) {
180 unsigned short wc = cp1133_2uni_1[c-0xa0];
181 if (wc != 0xfffd) {
182 /* IBM-CP1133 */
183 #endif
184 #endif
185 #endif
186 #endif
187 #endif
188 #endif
189 #endif
190 #endif
191 #endif
192 #endif
193 #endif
194 #endif
195 #endif
196 #endif
197 #endif
198 #endif
199 #endif
200 #endif
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221 #endif
222 #endif
223 #endif
224 #endif
225 #endif
226 #endif
227 #endif
228 #endif
229 #endif
230 #endif
231 #endif
232 #endif
233 #endif
234 #endif
235 #endif
236 #endif
237 #endif
```
else if (c < 0xf0) {
    *pwc = (ucs4_t) wc;
    return 1;
}
else {
    unsigned short wc = cp1133_2uni_2[c-0xf0];
    if (wc != 0xfffd) {
        *pwc = (ucs4_t) wc;
        return 1;
    }
}
return RET_ILSEQ;
}

static const unsigned char cp1133_page00[16] = {
    0xa0, 0x00, 0xfc, 0x00, 0x00, 0x00, 0x0f, 0x00, /* 0xa0-0xa7 */
    0x00, 0x00, 0x00, 0x00, 0xfd, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
};

static const unsigned char cp1133_page0e[96] = {
    0x00, 0xa1, 0xa2, 0x00, 0xa3, 0x00, 0x00, 0xa4, /* 0x80-0x87 */
    0xa5, 0x00, 0xa7, 0x00, 0xa8, 0x00, 0x00, 0xa9, /* 0x88-0x8f */
    0xac, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, /* 0x90-0x97 */
    0xc7, 0xc8, 0xc9, 0xca, 0xc0, 0x00, 0x00, 0xc1, /* 0x98-0x9f */
    0x00, 0x00, 0x00, 0x00, 0xa6, 0xb9, 0xba, 0xbb, /* 0xa0-0xa7 */
    0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xa8-0xaf */
    0x0f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x0e-0xff */
};

static int cp1133_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
    unsigned char c = 0;
    if (wc < 0x00a0) {
        *r = wc;
        return 1;
    }
    else if (wc >= 0x00a0 && wc < 0x00b0)
        c = cp1133_page00[wc-0x00a0];
    else if (wc >= 0x0e80 && wc < 0x0ee0)
        c = cp1133_page0e[wc-0x0e80];
    else if (wc == 0x20ad)
        c = 0xdf;
    if (c != 0) {
        *r = c;
        return 1;
    }
    return RET_ILSEQ;
}

static const unsigned char cp1133_2uni_2[128] = {
    0x0402, 0x0403, 0x201a, 0x0453, 0x201e, 0x2026, 0x2020, 0x2021,
    0x0404, 0x045e, 0x0408, 0x0490, 0x0409, 0x040a, 0x040b, 0x040c,
    0x20ac, 0x2030, 0x2031, 0x2032, 0x2033, 0x2034, 0x2035, 0x2036,
    0x2037, 0x2038, 0x2039, 0x203a, 0x2019, 0x2018, 0x2017, 0x2016,
    0x2015, 0x2014, 0x2013, 0x2012, 0x2011, 0x2010, 0x0405, 0x0406,
    0x0407, 0x0408, 0x0409, 0x040a, 0x040b, 0x040c, 0x040d, 0x040e,
    0x040f, 0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0416,
    0x0417, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
    0x041f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426,
    0x0427, 0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e,
    0x042f, 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0436,
    0x0437, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
    0x043f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446,
    0x0447, 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e,
    0x044f, 0x0450, 0x0451, 0x0452, 0x0453, 0x0454, 0x0455, 0x0456,
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32 \#ifdef NEED_TOMB
33  static const unsigned char cp1251_page00[32] = {
34       0xa0, 0x00, 0x00, 0x00, 0xa4, 0x00, 0xa6, 0xa7, / * 0xa0-0xa7 */
35       0x00, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0x00, / * 0xa8-0xaf */
36       0xb0, 0xb1, 0x00, 0x00, 0x00, 0xb5, 0xb6, 0xb7, / * 0xb0-0xb7 */
37       0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xb8-0xbf */
38   };  
39 
40  static const unsigned char cp1251_page04[152] = {
41       0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, / * 0x10-0x17 */
42       0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, / * 0x18-0x1f */
43       0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, / * 0x20-0x27 */
44       0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, / * 0x28-0x2f */
45       0xe0, 0x00, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, / * 0x30-0x37 */
46       0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, / * 0x38-0x3f */
47       0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, / * 0x40-0x47 */
48       0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0xff, / * 0x48-0x4f */
49       0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x50-0x5f */
50       0x5a, 0x5b, 0x5c, 0x5d, 0x5e, 0x5f, 0x60, 0x61, / * 0x60-0x6f */
51       0x62, 0x63, 0x64, 0x65, 0x66, 0x67, 0x68, 0x69, / * 0x70-0x7f */
52       0x7a, 0x7b, 0x7c, 0x7d, 0x7e, 0x7f, 0x00, 0x00, / * 0x80-0x9f */
53       0x9a, 0x9b, 0x9c, 0x9d, 0x9e, 0x9f, 0xa0, 0xa1, / * 0xa0-0xb7 */
54       0xb8, 0xb9, 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, / * 0xb8-0xbf */
55   };  
56  static const unsigned char cp1251_page20[48] = {
57       0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x10-0x17 */
58       0x19, 0x1a, 0x1b, 0x1c, 0x1d, 0x1e, 0x1f, 0x00, / * 0x18-0x1f */
59       0x20, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x20-0x27 */
60       0x7b, 0x7c, 0x7d, 0x7e, 0x7f, 0x00, 0x00, 0x00, / * 0x30-0x3f */
61       0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x40-0x4f */
62       0x4a, 0x4b, 0x4c, 0x4d, 0x4e, 0x4f, 0x50, 0x51, / * 0x50-0x5f */
63       0x52, 0x53, 0x54, 0x55, 0x56, 0x57, 0x58, 0x59, / * 0x60-0x6f */
64       0x66, 0x67, 0x68, 0x69, 0x6a, 0x6b, 0x6c, 0x6d, / * 0x70-0x7f */
65       0x7a, 0x7b, 0x7c, 0x7d, 0x7e, 0x7f, 0x00, 0x00, / * 0x80-0x9f */
66       0x9a, 0x9b, 0x9c, 0x9d, 0x9e, 0x9f, 0xa0, 0xa1, / * 0xa0-0xb7 */
67       0xb8, 0xb9, 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, / * 0xb8-0xbf */
68   };  
69  static int
cpl251_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
70   {  
71       \{  
72           \{  
73               if ( \{  
74                   if ( \{  
75               \}  
76                   *r = wc;  
77               \}  
78               return 1;  
79           \}  
80         \};  
81       \};  
82       \};  
83       \};  
84       \};  
85       \};  
86       \};  
87       \};  
88       \};  
89       \};  
90    \};
91  \};
92  \};
93  \};
94  \};
95  \};
96  \};
97  \};
98  \};
99  \};
100 \};
101 \};
102 \};
103 \};
104 \};
105 \};
106 \};
107 \};
108 \};
109 \};
110 \};
111 \};
112 \};
113 \};
114 \};
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115
}
116
return RET_ILSEQ;
117 }
118 #endif /* NEED_TOMB */

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2
3 /*
4 * CP1255
5 */
6
7 static const unsigned short cp1255_2uni[128] = {
8
/* 0x80 */
9
0x20ac, 0xfffd, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
10
0x02c6, 0x2030, 0xfffd, 0x2039, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
11
/* 0x90 */
12
0xfffd, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
13
0x02dc, 0x2122, 0xfffd, 0x203a, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
14
/* 0xa0 */
15
0x00a0, 0x00a1, 0x00a2, 0x00a3, 0x20aa, 0x00a5, 0x00a6, 0x00a7,
16
0x00a8, 0x00a9, 0x00d7, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00af,
17
/* 0xb0 */
18
0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x00b6, 0x00b7,
19
0x00b8, 0x00b9, 0x00f7, 0x00bb, 0x00bc, 0x00bd, 0x00be, 0x00bf,
20
/* 0xc0 */
21
0x05b0, 0x05b1, 0x05b2, 0x05b3, 0x05b4, 0x05b5, 0x05b6, 0x05b7,
22
0x05b8, 0x05b9, 0xfffd, 0x05bb, 0x05bc, 0x05bd, 0x05be, 0x05bf,
23
/* 0xd0 */
24
0x05c0, 0x05c1, 0x05c2, 0x05c3, 0x05f0, 0x05f1, 0x05f2, 0x05f3,
25
0x05f4, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
26
/* 0xe0 */
27
0x05d0, 0x05d1, 0x05d2, 0x05d3, 0x05d4, 0x05d5, 0x05d6, 0x05d7,
28
0x05d8, 0x05d9, 0x05da, 0x05db, 0x05dc, 0x05dd, 0x05de, 0x05df,
29
/* 0xf0 */
30
0x05e0, 0x05e1, 0x05e2, 0x05e3, 0x05e4, 0x05e5, 0x05e6, 0x05e7,
31
0x05e8, 0x05e9, 0x05ea, 0xfffd, 0xfffd, 0x200e, 0x200f, 0xfffd,
32 };
33
34 static int
35 cp1255_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
36 {
37
unsigned char c = *s;
38
if (c < 0x80) {
39
*pwc = (ucs4_t) c;
40
return 1;
41
}
42
else {
43
unsigned short wc = cp1255_2uni[c-0x80];
44
if (wc != 0xfffd) {
45
*pwc = (ucs4_t) wc;
46
return 1;
47
}
48
}
49
return RET_ILSEQ;
50 }
51
52 static const unsigned char cp1255_page00[88] = {
53
0xa0, 0xa1, 0xa2, 0xa3, 0x00, 0xa5, 0xa6, 0xa7, /* 0xa0-0xa7 */
54
0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
55
0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
56
0xb8, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, /* 0xb8-0xbf */
57
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
58
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
59
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xaa, /* 0xd0-0xd7 */
60
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
61
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
62
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
63
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xba, /* 0xf0-0xf7 */
64 };
65 static const unsigned char cp1255_page02[32] = {
66
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, /* 0xc0-0xc7 */
67
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
68
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
69
0x00, 0x00, 0x00, 0x00, 0x98, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
70 };
71 static const unsigned char cp1255_page05[72] = {
72
0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0xb0-0xb7 */
73
0xc8, 0xc9, 0x00, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0xb8-0xbf */
74
0xd0, 0xd1, 0xd2, 0xd3, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
75
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
76
0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xd0-0xd7 */
77
0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xd8-0xdf */
78
0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xe0-0xe7 */

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static const unsigned char cp1255_page20[56] = {
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xfd, 0xfe, /* 0x08-0x0f */
  0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
  0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
  0x86, 0x87, 0x89, 0x00, 0x80, 0x80, 0x85, 0x00, /* 0x20-0x27 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
  0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
  0x00, 0x8b, 0x8b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
};

static int cp1255_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
  unsigned char c = 0;
  if (wc < 0x0080) {
    *r = wc;
    return 1;
  } else if (wc >= 0x00a0 && wc < 0x00f8) {
    c = cp1255_page00[wc-0x00a0];
  } else if (wc == 0x0192) {
    c = 0x83;
  } else if (wc >= 0x02c0 && wc < 0x02e0) {
    c = cp1255_page02[wc-0x02c0];
  } else if (wc >= 0x05b0 && wc < 0x05f8) {
    c = cp1255_page05[wc-0x05b0];
  } else if (wc >= 0x2008 && wc < 0x2040) {
    c = cp1255_page20[wc-0x2008];
  } else if (wc == 0x20aa) {
    c = 0xa4;
  } else if (wc == 0x20ac) {
    c = 0x80;
  } else if (wc == 0x2122) {
    c = 0x99;
  } else if (c != 0) {
    *r = c;
    return 1;
  } return RET_ILSEQ;
}


static const unsigned short cp1256_2uni[128] = {
  /* 0x80 */
  0x20ac, 0x067e, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
  0x02c6, 0x2030, 0x0679, 0x2039, 0x0152, 0x0686, 0x0698, 0x0688,
  /* 0x90 */
  0x06af, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
  0x06a9, 0x2122, 0x0691, 0x203a, 0x0153, 0x200c, 0x200d, 0x06ba,
  /* 0xa0 */
  0x00a0, 0x060c, 0x00a2, 0x00a3, 0x00a4, 0x00a5, 0x00a6, 0x00a7,
  0x00a8, 0x00a9, 0x06be, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00af,
  /* 0xb0 */
  0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x00b6, 0x00b7,
  0x00b8, 0x00b9, 0x061b, 0x00bb, 0x00bc, 0x00bd, 0x00be, 0x061f,
  /* 0xc0 */
  0x06c1, 0x0621, 0x0622, 0x0623, 0x0624, 0x0625, 0x0626, 0x0627,
  0x0628, 0x0629, 0x062a, 0x062b, 0x062c, 0x062d, 0x062e, 0x062f,
  /* 0xd0 */
  0x0630, 0x0631, 0x0632, 0x0633, 0x0634, 0x0635, 0x0636, 0x06d7,
  0x0638, 0x0639, 0x063a, 0x0640, 0x0641, 0x0642, 0x0643,
  /* 0xe0 */
  0x0644, 0x0645, 0x0646, 0x0647, 0x0648, 0x0649, 0x064a, 0x064b,
  /* 0xf0 */
  0x064c, 0x064d, 0x064e, 0x00f4, 0x00f5, 0x00f6, 0x00f7, 0x00f8,
  0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x00fe, 0x00ff, 0x06f2,
};

static int cp1256_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
  unsigned char c = 0;
  if (wc < 0x0080) {
    *r = wc;
    return 1;
  } else if (wc == 0x00a0 && wc < 0x00f8) {
    c = cp1256_2uni[wc-0x00a0];
  } else if (wc == 0x0192) {
    c = 0x83;
  } else if (wc == 0x02c0 && wc < 0x02e0) {
    c = cp1256_2uni[wc-0x02c0];
  } else if (wc == 0x05b0 && wc < 0x05f8) {
    c = cp1256_page05[wc-0x05b0];
  } else if (wc == 0x2008 && wc < 0x2040) {
    c = cp1256_2uni[wc-0x2008];
  } else if (wc == 0x20aa) {
    c = 0xa4;
  } else if (wc == 0x20ac) {
    c = 0x80;
  } else if (wc == 0x2122) {
    c = 0x99;
  } else if (c != 0) {
    *r = c;
    return 1;
  } return RET_ILSEQ;
}

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40
else
41
*pwc = (ucs4_t) cp1256_2uni[c-0x80];
42
return 1;
43 }
44
45 static const unsigned char cp1256_page00[96] = {
46
0xa0, 0x00, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0xa0-0xa7 */
47
0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
48
0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
49
0xb8, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0x00, /* 0xb8-0xbf */
50
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
51
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
52
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd7, /* 0xd0-0xd7 */
53
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
54
0xe0, 0x00, 0xe2, 0x00, 0x00, 0x00, 0x00, 0xe7, /* 0xe0-0xe7 */
55
0xe8, 0xe9, 0xea, 0xeb, 0x00, 0x00, 0xee, 0xef, /* 0xe8-0xef */
56
0x00, 0x00, 0x00, 0x00, 0xf4, 0x00, 0x00, 0xf7, /* 0xf0-0xf7 */
57
0x00, 0xf9, 0x00, 0xfb, 0xfc, 0x00, 0x00, 0x00, /* 0xf8-0xff */
58 };
59 static const unsigned char cp1256_page01[72] = {
60
0x00, 0x00, 0x8c, 0x9c, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
61
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
62
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
63
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
64
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
65
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
66
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
67
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
68
0x00, 0x00, 0x83, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
69 };
70 static const unsigned char cp1256_page06[208] = {
71
0x00, 0x00, 0x00, 0x00, 0xa1, 0x00, 0x00, 0x00, /* 0x08-0x0f */
72
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
73
0x00, 0x00, 0x00, 0xba, 0x00, 0x00, 0x00, 0xbf, /* 0x18-0x1f */
74
0x00, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
75
0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x28-0x2f */
76
0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd8, /* 0x30-0x37 */
77
0xd9, 0xda, 0xdb, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
78
0xdc, 0xdd, 0xde, 0xdf, 0xe1, 0xe3, 0xe4, 0xe5, /* 0x40-0x47 */
79
0xe6, 0xec, 0xed, 0xf0, 0xf1, 0xf2, 0xf3, 0xf5, /* 0x48-0x4f */
80
0xf6, 0xf8, 0xfa, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
81
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
82
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
83
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
84
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
85
0x00, 0x8a, 0x00, 0x00, 0x00, 0x00, 0x81, 0x00, /* 0x78-0x7f */
86
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x8d, 0x00, /* 0x80-0x87 */
87
0x8f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
88
0x00, 0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
89
0x8e, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
90
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
91
0x00, 0x98, 0x00, 0x00, 0x00, 0x00, 0x00, 0x90, /* 0xa8-0xaf */
92
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
93
0x00, 0x00, 0x9f, 0x00, 0x00, 0x00, 0xaa, 0x00, /* 0xb8-0xbf */
94
0x00, 0xc0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
95
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
96
0x00, 0x00, 0xff, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
97 };
98 static const unsigned char cp1256_page20[56] = {
99
0x00, 0x00, 0x00, 0x00, 0x9d, 0x9e, 0xfd, 0xfe, /* 0x08-0x0f */
100
0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
101
0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
102
0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
103
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
104
0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
105
0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
106 };
107
108 static int
109 cp1256_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
110 {
111
unsigned char c = 0;
112
if (wc < 0x0080) {
113
*r = wc;
114
return 1;
115
}
116
else if (wc >= 0x00a0 && wc < 0x0100)
117
c = cp1256_page00[wc-0x00a0];
118
else if (wc >= 0x0150 && wc < 0x0198)
119
c = cp1256_page01[wc-0x0150];
120
else if (wc == 0x02c6)
121
c = 0x88;
122
else if (wc >= 0x0608 && wc < 0x06d8)
123
c = cp1256_page06[wc-0x0608];
124
else if (wc >= 0x2008 && wc < 0x2040)
125
c = cp1256_page20[wc-0x2008];
126
else if (wc == 0x20ac)

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1693


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```
1694 File Documentation

c = 0x80;
else if (wc == 0x2122)
c = 0x99;
if (c != 0) {
    *r = c;
    return 1;
}
return RET_ILSEQ;
```

35.264 `cp936ext.h`

```
1 /*
2 * Character encoding support for the Fast Light Tool Kit (FLTK).
3 *
4 * Copyright 1998-2018 by Bill Spitzak and others.
5 *
6 * This library is free software. Distribution and use rights are outlined in
7 * the file "COPYING" which should have been included with this file. If this
8 * file is missing or damaged, see the license at:
9 *
10 * https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 * https://www.fltk.org/bugs.php
15 */
16
17 #ifdef _WIN32 || defined(__APPLE__) /* PORTME: is this really needed? It's huge! */
18
19 */ not needed */
20 */
21 #else
22 #ifndef CP936
23 #ifdef NEED_TOWC
24 static int
25 cp936ext_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
26 { return 0; }
27 #endif /* NEED_TOWC */
28
29 #ifdef NEED_TOMB
30 static int
31 cp936ext_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
32 { (void)conv; (void)r; (void)wc; (void)n; return 0; }
33 #endif /* NEED_TOMB */
34
35 #else
36 /* CP936EXT */
37 #ifdef NEED_TOWC
38 static const unsigned short cp936ext_2uni_page81[23766] = {
39 0x4e02, 0x4e04, 0x4e05, 0x4e06, 0x4e0f, 0x4e12, 0x4e17, 0x4e1f,
40 0x4e20, 0x4e21, 0x4e23, 0x4e26, 0x4e29, 0x4e2e, 0x4e2f, 0x4e31,
41 0x4e33, 0x4e35, 0x4e37, 0x4e3c, 0x4e40, 0x4e41, 0x4e42, 0x4e44,
42 0x4e45, 0x4e46, 0x4e51, 0x4e55, 0x4e57, 0x4e5a, 0x4e5b, 0x4e62,
43 0x4e63, 0x4e64, 0x4e65, 0x4e67, 0x4e68, 0x4e6a, 0x4e6b, 0x4e6c,
44 0x4e6d, 0x4e6e, 0x4e6f, 0x4e72, 0x4e74, 0x4e75, 0x4e76, 0x4e77,
45 0x4e78, 0x4e79, 0x4e7a, 0x4e7c, 0x4e7d, 0x4e7f, 0x4e80,
46 0x4e81, 0x4e82, 0x4e83, 0x4e84, 0x4e85, 0x4e87, 0x4e8a, 0x4e90,
47 0x4e96, 0x4e97, 0x4e99, 0x4e9c, 0x4e9d, 0x4e9e, 0x4ea3, 0x4eaa,
48 0x4ea4, 0x4ea5, 0x4eb1, 0x4eb4, 0x4eb6, 0x4eb7, 0x4ebb, 0x4eb9,
49 0x4ebc, 0x4ebd, 0x4ebe, 0x4ec9, 0x4ecc, 0x4ecf, 0x4ed0, 0x4ed2,
50 0x4eda, 0x4ed9, 0x4edc, 0x4ee6, 0x4ee7, 0x4ee9, 0x4eeb, 0x4eeb,
51 0x4eed, 0x4eef, 0x4e6, 0x4ef2, 0x4f00, 0x4f02, 0x4f03, 0x4f04, 0x4f05, 0x4f06,
52 0x4f07, 0x4f08, 0x4f0b, 0x4f0c, 0x4f12, 0x4f13, 0x4f14, 0x4f15,
53 0x4f16, 0x4f1c, 0x4f1d, 0x4f21, 0x4f22, 0x4f29, 0x4f2f, 0x4f2c,
54 0x4f32, 0x4f30, 0x4f31, 0x4f33, 0x4f35, 0x4f37, 0x4f39, 0x4f3b,
55 0x4f3e, 0x4f3f, 0x4f40, 0x4f41, 0x4f42, 0x4f44, 0x4f45, 0x4f47,
56 0x4f48, 0x4f49, 0x4f4a, 0x4f4b, 0x4f4c, 0x4f52, 0x4f54, 0x4f56,
57 0x4f61, 0x4f62, 0x4f66, 0x4f68, 0x4f6a, 0x4f6b, 0x4f6d, 0x4f6a,
58 0x4f71, 0x4f72, 0x4f75, 0x4f77, 0x4f78, 0x4f79, 0x4f7a, 0x4f7d,
59 0x4f85, 0x4f81, 0x4f82, 0x4f85, 0x4f86, 0x4f87, 0x4f8a, 0x4f8c,
60 0x4f8e, 0x4f90, 0x4f92, 0x4f93, 0x4f95, 0x4f96, 0x4f98, 0x4f99,
61 0x4f9a, 0x4f9c, 0x4f9e, 0x4f9f, 0xfa1, 0xfa2,
/ * 0x82 */
```
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static int

cp936ext_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c1 = s[0];
    if ((c1 >= 0x81 && c1 <= 0xfe)) {
        if (n >= 2) {
            unsigned char c2 = s[1];
            if ((c2 >= 0x40 && c2 < 0x7f) || (c2 >= 0x80 && c2 < 0xff)) {
                unsigned int i = 190 * (c1 - 0x81) + (c2 - (c2 >= 0x80 ? 0x41 : 0x40));
                unsigned short wc = 0xfffd;
                if (i < 23766)
                    wc = cp936ext_2uni_page81[i];
                if (wc != 0xfffd) {
                    *pwc = (ucs4_t) wc;
                    return 2;
                }
            } else return RET_ILSEQ;
        } else return RET_TOOFEW(0);
    } else return RET_ILSEQ;
}

#endif /* NEED_TOWC */

#ifdef NEED_TOMB

#endif /* Date */

static int

cp936ext_mbtowc (conv_t conv,ucs4_t *pwc, const unsigned char *s, int n) { 
    unsigned char c1 = s[0];
    if ((c1 >= 0x81 && c1 <= 0xfe)) {
        if (n >= 2) {
            unsigned char c2 = s[1];
            if ((c2 >= 0x40 && c2 < 0x7f) || (c2 >= 0x80 && c2 < 0xff)) {
                unsigned int i = 190 * (c1 - 0x81) + (c2 - (c2 >= 0x80 ? 0x41 : 0x40));
                unsigned short wc = 0xfffd;
                if (i < 23766)
                    wc = cp936ext_2uni_page81[i];
                if (wc != 0xfffd) {
                    *pwc = (ucs4_t) wc;
                    return 2;
                }
            } else return RET_ILSEQ;
        } else return RET_TOOFEW(0);
    } else return RET_ILSEQ;

#endif /* Date */

static unsigned char c1 = s[0];
if ((c1 >= 0x81 && c1 <= 0xfe)) {
if (n >= 2) {
    unsigned char c2 = s[1];
    if ((c2 >= 0x40 && c2 < 0x7f) || (c2 >= 0x80 && c2 < 0xff)) {
        unsigned int i = 190 * (c1 - 0x81) + (c2 - (c2 >= 0x80 ? 0x41 : 0x40));
        unsigned short wc = 0xfffd;
        if (i < 23766)
            wc = cp936ext_2uni_page81[i];
        if (wc != 0xfffd) {
            *pwc = (ucs4_t) wc;
            return 2;
        }
    } else return RET_ILSEQ;
} else return RET_TOOFEW(0);

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static const unsigned short cp936ext_page0420[160] = {
  0xa1eb, 0x0000, 0xa1e4, 0xa1e5, 0x0000, 0xa846, 0x0000, 0x0000,
  0xa95c, 0x0000, 0x0000, 0xa843, 0xa1aa, 0xa844, 0xa1ac, 0x0000,
  0xa7da, 0xa7db, 0xa7dc, 0xa7dd, 0xa7de, 0xa7df, 0xa7e0, 0xa7e1,
  0xa6d0, 0xa6d1, 0x0000, 0xa6d2, 0xa6d3, 0xa6d4, 0xa6d5, 0xa6d6,
  0xa8be, 0xa8bf, 0xa8c0, 0xa8c1, 0xa8c2, 0xa8c3, 0xa8c4, 0xa8c5,
  0xa6a8, 0xa6a9, 0xa6aa, 0xa6ab, 0xa6ac, 0xa6ad, 0xa6ae, 0xa6af,
  0xa8a8, 0xa8a9, 0xa8aa, 0xa8ab, 0xa8ac, 0xa8ad, 0xa8ae, 0xa8af,
  0xa8ba, 0xa8bb, 0xa8bc, 0xa8bd, 0xa8be, 0xa8bf, 0xa8c0, 0xa8c1,
  0xa8c2, 0xa8c3, 0xa8c4, 0xa8c5, 0xa8c6, 0xa8c7, 0xa8c8, 0xa8c9,
  0xa72e, 0xa72f, 0xa730, 0xa731, 0xa732, 0xa733, 0xa734, 0xa735,
  0xa736, 0xa737, 0xa738, 0xa739, 0xa73a, 0xa73b, 0xa73c, 0xa73d,
  0xa73e, 0xa73f, 0xa740, 0xa741, 0xa742, 0xa743, 0xa744, 0xa745,
  0xa746, 0xa747, 0xa748, 0xa749, 0xa74a, 0xa74b, 0xa74c, 0xa74d,
  0xa74e, 0xa74f, 0xa750, 0xa751, 0xa752, 0xa753, 0xa754, 0xa755,
  0xa756, 0xa757, 0xa758, 0xa759, 0xa75a, 0xa75b, 0xa75c, 0xa75d,
  0xa75e, 0xa75f, 0xa760, 0xa761, 0xa762, 0xa763, 0xa764, 0xa765,
  0xa766, 0xa767, 0xa768, 0xa769, 0xa76a, 0xa76b, 0xa76c, 0xa76d,
  0xa76e, 0xa76f, 0xa770, 0xa771, 0xa772, 0xa773, 0xa774, 0xa775,
  0xa776, 0xa777, 0xa778, 0xa779, 0xa77a, 0xa77b, 0xa77c, 0xa77d,
  0xa77e, 0xa77f, 0xa780, 0xa781, 0xa782, 0xa783, 0xa784, 0xa785,
  0xa786, 0xa787, 0xa788, 0xa789, 0xa78a, 0xa78b, 0xa78c, 0xa78d,
  0xa78e, 0xa78f, 0xa790, 0xa791, 0xa792, 0xa793, 0xa794, 0xa795,
  0xa796, 0xa797, 0xa798, 0xa799, 0xa79a, 0xa79b, 0xa79c, 0xa79d,
static const unsigned short cp936ext_page1fe0[96] = {
  0x0000, 0xa3a1, 0xa3a2, 0xa3a3, 0xa3a7, 0xa3a5, 0xa3a6, 0xa3a7, /*0x00-0x07*/
  0xa3a8, 0xa3a9, 0xa3aa, 0xa3ab, 0xa3ac, 0xa3ad, 0xa3ae, 0xa3af, /*0x08-0x0f*/
  0xa3b0, 0xa3b1, 0xa3b2, 0xa3b3, 0xa3b4, 0xa3b5, 0xa3b6, 0xa3b7, /*0x10-0x17*/
  0xa3b8, 0xa3b9, 0xa3ba, 0xa3bb, 0xa3bc, 0xa3bd, 0xa3be, 0xa3bf, /*0x18-0x1f*/
  0xa3c0, 0xa3c1, 0xa3c2, 0xa3c3, 0xa3c4, 0xa3c5, 0xa3c6, 0xa3c7, /*0x20-0x27*/
  0xa3c8, 0xa3c9, 0xa3ca, 0xa3cb, 0xa3cc, 0xa3cd, 0xa3ce, 0xa3cf, /*0x28-0x2f*/
  0xa3d0, 0xa3d1, 0xa3d2, 0xa3d3, 0xa3d4, 0xa3d5, 0xa3d6, 0xa3d7, /*0x30-0x37*/
  0xa3d8, 0xa3d9, 0xa3da, 0xa3db, 0xa3dc, 0xa3dd, 0xa3de, 0xa3df, /*0x38-0x3f*/
  0xa3e0, 0xa3e1, 0xa3e2, 0xa3e3, 0xa3e4, 0xa3e5, 0xa3e6, 0xa3e7, /*0x40-0x47*/
  0xa3e8, 0xa3e9, 0xa3ea, 0xa3eb, 0xa3ec, 0xa3ed, 0xa3ee, 0xa3ef, /*0x48-0x4f*/
  0xa3f0, 0xa3f1, 0xa3f2, 0xa3f3, 0xa3f4, 0xa3f5, 0xa3f6, 0xa3f7, /*0x50-0x57*/
  0xa3f8, 0xa3f9, 0xa3fa, 0xa3fb, 0xa3fc, 0xa3fd, 0xa1ab, 0x0000, /*0x58-0x5f*/
};

static const unsigned short cp936ext_page1ffc[8] = {
  0xa1e9, 0xa1ea, 0xa956, 0xa3fe, 0xa957, 0xa3a4, 0x0000, 0x0000, /*0xe0-0xe7*/
};

static int cp936ext_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
  if (n >= 2) {
    unsigned short c = 0;
    if (wc >= 0x00a0 && wc < 0x0170)
      c = cp936ext_page0014[wc-0x00a0];
    else if (wc >= 0x01c8 && wc < 0x01e0)
      c = cp936ext_page0039[wc-0x01c8];
    else if (wc >= 0x0250 && wc < 0x0268)
      c = cp936ext_page004a[wc-0x0250];
    else if (wc >= 0x02c0 && wc < 0x02e0)
      c = cp936ext_page0058[wc-0x02c0];
    else if (wc >= 0x0390 && wc < 0x03d0)
      c = cp936ext_page0072[wc-0x0390];
    else if (wc >= 0x0400 && wc < 0x0458)
      c = cp936ext_page0080[wc-0x0400];
    else if (wc >= 0x0390 && wc < 0x03d0)
      c = cp936ext_page0072[wc-0x0390];
    else if (wc >= 0x0400 && wc < 0x0458)
      c = cp936ext_page0080[wc-0x0400];
    else if (wc >= 0x2010 && wc < 0x2040)
      c = cp936ext_page0402[wc-0x2010];
    else if (wc >= 0x2100 && wc < 0x21a0)
      c = cp936ext_page0420[wc-0x2100];
    else if (wc >= 0x2208 && wc < 0x22c0)
      c = cp936ext_page0441[wc-0x2208];
    else if (wc == 0x2312)
      c = 0xa1d0;
    else if (wc >= 0x2460 && wc < 0x24a0)
      c = cp936ext_page048c[wc-0x2460];
    else if (wc >= 0x2500 && wc < 0x25a8)
      c = cp936ext_page04a0[wc-0x2500];
    else if (wc >= 0x2600 && wc < 0x2648)
      c = cp936ext_page04c0[wc-0x2600];
    else if (wc >= 0x3000 && wc < 0x3130)
      c = cp936ext_page0600[wc-0x3000];
    else if (wc >= 0x3220 && wc < 0x3238)
      c = cp936ext_page0644[wc-0x3220];
    else if (wc == 0x32a3)
      c = 0xa949;
    else if (wc >= 0x3388 && wc < 0x33d8)
      c = cp936ext_page0671[wc-0x3388];
    else if (wc >= 0x3400 && wc < 0x34a8)
      c = cp936ext_page069c[wc-0x3400];
    else if (wc == 0xf92c)
      c = 0x9e4c;
    else if (wc == 0xf978 && wc < 0xf998)
      c = cp936ext_page072f[wc-0x9f78];
    else if (wc == 0xf990 && wc < 0xf998)
      c = cp936ext_page073c[wc-0xf960];
    else if (wc == 0xfa08 && wc < 0xfa30)
      c = cp936ext_page0741[wc-0xfa08];
    else if (wc == 0xfe30 && wc < 0xfe70)
      c = cp936ext_page07fc[wc-0xfe30];
    else if (wc == 0xff00 && wc < 0xff60)
      c = cp936ext_page07fo[wc-0xff00];
    else if (wc == 0xffe0 && wc < 0xffe8)
      c = cp936ext_page0801[wc-0xffe0];
    if (c != 0) {
      r[0] = (c >> 8); r[1] = (c & 0xff);
      return 2;
    }
    return 0;
  }
  return RET_ILSEQ;
}

return RET_TOOSMALL;
}

ifdef /* NEED_TOMB */

define CP936 */
define _MIN32 || __APPLE__ */*/ PORTME: Unicode stuff */

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static const unsigned short gb2312_2uni_page21[831] = {
 0x03c1, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7, 0x03c8, 0x03c9,
 0x03b9, 0x03ba, 0x03bb, 0x03bc, 0x03bd, 0x03be, 0x03bf, 0x03c0,
 0x0399, 0x039a, 0x039b, 0x039c, 0x039d, 0x039e, 0x039f, 0x03a0,
 0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397, 0x0398,
 0x30f1, 0x30f2, 0x30f3, 0x30f4, 0x30f5, 0x30f6, 0xfffd, 0xfffd,
 0x30e9, 0x30ea, 0x30eb, 0x30ec, 0x30ed, 0x30ee, 0x30ef, 0x30f0,
 0x30d9, 0x30da, 0x30db, 0x30dc, 0x30dd, 0x30de, 0x30df, 0x30e0,
 0x30c9, 0x30ca, 0x30cb, 0x30cc, 0x30cd, 0x30ce, 0x30cf, 0x30d0,
 0x30b9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf, 0x30c0,
 0x30a1, 0x30b2, 0x30b3, 0x30b4, 0x30b5, 0x30b6, 0x30b7, 0x30b8,
 0x30a9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf, 0x30c0,
 0x3091, 0x3092, 0x3093, 0x3094, 0x3095, 0x3096, 0x3097, 0x3098,
 0x3099, 0x309a, 0x309b, 0x309c, 0x309d, 0x309e, 0x309f, 0x30a0,
 0x3089, 0x308a, 0x308b, 0x308c, 0x308d, 0x308e, 0x308f, 0x3090,
 0x3071, 0x3072, 0x3073, 0x3074, 0x3075, 0x3076, 0x3077, 0x3078,
 0x3069, 0x306a, 0x306b, 0x306c, 0x306d, 0x306e, 0x306f, 0x3070,
 0x3059, 0x305a, 0x305b, 0x305c, 0x305d, 0x305e, 0x305f, 0x3060,
 0x3049, 0x304a, 0x304b, 0x304c, 0x304d, 0x304e, 0x304f, 0x3050,
 0x3031, 0x3032, 0x3033, 0x3034, 0x3035, 0x3036, 0x3037, 0x3038,
 0x3029, 0x302a, 0x302b, 0x302c, 0x302d, 0x302e, 0x302f, 0x3030,
 0x3019, 0x301a, 0x301b, 0x301c, 0x301d, 0x301e, 0x301f, 0x3020,
 0x2488, 0x2489, 0x248a, 0x248b, 0x248c, 0x248d, 0x248e, 0x248f,
 0x2490, 0x2491, 0x2492, 0x2493, 0x2494, 0x2495, 0x2496, 0x2497,
 0x2498, 0x2499, 0x249a, 0x249b, 0x249c, 0x249d, 0x249e, 0x249f,
 0x24a0, 0x24a1, 0x24a2, 0x24a3, 0x24a4, 0x24a5, 0x24a6, 0x24a7,
 0x24a8, 0x24a9, 0x24aa, 0x24ab, 0x24ac, 0x24ad, 0x24ae, 0x24af,
 0x24b0, 0x24b1, 0x24b2, 0x24b3, 0x24b4, 0x24b5, 0x24b6, 0x24b7,
 0x24b8, 0x24b9, 0x24ba, 0x24bb, 0x24bc, 0x24bd, 0x24be, 0x24bf,
 0x24c0, 0x24c1, 0x24c2, 0x24c3, 0x24c4, 0x24c5, 0x24c6, 0x24c7,
 0x24c8, 0x24c9, 0x24ca, 0x24cb, 0x24cc, 0x24cd, 0x24ce, 0x24cf,
 0x24d0, 0x24d1, 0x24d2, 0x24d3, 0x24d4, 0x24d5, 0x24d6, 0x24d7,
 0x24d8, 0x24d9, 0x24da, 0x24db, 0x24dc, 0x24dd, 0x24de, 0x24df,
 0x24e0, 0x24e1, 0x24e2, 0x24e3, 0x24e4, 0x24e5, 0x24e6, 0x24e7,
 0x24e8, 0x24e9, 0x24ea, 0x24eb, 0x24ec, 0x24ed, 0x24ee, 0x24ef,
null
static int gb2312_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c1 = (s[0] & 0x7F);
    if ((c1 >= 0x21 && c1 <= 0x29) || (c1 >= 0x30 && c1 <= 0x77)) {
        if (n >= 2) {
            unsigned char c2 = (s[1] & 0x7F);
            if (c2 >= 0x21 && c2 < 0x7f) {
                unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
                unsigned short wc = 0xfffd;
                if (i < 1410) {
                    if (i < 831)
                        wc = gb2312_2uni_page21[i];
                    else
                        if (i < 8178)
                            wc = gb2312_2uni_page30[i-1410];
                }
                if (wc != 0xfffd) {
                    *pwc = (ucs4_t) wc;
                    return 2;
                }
            }
            return RET_ILSEQ;
        }
        return RET_TOOFEW(0);
    }
    return RET_ILSEQ;
}
#endif /* NEED_TOWC */

#ifdef NEED_TOMB
    static const unsigned short gb2312_2charset[7445] = {
        // ASCII characters
    }
#endif /* NEED_TOMB */

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static const Summary16 gb2312_uni2indx_page30[35] = {

 0x3e00 },
 0x7f7b, 0x3db4, 0x7x76, 0x73b4, 0x9x85, 0x9x85, 0x9x85, 0x9x85,
 0x73b4, 0x70c4, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb, 0x00fb,
if (n >= 2) {
  const Summary16 *summary = NULL;
  if (wc < 0x0460) summary = &gb2312_uni2indx_page00[(wc»4)];
  else if (wc >= 0x2000 && wc < 0x2650) summary = &gb2312_uni2indx_page20[(wc»4)-0x200];
  else if (wc >= 0x3000 && wc < 0x3230) summary = &gb2312_uni2indx_page30[(wc»4)-0x300];
  else if (wc >= 0x4e00 && wc < 0x9cf0) summary = &gb2312_uni2indx_page4e[(wc»4)-0x4e0];
  else if (wc >= 0x9e00 && wc < 0x9fb0) summary = &gb2312_uni2indx_page9e[(wc»4)-0x9e0];
  else if (wc >= 0xff00 && wc < 0xfff0) summary = &gb2312_uni2indx_pageff[(wc»4)-0xff0];
  if (summary) {
    unsigned short used = summary->used;
    unsigned int i = wc & 0x0f;
    if (used & ((unsigned short) 1 « i)) {
      unsigned short c;
      /* Keep in 'used' only the bits 0..i-1. */
      used &= ((unsigned short) 1 « i) - 1;
      /* Add 'summary->indx' and the number of bits set in 'used'. */
      used = (used & 0x5555) + ((used & 0xaaaa) » 1);
      used = (used & 0x3333) + ((used & 0xcccc) » 2);
      used = (used & 0x0f0f) + ((used & 0xf0f0) » 4);
      used = (used & 0x00ff) + (used » 8);
      c = gb2312_2charset[summary->indx + used];
      r[0] = (c » 8); r[1] = (c & 0xff);
      return 2;
    }
  }
  return RET_ILSEQ;
  return RET_TOOSMALL;
}
#endif /* NEED_TOMB */
```c
static const unsigned char georgian_academy_page20[48] = {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, / * 0xc0-0xc7 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xc8-0xcf */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xd0-0xd7 */
    0x00, 0x98, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xd8-0xdf */
};

static int
georgian_academy_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    unsigned char c = 0;
    if (wc < 0x0080) {
        *r = wc;
        return 1;
    } else if (wc >= 0x0080 && wc < 0x00a0)
        c = georgian_academy_page00[wc-0x0080];
    else if ((wc >= 0x00a0 && wc < 0x00c0) || (wc >= 0x00e7 && wc < 0x0100))
        c = wc;
    else if (wc >= 0x0150 && wc < 0x0198)
        c = georgian_academy_page01[wc-0x0150];
    else if (wc >= 0x02c0 && wc < 0x02e0)
        c = georgian_academy_page02[wc-0x02c0];
    else if (wc >= 0x10d0 && wc < 0x10f7)
        c = wc-0x1010;
    else if (wc >= 0x2010 && wc < 0x2040)
        c = georgian_academy_page20[wc-0x2010];
    else if (wc == 0x2122)
        c = 0x99;
    if (c != 0) {
        *r = c;
        return 1;
    }
    return RET_ILSEQ;
}

static const unsigned short georgian_ps_2uni_1[32] = {
    0x0080, 0x0081, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
    0x02c6, 0x2030, 0x0160, 0x2039, 0x0152, 0x008d, 0x008e, 0x008f,
};

static const unsigned short georgian_ps_2uni_2[39] = {
    0x10d0, 0x10d1, 0x10d2, 0x10d3, 0x10d4, 0x10d5, 0x10d6, 0x10f1,
    0x10d7, 0x10d8, 0x10d9, 0x10da, 0x10db, 0x10f2, 0x10f3, 0x10f4,
    0x10e0, 0x10e1, 0x10e2, 0x10f3, 0x10e3, 0x10e4, 0x10e5, 0x10e6, 0x10e7,
    0x10e8, 0x10e9, 0x10ea, 0x10eb, 0x10ec, 0x2000, 0x200a, 0x2008, 0x201f,
    0x10ed, 0x10ee, 0x10ef, 0x10f0, 0x10f5,
};

static int
georgian_ps_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c = *s;
    if (c >= 0x80 && c < 0xa0)
        *pwc = (ucs4_t) georgian_ps_2uni_1[c-0x80];
    else if (c >= 0xc0 && c < 0xe6)
        *pwc = (ucs4_t) georgian_ps_2uni_2[c-0xc0];
    else
        *pwc = (ucs4_t) c;
    return 1;
}

static const unsigned char georgian_ps_page00[32] = {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x80-0x87 */
```

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```
static const unsigned char georgian_ps_page01[72] = {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x8d, 0x8e, 0x8f, /* 0x88-0x8f */
    0x90, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
    0x9f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
}

static const unsigned char georgian_ps_page02[32] = {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, /* 0xc0-0xc7 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
    0x00, 0x00, 0x00, 0x00, 0x98, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
}

static const unsigned char georgian_ps_page10[40] = {
    0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0xd0-0xd7 */
    0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, 0xd0, /* 0xd8-0xdf */
    0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, 0xd8, 0xd9, /* 0xe0-0xe7 */
    0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, 0xe0, 0xe1, /* 0xe8-0xef */
    0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, 0xe8, 0xe9, /* 0xf0-0xf7 */
}

static const unsigned char georgian_ps_page20[48] = {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x96, /* 0x10-0x17 */
    0x91, 0x92, 0x93, 0x94, 0x95, 0x96, 0x97, 0x98, /* 0x18-0x1f */
    0x86, 0x87, 0x88, 0x89, 0x8a, 0x8b, 0x8c, 0x8d, /* 0x20-0x27 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
    0x89, 0x8a, 0x8b, 0x8c, 0x8d, 0x8e, 0x8f, 0x90, /* 0x30-0x37 */
    0x91, 0x92, 0x93, 0x94, 0x95, 0x96, 0x97, 0x98, /* 0x38-0x3f */
}


static int
iso8859_1_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c = 0;
    if (wc <= 0x0080)
        return 1;
    for (; c = *s++ & 0x00ff;)
        *pwc = (ucs4_t) c;
    return 1;
}

static int
iso8859_1_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    unsigned char c = 0;
    if (wc <= 0x0080)
        *r = (unsigned char) wc;
    else if ((wc >= 0x0080 && wc < 0x00a0) ||
              (wc >= 0x00a0 && wc < 0x00c0) ||
              (wc >= 0x00e6 && wc < 0x0100) ||
              (wc >= 0x10d0 && wc < 0x10f8) ||
              (wc >= 0x2010 && wc < 0x2040) ||
              (wc == 0x2122))
        c = georgian_ps_page01[wc-0x0080];
    else if (wc >= 0x0150 && wc < 0x0198)
        c = georgan_ps_page00[wc-0x0150];
    else if (wc >= 0x02c0 && wc < 0x02e0)
        c = georgan_ps_page02[wc-0x02c0];
    else if (wc >= 0x0100 && wc < 0x010f)
        c = georgan_ps_page10[wc-0x0100];
    else if (wc >= 0x2010 && wc < 0x2040)
        c = georgan_ps_page20[wc-0x2010];
    return 1;
}

static int
is8859_1_ismbtwc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c = 0;
    *pwc = (ucs4_t) c;
    return 1;
}

static int
is8859_1_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
if (wc < 0x0100) {
  *r = wc;
  return 1;
}
return RET_ILSEQ;

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#ifdef NEED_TOWC
static const unsigned short iso8859_10_2uni[96] = {
  0xa0, 0x0104, 0x0112, 0x0122, 0x012a, 0x0128, 0x0136, 0x00a7,
  0x013b, 0x0110, 0x0160, 0x0166, 0x0117d, 0x000ad, 0x016a, 0x014a,
  0xb0, 0x0105, 0x0113, 0x0123, 0x012b, 0x0129, 0x0137, 0x00b7,
  0x013c, 0x0111, 0x0161, 0x0167, 0x017e, 0x02015, 0x016b, 0x014b,
  0xc0, 0x0100, 0x00c1, 0x00c2, 0x00c3, 0x00c4, 0x00c5, 0x00c6, 0x012e,
  0x010c, 0x00c9, 0x0118, 0x00cb, 0x0116, 0x00cd, 0x00ce, 0x00cf,
  0xd0, 0x00d0, 0x0145, 0x014c, 0x00d3, 0x00d4, 0x00d5, 0x00d6, 0x0168,
  0x00d8, 0x0172, 0x00da, 0x00db, 0x00dc, 0x00dd, 0x00de, 0x00df,
  0xe0, 0x00e0, 0x0146, 0x014d, 0x00f3, 0x00f4, 0x00f5, 0x00f6, 0x0169,
  0x00f8, 0x0173, 0x00fa, 0x00fb, 0x00fc, 0x00fd, 0x00fe, 0x0138,
};
#endif /* NEED_TOWC */

static int iso8859_10_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
  unsigned char c = *s;
  if (c < 0xa0)
    *pwc = (ucs4_t) c;
  else
    *pwc = (ucs4_t) iso8859_10_2uni[c-0xa0];
  return 1;
}

#ifdef NEED_TOMB
static const unsigned char iso8859_10_page00[224] = {
  0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
  0xb0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7, /* 0xb0-0xb7 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
  0x00, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0x00, /* 0xc0-0xc7 */
  0x00, 0xc9, 0x00, 0xcb, 0x00, 0xcd, 0xce, 0xcf, /* 0xc8-0xcf */
  0xd0, 0x00, 0x00, 0x00, 0xd3, 0xd4, 0xd5, 0xd6, /* 0xd0-0xd7 */
  0x00, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0xd8-0xdf */
  0x00, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0x00, /* 0xe0-0xe7 */
  0x00, 0xe9, 0x00, 0x00, 0xe0, 0xe1, 0xe2, 0xe3, /* 0xe8-0xef */
  0x00, 0xf3, 0xf4, 0xf5, 0xf6, 0x00, /* 0xf0-0xf7 */
  0x0f8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x0f8-0xff */
};
#endif /* NEED_TOMB */

static int iso8859_10_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
  unsigned char c = *s;
  if (c < 0xa0)
    *pwc = (ucs4_t) c;
  else
    *pwc = (ucs4_t) iso8859_10_2uni[c-0xa0];
  return 1;
}

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void) conv; (void) n;

unsigned char c = 0;

if (wc < 0x00a0) {
    *r = wc;
    return 1;
}

else if (wc >= 0x00a0 && wc < 0x0180)
    c = iso8859_10_page00[wc-0x00a0];

else if (wc == 0x2015)
    c = 0xbd;

if (c != 0) {
    *r = c;
    return 1;
}

return RET_ILSEQ;

#endif /* NEED_TOMB */

#endif /* NEED_TOWC */

static const unsigned short iso8859_11_2uni[96] = {
    0x00a0, 0x0e01, 0x0e02, 0x0e03, 0x0e04, 0x0e05, 0x0e06, 0x0e07,
    0x0e08, 0x0e09, 0x0e0a, 0x0e0b, 0x0e0c, 0x0e0d, 0x0e0e, 0x0e0f,
    0x0e10, 0x0e11, 0x0e12, 0x0e13, 0x0e14, 0x0e15, 0x0e16, 0x0e17,
    0x0e18, 0x0e19, 0x0e1a, 0x0e1b, 0x0e1c, 0x0e1d, 0x0e1e, 0x0e1f,
    0x0e20, 0x0e21, 0x0e22, 0x0e23, 0x0e24, 0x0e25, 0x0e26, 0x0e27,
    0x0e28, 0x0e29, 0x0e2a, 0x0e2b, 0x0e2c, 0x0e2d, 0x0e2e, 0x0e2f,
    0x0e30, 0x0e31, 0x0e32, 0x0e33, 0x0e34, 0x0e35, 0x0e36, 0x0e37,
    0x0e38, 0x0e39, 0x0e3a, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
    0x0e3e, 0x0e3f, 0x0e40, 0x0e41, 0x0e42, 0x0e43, 0x0e44, 0x0e45, 0x0e46, 0x0e47,
    0x0e48, 0x0e49, 0x0e4a, 0x0e4b, 0x0e4c, 0x0e4d, 0x0e4e, 0x0e4f,
    0x0e50, 0x0e51, 0x0e52, 0x0e53, 0x0e54, 0x0e55, 0x0e56, 0x0e57,
    0x0e58, 0x0e59, 0x0e5a, 0x0e5b, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
};

static int iso8859_11_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
    unsigned char c = *s;
    if (c < 0x80) {
        *pwc = (ucs4_t) c;
        return 1;
    }
    else if (c < 0xa0) {
        }
    else {
        unsigned short wc = iso8859_11_2uni[c-0xa0];
        if (wc != 0xfffd) {
            *pwc = (ucs4_t) wc;
            return 1;
        }
    }
    return RET_ILSEQ;
}

static const unsigned char iso8859_11_page0e[96] = {
    0x00, 0xa1, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0x00-0x07 */
    0x0e08, 0x0e09, 0x0e0a, 0x0e0b, 0x0e0c, 0x0e0d, 0x0e0e, 0x0e0f, /* 0x08-0x0f */
    0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x10-0x17 */
    0x0e18, 0x0e19, 0x0e1a, 0x0e1b, 0x0e1c, 0x0e1d, 0x0e1e, 0x0e1f, /* 0x18-0x1f */
    0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
    0x0e28, 0x0e29, 0x0e2a, 0x0e2b, 0x0e2c, 0x0e2d, 0x0e2e, 0x0e2f, /* 0x28-0x2f */
    0x0e30, 0x0e31, 0x0e32, 0x0e33, 0x0e34, 0x0e35, 0x0e36, 0x0e37, /* 0x30-0x37 */
    0x0e38, 0x0e39, 0x0e3a, 0x0e3b, 0x0e3c, 0x0e3d, 0x0e3e, 0x0e3f, /* 0x38-0x3f */
    0x0e40, 0x0e41, 0x0e42, 0x0e43, 0x0e44, 0x0e45, 0x0e46, 0x0e47, /* 0x40-0x47 */
    0x0e48, 0x0e49, 0x0e4a, 0x0e4b, 0x0e4c, 0x0e4d, 0x0e4e, 0x0e4f, /* 0x48-0x4f */
    0x0e50, 0x0e51, 0x0e52, 0x0e53, 0x0e54, 0x0e55, 0x0e56, 0x0e57, /* 0x50-0x57 */
    0x0e58, 0x0e59, 0x0e5a, 0x0e5b, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
};

static unsigned char c = 0;
static int
iso8859_11_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    unsigned char c = 0;
    if (wc < 0x0080 || wc == 0x00a0) {
        *r = wc;
        return 1;
    } else if (wc >= 0x0e00 && wc < 0x0e60)
        c = iso8859_11_page0e[wc-0x0e00];
    if (c != 0) {
        *r = c;
        return 1;
    } return RET_ILSEQ;
}

#ifndef NEED_TOMB
#endif /* NEED_TOMB */

static const unsigned short iso8859_13_2uni[96] = {
    /* 0xa0 */
    0x00a0, 0x201d, 0x00a2, 0x00a3, 0x00a4, 0x201e, 0x00a6, 0x00a7,
    /* 0xb0 */
    0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x201c, 0x00b5, 0x00b6, 0x00b7,
    /* 0xc0 */
    0x0104, 0x012e, 0x0100, 0x0106, 0x00c4, 0x00c5, 0x0118, 0x0112,
    /* 0xd0 */
    0x0160, 0x0143, 0x0145, 0x00d3, 0x014c, 0x00d5, 0x00d6, 0x00d7,
    /* 0xe0 */
    0x0105, 0x012f, 0x0101, 0x0107, 0x00e4, 0x00e5, 0x0119, 0x0113,
    /* 0xf0 */
    0x0161, 0x0144, 0x0146, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7,
    0x0173, 0x0142, 0x015b, 0x0156, 0x00fc, 0x017c, 0x017e, 0x017f,
    0x0180,
};

static int
iso8859_13_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c = *s;
    if (c < 0xa0)
        *pwc = (ucs4_t) c;
    else
        *pwc = (ucs4_t) iso8859_13_2uni[c-0xa0];
    return 1;
}
#endif /* NEED_TOWC */

static const unsigned char iso8859_13_page00[224] = {
    0xa0, 0x00a0, 0x00a2, 0x00a3, 0x00a4, 0x00a6, 0x00a7, /* 0xa0-0xa7 */
    0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00c4, 0x00c5, 0x00c6, /* 0xb0-0xb7 */
    0x0104, 0x012e, 0x0100, 0x0106, 0x00d3, 0x014c, 0x00d5, 0x00d6, /* 0xc0-0xc7 */
    0x0160, 0x0143, 0x0145, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7, /* 0xd0-0xdf */
    0x0105, 0x012f, 0x0101, 0x0107, 0x00e4, 0x00e5, 0x0119, 0x0113, /* 0xe0-0xef */
    0x0161, 0x0144, 0x0146, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7, /* 0xf0-0xff */
    0x0105, 0x012f, 0x0101, 0x0107, 0x00e4, 0x00e5, 0x0119, 0x0113,
    0x0161, 0x0144, 0x0146, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7,
    0x0173, 0x0142, 0x015b, 0x0156, 0x00fc, 0x017c, 0x017e, 0x017f,
    0x0180,
};

#ifndef NEED_TOWC
#endif /* NEED_TOWC */

static const unsigned char iso8859_13_page00[224] = {
    0xa0, 0x00a0, 0x00a2, 0x00a3, 0x00a4, 0x00a6, 0x00a7, /* 0xa0-0xa7 */
    0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00c4, 0x00c5, 0x00c6, /* 0xb0-0xb7 */
    0x0104, 0x012e, 0x0100, 0x0106, 0x00d3, 0x014c, 0x00d5, 0x00d6, /* 0xc0-0xc7 */
    0x0160, 0x0143, 0x0145, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7, /* 0xd0-0xdf */
    0x0105, 0x012f, 0x0101, 0x0107, 0x00e4, 0x00e5, 0x0119, 0x0113,
    0x0161, 0x0144, 0x0146, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7,
    0x0173, 0x0142, 0x015b, 0x0156, 0x00fc, 0x017c, 0x017e, 0x017f,
    0x0180,
};

#ifndef NEED_TOWC
#endif /* NEED_TOWC */

Generated by Doxygen
static const unsigned char iso8859_13_page20[8] = {
    0x00, 0xff, 0x00, 0x00, 0xb4, 0xa1, 0xa5, 0x00, /* 0x18-0x1f */
};

static int iso8859_13_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
    (void)conv; (void)n;
    unsigned char c = 0;
    if (wc < 0x00a0) {
        *r = wc;
        return 1;
    } else if (wc >= 0x00a0 && wc < 0x0180) {
        c = iso8859_13_page00[wc-0x00a0];
    } else if (wc >= 0x2018 && wc < 0x2020) {
        c = iso8859_13_page20[wc-0x2018];
    } else if (wc < 0x00a0) {
        *r = c;
        return 1;
    } else if (wc >= 0x00a0 && wc < 0x0180) {
        *r = c;
        return 1;
    } else if (wc >= 0x0180 && wc < 0x0200) {
        *r = c;
        return 1;
    } else if (wc >= 0x0200 && wc < 0x0208) {
        *r = c;
        return 1;
    } else if (wc >= 0x0208 && wc < 0x0210) {
        *r = c;
        return 1;
    } return RET_ILSEQ;
}
#endif /* NEED_TOWC */

#endif /* NEED_TOMB */

static const unsigned char iso8859_14_page00[96] = {
    0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xa0-0xbf */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xc0-0xff */
};

static const unsigned short iso8859_14_2uni[96] = {
    0xa0, 0x00, 0x00, 0x00, 0xa3, 0x00, 0x00, 0x00, / * 0xa0-0xa7 */
    0x00, 0xa9, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xb0-0xb7 */
    0x00, 0xb8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xc0-0xc7 */
    0x00, 0xc8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xd0-0xdf */
};

static int iso8859_14_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
    unsigned char c = *s;
    if (c >= 0xa0) {
        *pwc = (ucs4_t) iso8859_14_2uni[c-0xa0];
    } else {
        *pwc = (ucs4_t) c;
        return 1;
    }
}
#endif /* NEED_TOWC */

static const unsigned char iso8859_14_page20[8] = {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
};

Generated by Doxygen
51 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xe0-0xe7 */
52 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
53 0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xf0-0xf7 */
54 0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0x00, 0xff, /* 0xf8-0xff */
55 }
56 static const unsigned char iso8859_14_page01_0[32] = {
57 0x00, 0x00, 0xa4, 0xa5, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
58 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
59 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
60 0xb2, 0xb3, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
61 }
62 static const unsigned char iso8859_14_page01_1[16] = {
63 0x00, 0x00, 0x00, 0x00, 0xd0, 0xf0, 0xde, 0xfe, /* 0x70-0x77 */
64 0xaf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
65 }
66 static const unsigned char iso8859_14_page1e_0[136] = {
67 0x00, 0x00, 0xa1, 0xa2, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
68 0x00, 0x00, 0xa6, 0xab, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb0, 0xb1, /* 0x10-0x1f */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
71 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
72 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
73 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
74 0xb4, 0xb5, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
75 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
77 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
78 0xbb, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
79 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
80 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
81 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7, 0xb9, /* 0x78-0x7f */
82 0xbb, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
83 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x9f */
84 };  
85 static const unsigned char iso8859_14_page1e_1[8] = {
86 0x00, 0x00, 0xac, 0xbc, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xf7 */
87 };  
88  
89 static int
90 iso8859_14_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
91 {  
92 (void)conv; (void)n;
93 unsigned char c = 0;
94 if (wc < 0x00a0) {
95 *r = wc;
96 return 1;
97 }  
98 else if (wc >= 0x00a0 && wc < 0x0100)
99 c = iso8859_14_page00[wc-0x00a0];  
100 else if (wc >= 0x0108 && wc < 0x0128)
101 c = iso8859_14_page01_0[wc-0x0108];  
102 else if (wc >= 0x0170 && wc < 0x0180)
103 c = iso8859_14_page01_1[wc-0x0170];  
104 else if (wc >= 0x1e00 && wc < 0x1e88)
105 c = iso8859_14_page1e_0[wc-0x1e00];  
106 else if (wc >= 0x1ef0 && wc < 0x1ef8)
107 c = iso8859_14_page1e_1[wc-0x1ef0];  
108 if (c != 0) {
109 *r = c;
110 return 1;
111 }  
112 return RET_ILSEQ;
113 })  
114 #endif /* NEED_TOMB */

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2 /*
3 * ISO-8859-15
4 */
5 #ifdef NEED_TOWC
6 static const unsigned char iso8859_15_2uni[32] = {
7 / * 0xa0 */
8 0x00a0, 0x00a1, 0x00a2, 0x00a3, 0x20ac, 0x00a5, 0x0160, 0x00a7,
9 0x0161, 0x00a9, 0x00aa, 0x00ab, 0x00ad, 0x00ae, 0x00af,
10 / * 0xb0 */
11 0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x017d, 0x00b5, 0x00b6, 0x00b7,
12 0x017e, 0x00b9, 0x00ba, 0x00bb, 0x0152, 0x0153, 0x0178, 0x00bf,
13 / * 0x80 */
14 0x0080, 0x0081, 0x0082, 0x0083, 0x0084, 0x0085, 0x0086, 0x0087,
15 0x0088, 0x0089, 0x008a, 0x008b, 0x008c, 0x008d, 0x008e, 0x008f,
16 }  
17 static int
18 iso8859_15_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)

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unsigned char c = *s;
if (c >= 0xa0 && c < 0xc0)
  *pwc = (ucs4_t) iso8859_15_2uni[c-0xa0];
else
  *pwc = (ucs4_t) c;
return 1;
}
#endif /* NEED_TOWC */

#endif /* NEED_TOMB */

static const unsigned char iso8859_15_page00[32] = {
  0xa0, 0xa1, 0xa2, 0xa3, 0x00, 0xa5, 0x00, 0xa7, /* 0xa0-0xa7 */
  0x00, 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0x88-0xaf */
  0xb0, 0xb1, 0xb2, 0xb3, 0x00, 0xb5, 0xb6, 0xb7, /* 0xbc-0xb7 */
  0x00, 0xb9, 0xba, 0xbb, 0x00, 0x00, 0x0f, /* 0xb8-0xbf */
};

static const unsigned char iso8859_15_page01[48] = {
  0x00, 0x00, 0xbc, 0xbd, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
};

static int iso8859_15_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
  (void)conv; (void)n;
  unsigned char c = 0;
  if (wc < 0x00a0) {
    *r = wc;
    return 1;
  } else if (wc >= 0x00a0 && wc < 0x00c0)
    c = iso8859_15_page00[wc-0x00a0];
  else if (wc >= 0x00c0 && wc < 0x0100)
    c = wc;
  else if (wc >= 0x0150 && wc < 0x0180)
    c = iso8859_15_page01[wc-0x0150];
  else if (wc == 0x20ac)
    c = 0xa4;
  if (c != 0) {
    *r = c;
    return 1;
  }
  return RET_ILSEQ;
}

static const unsigned short iso8859_16_2uni[96] = {
  0xa0, 0xa1, 0xa2, 0xa3, 0x00, 0xa5, 0x00, 0xa7, /* 0xa0-0xa7 */
  0x00, 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0x88-0xaf */
  0xb0, 0xb1, 0xb2, 0xb3, 0x00, 0xb5, 0xb6, 0xb7, /* 0xbc-0xb7 */
  0x00, 0xb9, 0xba, 0xbb, 0x00, 0x00, 0x0f, /* 0xb8-0xbf */
};

static int iso8859_16_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
  unsigned char c = 0;
  if (c < 0xa0) { /* 0x00-0x7f */
    *pwc = (ucs4_t) c;
    return 1;
  } else if (c >= 0xa0 && c < 0xc0) /* 0x80-0xff */
    *pwc = (ucs4_t) iso8859_16_2uni[c-0xa0];
  else /* 0xc0-0xff */
    *pwc = (ucs4_t) c;
  return 1;
}


*/
33     *pwc = (ucs4_t) c;
34   } else
35     *pwc = (ucs4_t) iso8859_16_2uni[c-0xa0];
36     return 1;
37 }
38
39 static const unsigned char iso8859_16_page00[224] = {
40     0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
41     0x00, 0xa9, 0x00, 0xab, 0x00, 0xad, 0x00, /* 0x00-0xfaf */
42     0xb0, 0xb1, 0x00, 0x00, 0x00, 0x00, 0xb7, /* 0x0b0-0xb7 */
43     0x00, 0x00, 0xb0, 0xbb, 0x00, 0x00, 0x00, 0x00, /* 0x0b8-0xbbf */
44     0xc0, 0xc1, 0xc2, 0x00, 0xc4, 0x00, 0xc6, 0xc7, /* 0xc0-0xc7 */
45     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xce, 0xcf, /* 0xc8-0xcf */
46     0x00, 0x00, 0x02, 0x03, 0x04, 0x00, 0x06, 0x00, /* 0xd0-0xdf */
47     0x00, 0x00, 0x0f, 0x0f, 0x0c, 0x0c, 0x0d, 0x0d, /* 0xe0-0xe7 */
48     0x0e, 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, /* 0xe8-0xef */
49     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xff */
50     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x0100 */
51     0x00, 0x00, 0xc3, 0xe3, 0xa1, 0xa2, 0xc5, 0xe5, /* 0x00-0x07 */
52     0x00, 0x00, 0x00, 0x00, 0xb2, 0xb9, 0x00, 0x00, /* 0x08-0x0f */
53     0xd0, 0xf0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
54     0xdd, 0xfd, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
55     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
56     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
57     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
58     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
59     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
60     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
61     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
63     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
64     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
65     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
66
67 static const unsigned char iso8859_16_page02[8] = {
68     0xaa, 0xba, 0xde, 0xfe, 0x00, 0x00, 0x00, 0x00, /* 0x00-0xf */
69
70 static const unsigned char iso8859_16_page20[8] = {
71     0x00, 0x00, 0x00, 0x00, 0xb5, 0xa5, 0x00, 0x00, /* 0x18-0x1f */
72
73 static const unsigned char conv_t conv, unsigned char *r, ucs4_t wc, int n) {
74     unsigned char c = 0;
75     if (wc < 0x00a0) {  /* 0xa0-0xa7 */
76     *r = wc;
77     return 1;
78     } else if (wc >= 0x00a0 && wc < 0x0180) {  /* 0x00a0-0x01ff */
79         c = iso8859_16_page00[wc-0x00a0];
80         if (c != 0) {
81             *r = c;
82             return 1;
83         }
84     } else if (wc >= 0x0180 && wc < 0x0220) {  /* 0x0200-0x023f */
85         c = iso8859_16_page02[wc-0x0200];
86         if (c != 0) {
87             *r = c;
88             return 1;
89         }
90     } else if (wc >= 0x0220 && wc < 0x0240) {  /* 0x0240-0x025f */
91         c = iso8859_16_page20[wc-0x0220];
92         if (c != 0) {
93             *r = c;
94             return 1;
95         }
96     } else
97         return RET_ILSEQ;
98 }
35.275 iso8859_2.h 1805

17 0x010c, 0x00c9, 0x0118, 0x00cb, 0x011a, 0x00cd, 0x00ce, 0x010e,
18 */ 0x00d /)
19 0x0115, 0x00e1, 0x00e2, 0x0113, 0x00e4, 0x011a, 0x00ef, 0x010f,
20 /* 0xd0 */
21 0x0111, 0x0144, 0x0148, 0x01f3, 0x00f4, 0x0151, 0x00f6, 0x00f7,
22 0x0159, 0x016f, 0x00fa, 0x0171, 0x00fd, 0x0163, 0x02d9,
23 */
24 #endif /* NEED_TOWC */
25 /* 0x0100 */
26 /* 0x0100 */
27 /* 0x0100 */
28 */
29 static int
30 iso8859_2_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32 unsigned char c = *s;
33 if (c < 0xa0)
34 *pwc = (ucs4_t) c;
35 else
c6 36 *pwc = (ucs4_t) iso8859_2_2uni[c-0xa0];
37 return 1;
38 }
39 #endif /* NEED_TOWC */
40 */
41 #ifdef NEED_TOMB
42 static const unsigned char iso8859_2_page00[224] = {
43 0xa0, 0x00, 0x00, 0x00, 0xa4, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
44 0xa8, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
45 0xb0, 0x00, 0x00, 0x00, 0xb4, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
46 0xb8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
47 0x00, 0xc1, 0xc2, 0x00, 0xc4, 0x00, 0x00, 0xc7, /* 0xc0-0xc7 */
48 0x00, 0xc9, 0x00, 0xcb, 0x00, 0xcd, 0xce, 0x00, /* 0xc8-0xcf */
49 0x00, 0xda, 0x00, 0xdc, 0xdd, 0x00, 0xdf, /* 0xe0-0xef */
50 0x00, 0xe1, 0xe2, 0x00, 0xe4, 0x00, 0x00, 0xe7, /* 0xe0-0xe7 */
51 0x00, 0xe9, 0x00, 0xeb, 0x00, 0xe5, 0xe6, 0x00, /* 0xe0-0xef */
52 0x00, 0x00, 0x00, 0xf3, 0xf4, 0x00, 0xf6, 0xf7, /* 0xf0-0xf7 */
53 0x00, 0x00, 0xf2, 0x00, 0xf4, 0xd4, 0x00, 0x00, /* 0xf0-0xff */
54 */ 0x0100 */
55 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xff */
56 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xff */
57 #endif /* NEED_TOMB */
58 */
59 static const unsigned char iso8859_2_page02[32] = {
60 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
61 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
62 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
63 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
64 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
65 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
66 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
67 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
68 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
71 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
72 */
73 static const unsigned char iso8859_2_page02[32] = {
74 0x00, 0x00, 0x00, 0xc0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
75 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
77 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
78 */
79 */
80 */
81 static int
82 iso8859_2_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
83 {
84 unsigned char c = 0;
85 if (wc < 0x00a0) {
86 *r = wc;
87 return 1;
88 }
89 else if (wc >= 0x00a0 && wc < 0x0180) {
90 c = iso8859_2_page00[wc-0x00a0];
91 else if (wc >= 0x02c0 && wc < 0x02e0) {
92 c = iso8859_2_page02[wc-0x02c0];
93 if (c != 0) {
94 *r = c;
95 return 1;
96 }
97 return RET_ILSEQ;
98 }
99 */
100 #endif /* NEED_TOMB *//*
ISO-8859-3

```c

/* ISO-8859-3 */

#define NEED_TOWC

static const unsigned short iso8859_3_2uni[96] = {
  / * 0xa0 */
  0x00a0, 0x0126, 0x02d8, 0x00a3, 0x00a4, 0xfffd, 0x0124, 0x00a7,
  / * 0xb0 */
  0x00b0, 0x0127, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x0125, 0x00b7,
  / * 0xc0 */
  0x00c0, 0x00c1, 0x00c2, 0xfffd, 0x00c4, 0x010a, 0x0108, 0x00c7,
  / * 0xd0 */
  0xfffd, 0x00d1, 0x00d2, 0x00d3, 0x00d4, 0x011c, 0x00d9, 0x00da,
  / * 0xe0 */
  0x00e0, 0x00e1, 0x00e2, 0xfffd, 0x00e4, 0x010b, 0x0109, 0x00e7,
  / * 0xf0 */
  0xfffd, 0x00f1, 0x00f2, 0x00f3, 0x00f4, 0x016c, 0x015c, 0x00df,
};

static int iso8859_3_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
  unsigned char c = *s;
  if (c < 0xa0) {
    *pwc = (ucs4_t) c;
    return 1;
  } else {
    unsigned short wc = iso8859_3_2uni[c-0xa0];
    if (wc != 0xfffd) {
      *pwc = (ucs4_t) wc;
      return 1;
    }
  }
  return RET_ILSEQ;
}

#define NEED_TOMB

static const unsigned char iso8859_3_page00[96] = {
  / * 0xa0-0xa7 */
  0xa0, 0x00, 0x00, 0xa3, 0x08, 0x00, 0x00, 0xa7, / * 0x00-0xa7 */
  0xa8, 0x00, 0x00, 0x00, 0xda, 0x00, 0x00, 0xa9, / * 0xa8-0xda */
  0xb0, 0x00, 0x00, 0x00, 0x0b, 0x00, 0x00, 0xb1, / * 0xb0-0x0b */
  0xb2, 0x00, 0x00, 0x00, 0x07, 0x00, 0x00, 0xb3, / * 0xb2-0x07 */
  0xb4, 0x00, 0x00, 0x00, 0x0c, 0x00, 0x00, 0xb5, / * 0xb4-0x0c */
  0xc6, 0x00, 0x00, 0x00, 0x0e, 0x00, 0x00, 0xc7, / * 0xc6-0x0e */
  0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, / * 0xc8-0xcf */
  0xd0, 0xda, 0xdb, 0xdc, 0xde, 0xdf, 0xdf, 0x00, / * 0xd0-0xdf */
  0xe0, 0xb1, 0xb2, 0x00, 0x04, 0x00, 0x0e, 0xe7, / * 0xe0-0xe7 */
  0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, / * 0xe8-0xef */
  0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0x00, 0xf6, 0xf7, / * 0xf0-0xf7 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
};

static const unsigned char iso8859_3_page01[120] = {
  / * 0x08-0x0f */
  0xc6, 0xe6, 0xc5, 0xe5, 0x00, 0x00, 0x00, 0x00, / * 0x08-0xe5 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
};

static const unsigned char iso8859_3_page02[8] = {
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x00-0x00 */
};

static int iso8859_3_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
```
86 {  
87 (void)conv; (void)n;  
88 unsigned char c = 0;  
89 if (wc < 0x00a0) {  
90 *r = wc;  
91 return 1;  
92 }  
93 else if (wc >= 0x00a0 && wc < 0x0100)  
94 c = iso8859_3_page00[wc-0x00a0];  
95 else if (wc >= 0x0108 && wc < 0x0180)  
96 c = iso8859_3_page01[wc-0x0108];  
97 else if (wc >= 0x02d8 && wc < 0x02e0)  
98 c = iso8859_3_page02[wc-0x02d8];  
99 if (c != 0) {  
100 *r = c;  
101 return 1;  
102 }  
103 return RET_ILSEQ;  
104 }  
105 #endif /* NEED_TOMB */
63 0xa2, 0x00, 0x00, 0xa6, 0xb6, 0x00, 0x00, 0x00, 0x00; /* 0x38-0x3f */
64 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd1, 0xf1; /* 0x40-0x47 */
65 0x00, 0x00, 0xb6, 0xbf, 0xd2, 0xf2, 0x00, 0x00; /* 0x48-0x4f */
66 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00; /* 0x50-0x57 */
67 0xa9, 0xb9, 0x00, 0x00, 0x00, 0x00, 0xac, 0xbc; /* 0x60-0x67 */
68 0xdd, 0xfd, 0xde, 0xfe, 0x00, 0x00, 0x00, 0x00; /* 0x68-0x6f */
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00; /* 0x70-0x77 */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00; /* 0x78-0x7f */
71};
72
73 static const unsigned char iso8859_4_page02[32] = {
74 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7 /* 0xc0-0xc7 */
75 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00 /* 0xc8-0xcf */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00 /* 0xd0-0xd7 */
77 0x00, 0x0f, 0x00, 0x0b, 0x00, 0x00, 0x00, 0x00 /* 0xd8-0xdf */
78};
79
80 static int
81 iso8859_4_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
82 {
83 (void)conv; (void)n;
84 unsigned char c = 0;
85 if (wc < 0x00a0) {
86 *r = wc;
87 return 1;
88 }
89 else if (wc >= 0x00a0 && wc < 0x0180)
90 c = iso8859_4_page00[wc-0x00a0];
91 else if (wc >= 0x02c0 && wc < 0x02e0)
92 c = iso8859_4_page02[wc-0x02c0];
93 if (c != 0) {
94 *r = c;
95 return 1;
96 }
97 return RET_ILSEQ;
98 }
99 #endif /* NEED_TOMB */
35.278 iso8859_5.h
2 /*
3 * ISO-8859-5
4 */
5
6 #ifdef NEED_TOWC
7 static const unsigned short iso8859_5_2uni[96] = {
8 / * 0xa0 */
9 0x00a0, 0x0401, 0x0402, 0x0403, 0x0404, 0x0405, 0x0406, 0x0407,
10 0x0408, 0x0409, 0x040a, 0x040b, 0x040c, 0x040d, 0x040e, 0x040f,
11 / * 0xb0 */
12 0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0416, 0x0417,
13 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e, 0x041f,
14 / * 0xc0 */
15 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426, 0x0427,
16 0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e, 0x042f,
17 / * 0xd0 */
18 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0436, 0x0437,
19 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e, 0x043f,
20 / * 0xe0 */
21 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446, 0x0447,
22 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e, 0x044f,
23 / * 0xf0 */
24 0x0450, 0x0451, 0x0452, 0x0453, 0x0454, 0x0455, 0x0456, 0x0457,
25 0x0458, 0x0459, 0x045a, 0x045b, 0x045c, 0x045d, 0x045e, 0x045f,
26 0x0460, 0x0461, 0x0462, 0x0463, 0x0464, 0x0465, 0x0466, 0x0467,
27};
28
29 static int
30 iso8859_5_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32 unsigned char c = *s;
33 if (c < 0xa0) {
34 *pwc = (ucs4_t) c;
35 }
36 else
37 *pwc = (ucs4_t) iso8859_5_2uni[c-0xa0];
38 return 1;
39 }
40 #endif /* NEED_TOWC */
41
42 #ifdef NEED_TOMB
43 static const unsigned char iso8859_5_page00[16] = {
44 0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00; /* 0xa0-0xa7 */
45 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x0d, 0x08; /* 0xa8-0xaf */
46};
47 */
48 Generated by Doxygen
static const unsigned char iso8859_5_page04[96] = {
    0x00, 0xa1, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, 0x10-0x17, 0x18-0x1f, 0x20-0x2f, 0x30-0x3f, 0x40-0x4f, 0x50-0x57, 0x58-0x5f, 0x60-0x6f, 0x70-0x7f,
}

static int iso8859_5_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
    (void)conv; (void)n;
    unsigned char c = 0;
    if (wc < 0x00a0) {
        *r = wc;
        return 1;
    }
    else if (wc >= 0x00a0 && wc < 0x00b0) { c = iso8859_5_page00[wc-0x00a0];
    else if (wc >= 0x0400 && wc < 0x0460) { c = iso8859_5_page04[wc-0x0400];
    else if (wc == 0x2116) { c = 0xf0;
    if (c != 0) {
        *r = c;
        return 1;
    }
    }
    else if (wc == 0x4567) { c = 0x2116;
    if (c != 0) {
        *r = c;
        return 1;
    }
    }
    return RET_ILSEQ;
}
};

static int iso8859_6_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
    (void)conv; (void)n;
    unsigned char c = 0;
    if (wc < 0x00a0) {
        *r = wc;
        return 1;
    }
    else if (wc >= 0x00a0 && wc < 0x00b0) { c = iso8859_6_2uni[wc-0x00a0];
    else if (wc >= 0x0400 && wc < 0x0460) { c = iso8859_6_2uni[wc-0x0400];
    else if (wc == 0x2116) { c = 0xf0;
    if (c != 0) {
        *r = c;
        return 1;
    }
    }
    else if (wc == 0x4567) { c = 0x2116;
    if (c != 0) {
        *r = c;
        return 1;
    }
    }
    return RET_ILSEQ;
}
};
#endif /* NEED_TOMB */

static const unsigned char iso8859_6_page00[16] = {
  0xa0, 0x00, 0x00, 0x00, 0x04, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
  0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
};

static const unsigned char iso8859_6_page06[80] = {
  0x00, 0x00, 0x00, 0x00, 0xac, 0x00, 0x00, 0x00, /* 0x08-0x0f */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
  0x00, 0x00, 0x00, 0x00, 0xb0, 0x00, 0x00, 0x00, /* 0x18-0x1f */
  0x00, 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, /* 0x20-0x27 */
  0x08, 0x09, 0x0a, 0x0b, 0x0c, 0x0d, 0x0e, 0x0f, /* 0x28-0x2f */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
};

int
iso8859_6_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
  (void)conv; (void)n;
  unsigned char c = 0;
  if (wc < 0x00a0) {
    *r = wc;
    return 1;
  }
  else if (wc >= 0x00a0 && wc < 0x00b0)
    c = iso8859_6_page00[wc-0x00a0];
  else if (wc >= 0x0608 && wc < 0x0658)
    c = iso8859_6_page06[wc-0x0608];
  else {
    return RET_ILSEQ;
  }
  return 1;
}
#endif /* NEED_TOMB */

static const unsigned short iso8859_7_2uni[96] = {
  0xa0, 0x00a0, 0x2018, 0x2019, 0x00a3, 0xfffd, 0xfffd, 0x00a6, 0x00a7, /* 0xa0 */
  0x00a8, 0x00a9, 0x00ab, 0x00ac, 0x00ad, 0x00af, /* 0x00b0 */
  0x00b1, 0x00b2, 0x00b3, 0x0384, 0x0385, 0x0386, 0x00b7, /* 0x0390 */
  0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397, /* 0x03a0 */
  0x03a1, 0x03a2, 0x03a3, 0x03a4, 0x03a5, 0x03a6, 0x03a7, /* 0x03b0 */
  0x03b1, 0x03b2, 0x03b3, 0x03b4, 0x03b5, 0x03b6, 0x03b7, /* 0x03c0 */
  0x03c1, 0x03c2, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7, /* 0x03d0 */
  0x03d1, 0x03d2, 0x03d3, 0x03d4, 0x03d5, 0x03d6, 0x03d7, /* 0x03e0 */
  0x03e1, 0x03e2, 0x03e3, 0x03e4, 0x03e5, 0x03e6, 0x03e7, /* 0x03f0 */
  0x03f1, 0x03f2, 0x03f3, 0x03f4, 0x03f5, 0x03f6, 0x03f7,
};

int
iso8859_7_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
  unsigned char c = *s;
  if (c < 0xa0) {
    *pwc = (ucs4_t) c;
    return 1;
  }
  else {
    unsigned short wc = iso8859_7_2uni[c-0xa0];
    if (wc != 0xfffd) {
      *pwc = (ucs4_t) wc;
      return 1;
    }
    return 0;
  }
}
#endif /* NEED_TOMB */
43 } 
44 return RET_ILSEQ;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifdef NEED_TOMB
49 static const unsigned char iso8859_7_page00[32] = {
50 0xa0, 0xa0, 0xa0, 0xa3, 0xa9, 0x00, 0xa6, 0xa7, / * 0xa0-0xa7 */
51 0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xa0, 0x00, / * 0xa8-0xaf */
52 0x0b, 0x0b, 0x0b, 0x00, 0x00, 0x0b, 0x00, / * 0x0b-0x0b */
53 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x0b-0x0b */
54 };
55 static const unsigned char iso8859_7_page03[80] = {
56 0x00, 0x00, 0x00, 0x00, 0xb4, 0xb5, 0xb6, 0x00, / * 0x80-0x87 */
57 0xb8, 0xb9, 0xba, 0x00, 0xbc, 0x00, 0xbe, 0xbf, / * 0x88-0x8f */
58 0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, / * 0x90-0x97 */
59 0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, / * 0x98-0x9f */
60 0xd0, 0xd1, 0xd2, 0xd3, 0xda, 0xdb, 0xda, 0xda, / * 0xa0-0xad */
61 0xda, 0xda, 0xda, 0xda, 0xda, 0xda, 0xda, 0xda, / * 0xa0-0xad */
62 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, / * 0xb0-0xb7 */
63 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, / * 0xb8-0xbf */
64 0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, / * 0xc0-0xc7 */
65 0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0x00, / * 0xc8-0xcf */
66 };
67 static const unsigned char iso8859_7_page20[16] = {
68 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x10-0x1f */
69 0x0a, 0x0b, 0x0c, 0x0d, 0x0e, 0x0f, 0x00, 0x00, / * 0x10-0x1f */
70 };}
71
72 static int
73 iso8859_7_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
74 {
75 (void)conv; (void)n;
76 unsigned char c = 0;
77 if (wc < 0x00a0) {
78 *r = wc;
79 return 1;
80 }
81 else if (wc >= 0x00a0 && wc < 0x00c0)
82 c = iso8859_7_page00[wc-0x00a0];
83 else if (wc >= 0x0380 && wc < 0x03d0)
84 c = iso8859_7_page03[wc-0x0380];
85 else if (wc >= 0x2010 && wc < 0x2020)
86 c = iso8859_7_page20[wc-0x2010];
87 if (c != 0) {
88 *r = c;
89 return 1;
90 }
91 return RET_ILSEQ;
92 }
93

35.281 iso8859_8.h

2
3 */
4 /* ISO-8859-8 */
5 */
6 #ifdef NEED_TOMB
7 static const unsigned short iso8859_8_2uni[96] = {
8 / * 0xa0 */
9 0x00a0, 0xfffd, 0x00a2, 0x00a3, 0x00a4, 0x00a5, 0x00a6, 0x00a7, /* 0xa0 */
10 0x00a8, 0x00a9, 0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x00b6, 0x00b7, /* 0x0b-0xb7 */
11 0x00b8, 0x00b9, 0x00bc, 0x00bf, 0x00c0, 0x00c1, 0x00c2, 0x00c3, 0x00c4, 0x00c5, 0x00c6, 0x00c7, /* 0x0b-0xb7 */
12 0x00c8, 0x00c9, 0x00da, 0x00db, 0x00dc, 0x00dd, 0x00de, 0x00df, / * 0xa0-0xad */
13 /* 0xb0 */
14 0x05d0, 0x05d1, 0x05d2, 0x05d3, 0x05d4, 0x05d5, 0x05d6, 0x05d7, /* 0xb0-0xb7 */
15 0x05d8, 0x05d9, 0x05da, 0x05db, 0x05dc, 0x05dd, 0x05de, 0x05df, /* 0xb0-0xb7 */
16 0x05e0, 0x05e1, 0x05e2, 0x05e3, 0x05e4, 0x05e5, 0x05e6, 0x05e7, /* 0xb8-0xbf */
17 0x05e8, 0x05e9, 0x05ea, 0x05eb, 0x05ec, 0x05ed, 0x05ee, 0x05ef, /* 0xb8-0xbf */
18 0x05f0, 0x05f1, 0x05f2, 0x05f3, 0x05f4, 0x05f5, 0x05f6, 0x05f7, / * 0xc0-0xc7 */
19 0x05f8, 0x05f9, 0x05fa, 0x05fb, 0x05fc, 0x05fd, 0x05fe, 0x00, / * 0xc8-0xcf */
20 };
21
22 static int
23 iso8859_8_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
24 { (void)conv; (void)n;
25 unsigned char c = 0;
26 if (w < 0x00a0) {
27 *r = w;
28 return 1;
29 }
30 else if (w >= 0x00a0 && w < 0x00c0)
31 c = iso8859_8_page00[w-0x00a0];
32 else if (w >= 0x0380 && w < 0x03d0)
33 c = iso8859_8_page03[w-0x0380];
34 else if (w >= 0x2010 && w < 0x2020)
35 c = iso8859_8_page20[w-0x2010];
36 if (c != 0) {
37 *r = c;
38 return 1;
39 }
40 return RET_ILSEQ;
41 }
42
43 */
44 #endif /* NEED_TOMB */
32 unsigned char c = *s;
33 if (c >= 0xa0) {
34 unsigned short wc = iso8859_8_2uni[c-0xa0];
35 if (wc != 0xfffd) {
36 *pwc = (ucs4_t) wc;
37 return 1;
38 }
39 }
40 else {
41 *pwc = (ucs4_t) c;
42 return 1;
43 }
44 return RET_ILSEQ;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifdef NEED_TOMB
49 static const unsigned char iso8859_8_page00[88] = {
50 0xa0, 0x00, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0xa0-0xa7 */
51 0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
52 0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
53 0xb8, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0x00, /* 0xb8-0xbf */
54 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
55 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
56 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xdf */
57 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
58 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xff */
59 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x1f */
60 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xff-0xff */
61};
62 static const unsigned char iso8859_8_page05[32] = {
63 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xfd, 0xfe, /* 0x08-0x0f */
64 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x10, 0x17, /* 0x10-0x17 */
65 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0xff */
66 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
67};
68 static const unsigned char iso8859_8_page20[16] = {
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0xff */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x1f */
71};
72
73 static int
74 iso8859_8_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
75 {
76 (void)conv; (void)n;
77 unsigned char c = 0;
78 if (wc < 0x00a0) {
79 *r = wc;
80 return 1;
81 }
82 else if (wc >= 0x00a0 && wc < 0x00f8)
83 c = iso8859_8_page00[wc-0x00a0];
84 else if (wc >= 0x00a0 && wc < 0x05f0)
85 c = iso8859_8_page05[wc-0x05d0];
86 else if (wc >= 0x2008 && wc < 0x2fa8)
87 c = iso8859_8_page20[wc-0x2008];
88 if (c != 0) {
89 *r = c;
90 return 1;
91 }
92 return RET_ILSEQ;
93 }
94 #endif /* NEED_TOMB */

35.282 iso8859_9.h

2
3 */
4 * ISO-8859-9
5 */
6
7 #ifdef NEED_TOMB
8 static const unsigned short iso8859_9_2uni[48] = {
9 /* 0xa0 */
10 0x011e, 0x00d1, 0x00d2, 0x00d3, 0x00d4, 0x00d5, 0x00d6, 0x00d7,
11 0x00d8, 0x00d9, 0x00da, 0x00db, 0x00dc, 0x0130, 0x015e, 0x00df,
12 /* 0xb0 */
13 0x00e0, 0x00e1, 0x00e2, 0x00e3, 0x00e4, 0x00e5, 0x00e6, 0x00e7,
14 0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x00ec, 0x00ed, 0x00ee, 0x00ef,
15 /* 0xe0 */
16 0x00f0, 0x00f1, 0x00f2, 0x00f3, 0x00f4, 0x00f5, 0x00f6, 0x00f7,
17 0x00f8, 0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x0131, 0x015f, 0x00ff,
18 */
19
20 */
21 Generated by Doxygen
20 static int
21 iso8859_9_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
22 {
23 unsigned char c = *s;
24 if (c >= 0xd0)
25 *pwc = (ucs4_t) iso8859_9_2uni[c-0xd0];
26 else
27 *pwc = (ucs4_t) c;
28 return 1;
29 }
30 #endif /* NEED_TOWC */
31
32 #ifdef NEED_TOMB
33 static const unsigned char iso8859_9_page00[48] = {
34 0x00, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0xd0-0xd7 */
35 0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0x00, 0x00, 0xdf, /* 0xd8-0xdf */
36 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xe0-0xe7 */
37 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
38 0xe0, 0xef, 0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, /* 0xf0-0xf7 */
39 0xf6, 0xf7, 0xfe, 0xff, 0x00, 0xf8, 0xf9, 0xff, /* 0xf8-0xff */
40};
41 static const unsigned char iso8859_9_page01[72] = {
42 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x18, 0x1f, /* 0x18-0x1f */
43 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x20, 0x27, /* 0x20-0x27 */
44 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
45 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
46 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
47 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
48 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
49 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
50 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xde, 0xfe, /* 0x58-0x5f */
51};
52
53 static int
54 iso8859_9_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
55 {
56 (void)conv; (void)n;
57 unsigned char c = 0;
58 if (wc < 0x00d0) {
59 *r = wc;
60 return 1;
61 }
62 else if ((wc >= 0x00d0 && wc < 0x0100) ||
63 c - iso8859_9_page00[wc-0x00d0];
64 else if ((wc >= 0x0118 && wc < 0x0160) ||
65 c - iso8859_9_page01[wc-0x0118];
66 if (c == 0) {
67 *r = c
68 return 1;
69 }
70 return RET_ILSEQ;
71 }
72 #endif /* NEED_TOMB */
30 {
31 unsigned char c = *s;
32 if (c >= 0xa0)
33 *pwc = (ucs4_t) iso8859_9e_2uni[c-0xa0];
34 else
35 *pwc = (ucs4_t) c;
36 return 1;
37 }
38
39 static const unsigned char iso8859_9e_page00[96] = {
40 0xa0, 0x00, 0xa2, 0xa3, 0x00, 0xa5, 0x00, 0xa7, /* 0xa0-0xa7 */
41 0x00, 0xa9, 0x00, 0xb2, 0xb3, 0xb4, 0xb5, 0xb7, /* 0xb0-0xb7 */
42 0x00, 0xb9, 0x00, 0xbb, 0x00, 0xbd, 0x00, 0xbf, /* xbf */
43 0x00, 0xc1, 0x00, 0xc3, 0xc4, 0xc5, 0xc7, 0x00, /* xcf */
44 0x00, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* xcf */
45 0x00, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* xcf */
46 0x00, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe7, /* 0xe0-0xe7 */
47 0x00, 0xef, 0xef, 0xef, 0xef, /* 0xe8-0xef */
48 0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf0, /* 0xf0-0xf7 */
49 0x00, 0xf9, 0x00, 0xfb, 0xfc, 0xf7, 0x00, 0xff, /* 0xf8-0xff */
50
51 static const unsigned char iso8859_9e_page01[136] = {
52 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd0, 0xf0, /* 0x18-0x1f */
53 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x20, 0x27, /* 0x20-0x27 */
54 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa6, 0xb6, /* 0x28-0x2f */
55 0xdd, 0xfd, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
56 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
57 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x4f */
58 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
59 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
60 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x6f */
61 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
62 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
63 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
64 0x00, 0x00, 0x00, 0x00, 0xa8, 0xb8, 0x00, 0x00, /* 0x88-0x8f */
65 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
66 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, 0xe8, /* 0x98-0x9f */
67 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0x9f */
68 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xff */
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xff */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xff */
71 }
72 static const unsigned char iso8859_9e_page01_d[24] = {
73 0x00, 0xaf, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
74 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
75 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
77 }
78
79 static int
80 iso8859_9e_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
81 {  
82 unsigned char c = 0;
83 if (wc < 0x00a0) {
84 *r = wc;
85 return 1;
86 }
87 }  
88
89 else if (wc >= 0x00a0 && wc < 0x0100)
90 c = iso8859_9e_page00[wc-0x00a0];
91 else if (wc >= 0x0118 && wc < 0x01a0)
92 c = iso8859_9e_page01[wc-0x0118];
93 else if (wc >= 0x01d0 && wc < 0x01e8)
94 c = iso8859_9e_page01_d[wc-0x01d0];
95 else if (wc == 0x0259)
96 c = 0xe6;
97 else if (wc == 0x0275)
98 c = 0xf8;
99 else if (wc == 0x20ac)
100 c = 0xa4;
101 if (c != 0) {
102 *r = c;
103 return 1;
104 }  
105 }  
106 else return RET_ILSEQ;
107 
108 }
109
110 static int
111 jisx0201_tconv (conv_t conv, unsigned char *r, ucs4_t wc, int n)
112 {  
113 unsigned char c = 0;
114 if (wc <= 0x7f) {
115 }  
116 else if (wc <= 0x7f) {
117 c = iso8859_9e_page00[wc-0x00a0];
118 else if (wc <= 0x7f) {
119 c = iso8859_9e_page01[wc-0x0118];
120 else if (wc <= 0x7f) {
121 c = iso8859_9e_page01_d[wc-0x01d0];
122 else if (wc == 0x0259)
123 c = 0xe6;
124 else if (wc == 0x0275)
125 c = 0xf8;
126 else if (wc == 0x20ac)
127 c = 0xa4;
128 if (c != 0) {
129 *r = c;
130 return 1;
131 }  
132 }  
133 else return RET_ILSEQ;
134 
135 #endif
136 #endif

35.284 jisx0201.h
1 /* SXFree86: xc:/lib/X11/1cUniConv/jisx0201.h,v 1.3 2000/11/29 17:40:33 dawes Exp $ */
2 3 /*
4 * JISX0201.1976-0
5 */
6 static int
7
8
jisx0201_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
10 {  
11 unsigned char c = *s;  
12 if (c < 0x80) {  
13 if (c == 0x5c)  
14 *pwc = (ucs4_t) 0x00a5;  
15 else if (c == 0x7e)  
16 *pwc = (ucs4_t) 0x203e;  
17 else  
18 *pwc = (ucs4_t) c;  
19 return 1;  
20 } else {  
21 if (c >= 0xa1 && c < 0xe0) {  
22 *pwc = (ucs4_t) c + 0xfec0;  
23 return 1;  
24 }  
25 }  
26 return RET_ILSEQ;  
27 }  
28 #endif /* NEED_TOWC */  
29 
30 #ifdef NEED_TOMB  
31 
32 static int  
33 jisx0201_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)  
34 {  
35 (void)conv; (void)n;  
36 if (wc < 0x0080 && !(wc == 0x005c || wc == 0x007e)) {  
37 *r = wc;  
38 return 1;  
39 }  
40 if (wc == 0x00a5) {  
41 *r = 0x5c;  
42 return 1;  
43 }  
44 if (wc == 0x203e) {  
45 *r = 0x7e;  
46 return 1;  
47 }  
48 if (wc >= 0xff61 && wc < 0xffa0) {  
49 *r = wc - 0xfec0;  
50 return 1;  
51 }  
52 return RET_ILSEQ;  
53 }  
54 #endif /* NEED_TOMB */

jisx0208.h

static const unsigned short jisx2082_2uni_page21[690] = {
9 /* 0x21 */
10 0x3000, 0x3001, 0x3002, 0xff0c, 0xff0a, 0x30fb, 0xff1a, 0xff1b,
11 0xff1f, 0xff01, 0x309b, 0x309c, 0x00b4, 0xff40, 0x00a8, 0xff3e,
12 0xffe3, 0xff3f, 0x30fd, 0x30fe, 0x309d, 0x309e, 0x3003, 0x4edd,
13 0x3005, 0x3006, 0x3007, 0x30fc, 0x2015, 0x2010, 0xff0f, 0xff3c,
14 0x301c, 0x2016, 0xff5c, 0x2026, 0x2025, 0x2018, 0x2019, 0x201c,
15 0x201d, 0xff09, 0x3014, 0x3015, 0xff3b, 0xff3d, 0xff5b,
16 0xfffd, 0x3008, 0x3009, 0x300a, 0x300b, 0x300d, 0x300e,
17 0x300f, 0x3010, 0x3011, 0xff0b, 0x2212, 0x00b1, 0x00d7, 0x00f7,
18 0xfffd, 0x2260, 0xfffc, 0x2264, 0x2265, 0x2266, 0x2267, 0x2268,
19 0x2269, 0x226a, 0x226b, 0x226c, 0x226d, 0x226e, 0x226f, 0x2270,
20 0x2271, 0x2272, 0x2273, 0x2274, 0x2275, 0x2276, 0x2277, 0x2278,
21 0x2279, 0x227a, 0x227b, 0x227c, 0x227d, 0x227e, 0x227f, 0x2280,
22 0x2281, 0x2282, 0x2283, 0x2284, 0x2285, 0x2286, 0x2287, 0x2288,
23 0x2289, 0x228a, 0x228b, 0x228c, 0x228d, 0x228e, 0x228f, 0x2290,
24 0x2291, 0x2292, 0x2293, 0x2294, 0x2295, 0x2296, 0x2297, 0x2298,
25 0x2299, 0x229a, 0x229b, 0x229c, 0x229d, 0x229e, 0x229f, 0x22a0,
26 0x22a1, 0x22a2, 0x22a3, 0x22a4, 0x22a5, 0x22a6, 0x22a7, 0x22a8,
27 0x22a9, 0x22aa, 0x22ab, 0x22ac, 0x22ad, 0x22ae, 0x22af, 0x22b0,
28 0x22b1, 0x22b2, 0x22b3, 0x22b4, 0x22b5, 0x22b6, 0x22b7, 0x22b8,
29 0x22b9, 0x22ba, 0x22bb, 0x22bc, 0x22bd, 0x22be, 0x22bf, 0x22c0,
30 0x22c1, 0x22c2, 0x22c3, 0x22c4, 0x22c5, 0x22c6, 0x22c7, 0x22c8,
31 0x22c9, 0x22ca, 0x22cb, 0x22cc, 0x22cd, 0x22ce, 0x22cf, 0x22d0,
32 0x22d1, 0x22d2, 0x22d3, 0x22d4, 0x22d5, 0x22d6, 0x22d7, 0x22d8,
33 0x22d9, 0x22da, 0x22db, 0x22dc, 0x22dd, 0x22de, 0x22df, 0x22e0,
34 0x22e1, 0x22e2, 0x22e3, 0x22e4, 0x22e5, 0x22e6, 0x22e7, 0x22e8,
35 /* 0x23 */
36 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
```c
994 static int
995 jisx0208_mb2wchar (conv_t conv,ucs4_t *pwc, const unsigned char *s, int n)
996 {
997     unsigned char c1 = (s[0] & 0xFF);
998     if ((c1 > 0x21 && c1 <= 0x28) || (c1 > 0x30 && c1 <= 0x47)) {
999         if (n >= 2) {
1000             unsigned char c2 = (s[1] & 0xFF);
1001             if (c2 > 0x21 && c2 < 0x7F) {
1002                 unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
1003                 unsigned short wc = 0xfffd;
1004                 if (i < 1410) {
1005                     if (i < 690) {
1006                         wc = jisx0208_2uni_page21[i];
1007                     } else {
1008                         if (i < 7808) {
1009                             wc = jisx0208_2uni_page30[i-1410];
1010                         } else {
1011                             if (wc != 0xfffd) {
1012                                 *pwc = (ucs4_t) wc;
1013                                 return 2;
1014                             } else {
1015                                 return RET_ILSEQ;
1016                             }
1017                         }
1018                     }
1019                     return RET_TOOFEW(0);
1020                 }
1021             } else {
1022                 return RET_ILSEQ;
1023             }
1024         }
1025     }
1026     return RET_TOOFEW(0);
1027 }
1028
```

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static int
File Documentation

unsigned short c;

else if (wc < 0x0100) {
    if (n >= 2) {
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2386  /* Keep in 'used' only the bits 0..i-1. */
2387  used &= ((unsigned short) 1 << i) - 1;
2388  /* Add 'summary->indx' and the number of bits set in 'used'. */
2389  used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
2390  used = (used & 0x3333) + ((used & 0xcccc) >> 2);
2391  used = (used & 0x0f0f) + ((used & 0xf0f0) >> 4);
2392  used = (used & 0x00ff) + (used >> 8);
2393  c = jisx0208_2charset[summary->indx + used];
2394  r[0] = (c >> 8); r[1] = (c & 0xff);
2395  return 2;
2396 }
2397 }
2398 return RET_ILSEQ;
2399 }
2400 return RET_TOOSMALL;
2401 }
2402 }
2403 #endif /* NEED_TOMB */
35.286 jisx0212.h
1 /* $XFree86: xc/lib/X11/lcUniConv/jisx0212.h,v 1.5 2003/05/27 22:26:31 tsi Exp $ */
2
3 /* JISX0212.1990-0 */
4 #ifdef NEED_TOWC
5
6 static const unsigned short jisx0212_2uni_page22[81] = {
7 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
8 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0x02d8, 0x02c7, 0x00b8, 0x02d9, 0x02dd,
9 0x00af, 0x02db, 0x02da, 0x007e, 0x0384, 0x0385, 0xfffd, 0xfffd, 0xfffd,
10 0xfffd, 0x00a1, 0x00a6, 0x00bf, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
11 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
12 0xfffd, 0xfffd, 0x00ba, 0x00aa, 0x00a9, 0x00ae, 0x2122, 0x00a4, 0x2116,
13 };
static int
jisx0212_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
    unsigned char c1 = (s[0] & 0x7F);
    if ((c1 == 0x22) || (c1 >= 0x26 && c1 <= 0x27) || (c1 >= 0x30 && c1 <= 0x6d)) {
        if (n >= 2) {
            unsigned char c2 = (s[1] & 0x7F);
            if (c2 >= 0x21 && c2 < 0x7f) {
                unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
                unsigned short wc = 0xfffd;
                if (i < 470) {
                    if (i < 175)
                        wc = jisx0212_2uni_page22[i-94];
                    else if (i < 752)
                        wc = jisx0212_2uni_page26[i-470];
                    else if (i < 1410)
                        wc = jisx0212_2uni_page29[i-752];
                    else
                        wc = jisx0212_2uni_page30[i-1410];
                }
                if (wc != 0xfffd) {
                    *pwc = (ucs4_t) wc;
                    return 2;
                }
            }
        }
    }
    return RET_ILSEQ;
}
static const Summary16 jisx0212_uni2indx_page4e[1307] = {
    ...}

static const Summary16 jisx0212_uni2indx_page21[3] = {
    ...}

...
static int
jisx0212_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
(void)conv;
if (n >= 2) {
    const Summary16 *summary = NULL;
    if (wc < 0x0460)
        summary = &jisx0212_uni2indx_page00[(wc»4)];
    else if (wc >= 0x2100 && wc < 0x2130)
        summary = &jisx0212_uni2indx_page21[(wc»4)-0x210];
    else if (wc >= 0x4e00 && wc < 0x9fb0)
        summary = &jisx0212_uni2indx_page4e[(wc»4)-0x4e0];
    if (summary) {
        unsigned short used = summary->used;
        unsigned int i = wc & 0x0f;
        if (used & ((unsigned short) 1 « i)) {
            unsigned short c;
            Generated by Doxygen


used &= ((unsigned short) 1 << i) - 1;
/* Add 'summary->indx' and the number of bits set in 'used'. */
used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
used = (used & 0x3333) + ((used & 0xcccc) >> 2);
used = (used & 0x0f0f) + (used >> 4);
used = (used & 0x00ff) + (used >> 8);
c = jisx0212_2charset[summary->indx + used];
r[0] = (c >> 8); r[1] = (c & 0xff);
return 2;
}
return RET_ILSEQ;
return RET_TOOSMALL;
#endif /* NEED_TOMB */
static int
koi8_c_wc2mb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    unsigned char c = 0;
    if (wc < 0x0080) {
        *r = wc;
        return 1;
    }
    else if (wc >= 0x00a0 && wc < 0x00a1)
        c = koi8_c_page00[wc-0x00a0];
    else if (wc >= 0x0400 && wc < 0x04ef)
        c = koi8_c_page04[wc-0x0400];
    else if (wc >= 0x2216 && wc < 0x2217)
        c = koi8_c_page22[wc-0x2216];
    if (c != 0) {
        *r = c;
        return 1;
    }
    return RET_ILSEQ;
}
return 1;
} else if (wc >= 0x0080) {
    c = koi8_r_page23[wc-0x2320];
}
else if (wc >= 0x0080) {
    c = koi8_r_page22[wc-0x20];
}
else if (wc >= 0x0080) {
    c = koi8_r_page21[wc-0x10];
}
else if (wc >= 0x0080) {
    c = koi8_r_page20[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page19[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page18[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page17[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page16[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page15[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page14[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page13[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page12[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page11[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page10[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page09[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page08[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page07[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page06[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page05[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page04[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page03[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page02[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page01[wc-0x00];
}
else if (wc >= 0x0080) {
    c = koi8_r_page00[wc-0x00];
}
else
    *r = wc;
else
    return 1;
else if (wc >= 0x2500 && wc < 0x25a8)
    c = koi8_r_page25[wc-0x2500];
else if (c != 0) {
    *r = c;
    return 1;
}
return RET_ILSEQ;
#endif /* NEED_TOMB */

static const unsigned short koi8_u_2uni[128] = {
    /* 0x80 */
    0x2500, 0x2502, 0x250c, 0x2510, 0x2514, 0x2518, 0x251c, 0x2524,
    0x252c, 0x2534, 0x253c, 0x2580, 0x2584, 0x2588, 0x258c, 0x2590,
    /* 0x90 */
    0x2591, 0x2592, 0x2593, 0x2320, 0x25a0, 0x2219, 0x221a, 0x2248,
    0x2264, 0x2265, 0x00a0, 0x2321, 0x00b0, 0x00b2, 0x00b7, 0x00f7,
    /* 0xa0 */
    0x2550, 0x2551, 0x2552, 0x0451, 0x0454, 0x2554, 0x0456, 0x0457,
    /* 0xb0 */
    0x2558, 0x2559, 0x255a, 0x255b, 0x0490, 0x255d, 0x255e, 0x00a9,
    /* 0xc0 */
    0x044e, 0x0430, 0x0431, 0x0446, 0x0434, 0x0435, 0x0444, 0x0433,
    /* 0xd0 */
    0x043f, 0x044f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445,
    /* 0xe0 */
    0x041f, 0x042f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425,
    /* 0xf0 */
    0x041f, 0x042f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425,
};

static int koi8_u_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n){
    unsigned char c = *s;
    if (c < 0x80)
        *pwc = (ucs4_t) c;
    else
        *pwc = (ucs4_t) koi8_u_2uni[c-0x80];
    return 1;
}

static const unsigned char koi8_u_page00[88] = {
    0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
    0xb4, 0xb5, 0xb6, 0xb7, 0xb8, 0xb9, 0xba, 0xbb, /* 0xb0-0xbf */
    0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xda, /* 0xc0-0xd7 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xf7 */
};

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74
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
75
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
76
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
77
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
78
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
79
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
80
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
81
0xbd, 0xad, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
82 };
83 static const unsigned char koi8_u_page22[80] = {
84
0x00, 0x95, 0x96, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
85
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
86
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
87
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
88
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
89
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
90
0x97, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
91
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
92
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
93
0x00, 0x00, 0x00, 0x00, 0x98, 0x99, 0x00, 0x00, /* 0x60-0x67 */
94 };
95 static const unsigned char koi8_u_page23[8] = {
96
0x93, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
97 };
98 static const unsigned char koi8_u_page25[168] = {
99
0x80, 0x00, 0x81, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
100
0x00, 0x00, 0x00, 0x00, 0x82, 0x00, 0x00, 0x00, /* 0x08-0x0f */
101
0x83, 0x00, 0x00, 0x00, 0x84, 0x00, 0x00, 0x00, /* 0x10-0x17 */
102
0x85, 0x00, 0x00, 0x00, 0x86, 0x00, 0x00, 0x00, /* 0x18-0x1f */
103
0x00, 0x00, 0x00, 0x00, 0x87, 0x00, 0x00, 0x00, /* 0x20-0x27 */
104
0x00, 0x00, 0x00, 0x00, 0x88, 0x00, 0x00, 0x00, /* 0x28-0x2f */
105
0x00, 0x00, 0x00, 0x00, 0x89, 0x00, 0x00, 0x00, /* 0x30-0x37 */
106
0x00, 0x00, 0x00, 0x00, 0x8a, 0x00, 0x00, 0x00, /* 0x38-0x3f */
107
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
108
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
109
0xa0, 0xa1, 0xa2, 0x00, 0xa5, 0x00, 0x00, 0xa8, /* 0x50-0x57 */
110
0xa9, 0xaa, 0xab, 0xac, 0x00, 0xae, 0xaf, 0xb0, /* 0x58-0x5f */
111
0xb1, 0xb2, 0x00, 0xb5, 0x00, 0x00, 0xb8, 0xb9, /* 0x60-0x67 */
112
0xba, 0xbb, 0xbc, 0x00, 0xbe, 0x00, 0x00, 0x00, /* 0x68-0x6f */
113
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
114
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
115
0x8b, 0x00, 0x00, 0x00, 0x8c, 0x00, 0x00, 0x00, /* 0x80-0x87 */
116
0x8d, 0x00, 0x00, 0x00, 0x8e, 0x00, 0x00, 0x00, /* 0x88-0x8f */
117
0x8f, 0x90, 0x91, 0x92, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
118
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
119
0x94, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
120 };
121
122 static int
123 koi8_u_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
124 {
125
(void)conv; (void)n;
126
unsigned char c = 0;
127
if (wc < 0x0080) {
128
*r = wc;
129
return 1;
130
}
131
else if (wc >= 0x00a0 && wc < 0x00f8)
132
c = koi8_u_page00[wc-0x00a0];
133
else if (wc >= 0x0400 && wc < 0x0498)
134
c = koi8_u_page04[wc-0x0400];
135
else if (wc >= 0x2218 && wc < 0x2268)
136
c = koi8_u_page22[wc-0x2218];
137
else if (wc >= 0x2320 && wc < 0x2328)
138
c = koi8_u_page23[wc-0x2320];
139
else if (wc >= 0x2500 && wc < 0x25a8)
140
c = koi8_u_page25[wc-0x2500];
141
if (c != 0) {
142
*r = c;
143
return 1;
144
}
145
return RET_ILSEQ;
146 }
147 #endif /* NEED_TOMB */

35.290
1
2
3
4
5
6
7
8

ksc5601.h

/* $XFree86:

xc/lib/X11/lcUniConv/ksc5601.h,v 1.5 2003/05/27 22:26:34 tsi Exp $ */

/*
* KSC5601.1987-0
*/
#ifdef NEED_TOWC
static const unsigned short ksc5601_2uni_page21[1115] = {
/* 0x21 */

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static const Summary16 ksc5601_uni2indx_page00[70] = {
};
static const Summary16 ksc5601_uni2indx_page20[103] = {

static const Summary16 ksc5601_uni2indx_page4e[1306] = {
    0x4e00,'/'
}

static const Summary16 ksc5601_uni2indx_page30[62] = {
    0x3000,'/'
}

static const Summary16 ksc5601_uni2indx_page3[62] = {
    0x2300,'/'
}

static const Summary16 ksc5601_uni2indx_page2[62] = {
    0x2200,'/'
}

static const Summary16 ksc5601_uni2indx_page1[62] = {
    0x2100,'/'
}

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static const Summary16 ksc5601_uni2indx_pagedc[698] = {
  
};


29100 File Documentation

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2967 ksc5601_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)  
2968 {  
2969   (void)conv;  
2970   if (n == 2) {  
2971     const Summary16 *summary = NULL;  
2972     if (wc < 0x0460)  
2973       summary = &ksc5601_uni2indx_page00[(wc»4)];  
2974     else if (wc >= 0x2000 && wc < 0x2670)  
2975       summary = &ksc5601_uni2indx_page20[(wc»4)-0x200];  
2976     else if (wc >= 0x3000 && wc < 0x33e0)  
2977       summary = &ksc5601_uni2indx_page30[(wc»4)-0x300];  
2978     else if (wc >= 0x4e00 && wc < 0x9fa0)  
2979       summary = &ksc5601_uni2indx_page4e[(wc»4)-0x4e0];  
2980     else if (wc >= 0xac00 && wc < 0xd7a0)  
2981       summary = &ksc5601_uni2indx_pageac[(wc»4)-0xac0];  
2982     else if (wc >= 0xf900 && wc < 0xfa10)  
2983       summary = &ksc5601_uni2indx_pagef9[(wc»4)-0xf90];  
2984     else if (wc >= 0xff00 && wc < 0xfff0)  
2985       summary = &ksc5601_uni2indx_pageff[(wc»4)-0xfff];  
2986     if (summary) {  
2987       unsigned short used = summary->used;  
2988       unsigned int i = wc & 0x0f;  
2989       if (used & (unsigned short) 1 « i)) {  
2990         unsigned short c;  
2991         /* Keep in 'used' only the bits 0..i-1. */  
2992         used &= ((unsigned short) 1 « i) - 1;  
2993         /* Add 'summary->indx' and the number of bits set in 'used'. */  
2994         used = (used & 0x3333) + ((used & 0xc000) » 2);  
2995         used = (used & 0xaaaa) + (used & 0x5555) + 1;  
2996         used = (used & 0x0f0f) + (used & 0x0f0f) + 4;  
2997         c = ksc5601_2charset[summary->indx + used];  
2998         r[0] = (c » 8); r[1] = (c & 0xff);  
2999         return 2;  
3000       }  
3001     }  
3002   }  
3003   return RET_ILSEQ;  
3004 }  
3005 return RET_TOOSMALL;  
3006 }  
3007 #endif /* NEED_TOMB */

35.291 mulelao.h

2 */
3 /*
4 * MULELAO-1
5 */
6
7 static const unsigned short mulelao_2uni[96] = {
8   /* 0xa0 */
9   0x00a0, 0x0e81, 0x0e82, 0xfffd, 0x0e84, 0xfffd, 0x0e87,
10   0x0e88, 0x0e89, 0x0e8a, 0x0e8b, 0x0e8c, 0x0e8d, 0x0e8e, 0x0e8f,
11   /* 0xb0 */
12   0x0e90, 0x0e91, 0x0e92, 0x0e93, 0x0e94, 0x0e95, 0x0e96, 0x0e97,
13   0x0e98, 0x0e99, 0x0e9a, 0x0e9b, 0x0e9c, 0x0e9d, 0x0e9e, 0x0e9f,
14   /* 0xc0 */
15   0x0ea0, 0x0ea1, 0x0ea2, 0x0ea3, 0x0ea4, 0x0ea5, 0xfffd, 0x0ea7,
16   0x0ea8, 0x0ea9, 0x0eab, 0x0ead, 0x0eaf, 0x0eb0,
17   /* 0xd0 */
18   0x0eb1, 0x0eb2, 0x0eb3, 0x0eb4, 0x0eb5, 0x0eb6, 0x0eb7,
19   0x0eb8, 0x0eb9, 0x0eab, 0x0eac, 0x0ebd, 0x0ebe, 0x0ebf, 0x0ec0,
20   /* 0xe0 */
21   0x0ec1, 0x0ec2, 0x0ec3, 0x0ec4, 0xfffd, 0x0ec6, 0xfffd, 0x0ec8,
22   0x0ec9, 0x0eca, 0x0ecb, 0x0ecc, 0x0ecd, 0x0ecf, 0xfffd, 0xfffd,
23   /* 0xf0 */
24   0x0ed0, 0x0ed1, 0x0ed2, 0x0ed3, 0x0ed4, 0x0ed5, 0x0ed6, 0x0ed7,
25   0x0ed8, 0x0ed9, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
26   */
27
28 static int
29 mulelao_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
30 {  
30 31   unsigned char c = *s;  
30 32   if (c < 0xa0) {  
30 33     *pwc = (ucs4_t) c;  
30 34     return 1;  
30 35   }  
30 36   else {  
30 37     unsigned short wc = mulelao_2uni[c-0xa0];  
30 38     if (wc != 0xfffd) {  
30 39       *pwc = (ucs4_t) wc;  
30 40       return 1;  
30 41     }  

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42 }
43  return RET_ILSEQ;
44 }
45
46 static const unsigned char mulelao_page0e[96] = {
47  0x00, 0xa1, 0xa2, 0x00, 0xa4, 0x00, 0x0a, / * 0x80-0x87 */
48  0xa8, 0x00, 0xaa, 0x00, 0x0b, / * 0x88-0x8f */
49  0x00, 0x00, 0x00, 0x00, 0xb4, 0xb5, 0xb6, 0xb7, / * 0x90-0x97 */
50  0x00, 0xb9, 0xba, 0xbb, 0xc0, 0xc1, 0xc2, / * 0x98-0x9f */
51  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xa0-0xaf */
52  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xb0-0xbf */
53  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xc0-0xf7 */
54  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0xf0-0xff */
55  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x80-0xff */
56  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x80-0xff */
57  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x80-0xff */
58  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, / * 0x80-0xff */
59 }
60
61 static int mulelao_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
62 {
63  if (wc < 0x00a0) {
64    *r = wc;
65    return 1;
66  }
67  else if (wc == 0x00a0)
68    *r = 0xa0;
69  else if (wc >= 0x0e80 && wc < 0x0ee0)
70    *r = mulelao_page0e[wc-0x0e80];
71  if (*r != 0) {
72    *r = wc;
73    return 1;
74  }
75  return RET_ILSEQ;
76 }

35.292 tatar_cyr.h

2
3 /* TATAR-CYR */
4
5 static const unsigned short tatar_cyr_2uni[128] = {
6  / * 0x80 */
7  0x04d8, 0x0403, 0x201a, 0x0453, 0x201e, 0x2026, 0x2020, 0x2021,
8  0x20ac, 0x2030, 0x04e8, 0x2039, 0x04ae, 0x0496, 0x04a2, 0x04ba,
9  / * 0x90 */
10  0x04d9, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
11  0x98, 0x2122, 0x04e9, 0x203a, 0x04af, 0x0497, 0x04a3, 0x04bb,
12  / * 0xa0 */
13  0x00a0, 0x040e, 0x045e, 0x0488, 0x00a4, 0x00a5, 0x00a6, 0x00a7,
14  0x00a8, 0x00a9, 0x0404, 0x00ae, 0x00b9, 0x00c0, 0x00c1, 0x00c2,
15  / * 0xb0 */
16  0x00b0, 0x00b1, 0x0407, 0x0457, 0x0487, 0x00b5, 0x00b6, 0x00b7,
17  0x00b8, 0x00b9, 0x0412, 0x0413, 0x0414, 0x0415, 0x0416, 0x0417,
18  / * 0x80 */
19  0x04d8, 0x0403, 0x201a, 0x0453, 0x201e, 0x2026, 0x2020, 0x2021,
20  0x20ac, 0x2030, 0x04e8, 0x2039, 0x04ae, 0x0496, 0x04a2, 0x04ba,
21  / * 0x90 */
22  0x04d9, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
23  0x98, 0x2122, 0x04e9, 0x203a, 0x04af, 0x0497, 0x04a3, 0x04bb,
24  / * 0xa0 */
25  0x00a0, 0x040e, 0x045e, 0x0488, 0x00a4, 0x00a5, 0x00a6, 0x00a7,
26  0x00a8, 0x00a9, 0x0404, 0x00ae, 0x00b9, 0x00c0, 0x00c1, 0x00c2,
27  / * 0xb0 */
28  0x00b0, 0x00b1, 0x0407, 0x0457, 0x0487, 0x00b5, 0x00b6, 0x00b7,
static const unsigned char tatar_cyr_page04[240] = {
  0x00, 0xa8, 0x00, 0x81, 0xaa, 0xbd, 0xb2, 0xaf, /* 0x00-0x07 */
  0xa3, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa1, 0x00, /* 0x08-0x0f */
  0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x10-0x17 */
  0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x18-0x1f */
  0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x20-0x27 */
  0xa5, 0xb4, 0x00, 0x00, 0x00, 0x00, 0xb5, 0xbf, /* 0x50-0x57 */
  0xbc, 0xb1, 0x00, 0x00, 0x00, 0x00, 0xb2, 0xb3, /* 0x58-0x5f */
};

static const unsigned char tatar_cyr_page20[48] = {
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
  0x8a, 0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
  0x88, 0x98, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
  0xb0, 0xb1, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xdf */
};

static const unsigned char tatar_cyr_page21[24] = {
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
};

static const unsigned char tatar_cyr_page22[1] = {
  0xb0, /* 0x16-0x16 */
};

static int
tatar_cyr_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
  unsigned char c = 0;
  if (wc < 0x0080) {
    *r = wc;
    return 1;
  } else if (wc >= 0x00a0 && wc < 0x00bc) {
    c = tatar_cyr_page00[wc-0x00a0];
  } else if (wc >= 0x0400 && wc < 0x04ef) {
    c = tatar_cyr_page04[wc-0x0400];
  } else if (wc >= 0x2010 && wc < 0x203b) {
    c = tatar_cyr_page20[wc-0x2010];
  } else if (wc == 0x20ac) {
    c = 0x88;
  } else if (wc == 0x2110 && wc < 0x2123) {
    c = tatar_cyr_page21[wc-0x2110];
  } else if (c != 0) {
    *r = c;
    return 1;
  } else if (wc >= 0x0000 && wc < 0x0080) {
    *r = wc;
    return 1;
  } return RET_ILSEQ;

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5 */
6
7 static const unsigned short tcvn_2uni_1[32] = {
8
/* 0x00 */
9
0x0000, 0x00da, 0x1ee4, 0x0003, 0x1eea, 0x1eec, 0x1eee, 0x0007,
10
0x0008, 0x0009, 0x000a, 0x000b, 0x000c, 0x000d, 0x000e, 0x000f,
11
/* 0x10 */
12
0x0010, 0x1ee8, 0x1ef0, 0x1ef2, 0x1ef6, 0x1ef8, 0x00dd, 0x1ef4,
13
0x0018, 0x0019, 0x001a, 0x001b, 0x001c, 0x001d, 0x001e, 0x001f,
14 };
15 static const unsigned short tcvn_2uni_2[128] = {
16
/* 0x80 */
17
0x00c0, 0x1ea2, 0x00c3, 0x00c1, 0x1ea0, 0x1eb6, 0x1eac, 0x00c8,
18
0x1eba, 0x1ebc, 0x00c9, 0x1eb8, 0x1ec6, 0x00cc, 0x1ec8, 0x0128,
19
/* 0x90 */
20
0x00cd, 0x1eca, 0x00d2, 0x1ece, 0x00d5, 0x00d3, 0x1ecc, 0x1ed8,
21
0x1edc, 0x1ede, 0x1ee0, 0x1eda, 0x1ee2, 0x00d9, 0x1ee6, 0x0168,
22
/* 0xa0 */
23
0x00a0, 0x0102, 0x00c2, 0x00ca, 0x00d4, 0x01a0, 0x01af, 0x0110,
24
0x0103, 0x00e2, 0x00ea, 0x00f4, 0x01a1, 0x01b0, 0x0111, 0x1eb0,
25
/* 0xb0 */
26
0x0300, 0x0309, 0x0303, 0x0301, 0x0323, 0x00e0, 0x1ea3, 0x00e3,
27
0x00e1, 0x1ea1, 0x1eb2, 0x1eb1, 0x1eb3, 0x1eb5, 0x1eaf, 0x1eb4,
28
/* 0xc0 */
29
0x1eae, 0x1ea6, 0x1ea8, 0x1eaa, 0x1ea4, 0x1ec0, 0x1eb7, 0x1ea7,
30
0x1ea9, 0x1eab, 0x1ea5, 0x1ead, 0x00e8, 0x1ec2, 0x1ebb, 0x1ebd,
31
/* 0xd0 */
32
0x00e9, 0x1eb9, 0x1ec1, 0x1ec3, 0x1ec5, 0x1ebf, 0x1ec7, 0x00ec,
33
0x1ec9, 0x1ec4, 0x1ebe, 0x1ed2, 0x0129, 0x00ed, 0x1ecb, 0x00f2,
34
/* 0xe0 */
35
0x1ed4, 0x1ecf, 0x00f5, 0x00f3, 0x1ecd, 0x1ed3, 0x1ed5, 0x1ed7,
36
0x1ed1, 0x1ed9, 0x1edd, 0x1edf, 0x1ee1, 0x1edb, 0x1ee3, 0x00f9,
37
/* 0xf0 */
38
0x1ed6, 0x1ee7, 0x0169, 0x00fa, 0x1ee5, 0x1eeb, 0x1eed, 0x1eef,
39
0x1ee9, 0x1ef1, 0x1ef3, 0x1ef7, 0x1ef9, 0x00fd, 0x1ef5, 0x1ed0,
40 };
41
42 static int
43 tcvn_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
44 {
45
unsigned char c = *s;
46
if (c < 0x20)
47
*pwc = (ucs4_t) tcvn_2uni_1[c];
48
else if (c < 0x80)
49
*pwc = (ucs4_t) c;
50
else
51
*pwc = (ucs4_t) tcvn_2uni_2[c-0x80];
52
return 1;
53 }
54
55 static const unsigned char tcvn_page00[96+184] = {
56
0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
57
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
58
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
59
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
60
0x80, 0x83, 0xa2, 0x82, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
61
0x87, 0x8a, 0xa3, 0x00, 0x8d, 0x90, 0x00, 0x00, /* 0xc8-0xcf */
62
0x00, 0x00, 0x92, 0x95, 0xa4, 0x94, 0x00, 0x00, /* 0xd0-0xd7 */
63
0x00, 0x9d, 0x01, 0x00, 0x00, 0x16, 0x00, 0x00, /* 0xd8-0xdf */
64
0xb5, 0xb8, 0xa9, 0xb7, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
65
0xcc, 0xd0, 0xaa, 0x00, 0xd7, 0xdd, 0x00, 0x00, /* 0xe8-0xef */
66
0x00, 0x00, 0xdf, 0xe3, 0xab, 0xe2, 0x00, 0x00, /* 0xf0-0xf7 */
67
0x00, 0xef, 0xf3, 0x00, 0x00, 0xfd, 0x00, 0x00, /* 0xf8-0xff */
68
/* 0x0100 */
69
0x00, 0x00, 0xa1, 0xa8, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
70
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
71
0xa7, 0xae, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
72
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
73
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
74
0x8f, 0xdc, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
75
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
76
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
77
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
78
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
79
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
80
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
81
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
82
0x9f, 0xf2, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
83
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
84
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
85
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
86
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
87
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
88
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
89
0xa5, 0xac, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
90
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa6, /* 0xa8-0xaf */
91
0xad, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */

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static const unsigned char tcvn_page03[40] = {
  0xb0, 0xb3, 0x00, 0xb2, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
  0x00, 0xb1, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
  0x00, 0x00, 0x00, 0xb4, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
};

static const unsigned char tcvn_page1e[96] = {
  0x84, 0xb9, 0x81, 0xb6, 0xc4, 0xca, 0xc1, 0xc7, /* 0xa0-0xa7 */
  0xc2, 0xc8, 0xc3, 0xc9, 0x86, 0xcb, 0xc0, 0xbe, /* 0xa8-0xaf */
  0xaf, 0xbb, 0xba, 0xbc, 0xbf, 0xbd, 0x85, 0xc6, /* 0xb0-0xb7 */
  0x8b, 0xd1, 0x88, 0xce, 0x89, 0xcf, 0xda, 0xd4, /* 0xb8-0xbf */
  0x8c, 0xd9, 0x8d, 0xda, 0x8e, 0xdb, 0x8f, 0xdc, /* 0xc0-0xc7 */
  0x8d, 0x90, 0x8e, 0xd6, 0x8f, 0xdf, 0x91, 0xda, /* 0xc8-0xcf */
  0x92, 0xe8, 0x93, 0xea, 0x94, 0xeb, 0x95, 0xfe, /* 0xd0-0xdf */
  0x96, 0xe9, 0x97, 0xe9, 0x98, 0xe9, 0x99, 0xe9, /* 0xe0-0xe7 */
  0x9a, 0xec, 0x9c, 0xe4, 0x9e, 0xec, 0x9f, 0xe4, /* 0xe8-0xef */
  0x11, 0xf8, 0x12, 0xfa, 0x13, 0xf8, 0x14, 0xf8, /* 0xf0-0xf7 */
  0x15, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf8-0xff */
};

static int tcvn_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) {
  unsigned char c = 0;
  if (wc < 0x0080 && (wc >= 0x0020 || (0x00fe0076 & (1 « wc)) == 0)) {
    *r = wc;
    return 1;
  }
  else if (wc >= 0x00a0 && wc < 0x01b8)
    c = tcvn_page00[wc-0x00a0];
  else if (wc >= 0x0300 && wc < 0x0328)
    c = tcvn_page03[wc-0x0300];
  else if (wc >= 0x1ea0 && wc < 0x1f00)
    c = tcvn_page1e[wc-0x1ea0];
  if (c != 0) {
    *r = c;
    return 1;
  }
  return RET_ILSEQ;
}

static const unsigned short tis620_2uni[96] = {
  0xfffd, 0x0e01, 0x0e02, 0x0e03, 0x0e04, 0x0e05, 0x0e06, 0x0e07, /* 0xa0 */
  0x0e10, 0x0e11, 0x0e12, 0x0e13, 0x0e14, 0x0e15, 0x0e16, 0x0e17, /* 0xb0 */
  0x0e20, 0x0e21, 0x0e22, 0x0e23, 0x0e24, 0x0e25, 0x0e26, 0x0e27, /* 0xc0 */
  0x0e30, 0x0e31, 0x0e32, 0x0e33, 0x0e34, 0x0e35, 0x0e36, 0x0e37, /* 0xd0 */
  0x0e38, 0x0e39, 0x0e3a, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0x0e3f, /* 0xe0 */
  0x0e40, 0x0e41, 0x0e42, 0x0e43, 0x0e44, 0x0e45, 0x0e46, 0x0e47, /* 0xe8 */
  0x0e48, 0x0e49, 0x0e4a, 0x0e4b, 0x0e4c, 0x0e4d, 0x0e4e, 0x0e4f, /* 0xf0 */
  0x0e50, 0x0e51, 0x0e52, 0x0e53, 0x0e54, 0x0e55, 0x0e56, 0x0e57, /* 0x00 */
  0x0e58, 0x0e59, 0x0e5a, 0x0e5b, 0xfffd, 0xfffd, 0xfffd, 0xfffd, /* 0xf8 */
};

static int tis620_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {
  unsigned char c = *s;
  if (c < 0x80) {
    *pwc = (ucs4_t) c;
    return 1;
  }
  else if (c < 0xa0) {
    *pwc = 0x0000a0 & c;
    return 1;
  } else {
    unsigned short wc = tis620_2uni[c-0xa0];
    *pwc = wc;
    return 1;
  }
  return RET_ILSEQ;
}
if (wc != 0xfffd) {
    *pwc = (ucs4_t) wc;
    return 1;
}

return RET_ILSEQ;

static const unsigned char tis620_page0e[96] = {
    0x00, 0xa1, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0x00-0x07 */
    0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x08-0x0f */
    0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x10-0x17 */
    0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x18-0x1f */
    0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x20-0x27 */
    0xf0, 0xf9, 0xfa, 0xfb, 0xf0, 0xf1, 0xf2, 0xf3, /* 0x28-0x2f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0xe0, 0xe1, 0xe2, /* 0x30-0x37 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
};

static int
ucs2be_mbtowc (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    unsigned char c = 0;
    if (wc < 0x0080) {
        *r = wc;
        return 1;
    }

    else if (wc >= 0x0e00 && wc < 0xe000) {
        c = tis620_page0e[wc-0xe00];
        if (c != 0) {
            *r = c;
            return 1;
        }
    }

    return RET_ILSEQ;
}

static int
ucs2be_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
    if (wc < 0x10000 && !(wc >= 0xd800 && wc < 0xe000)) {
        if (n >= 2) {
            r[0] = (unsigned char) (wc » 8);
            r[1] = (unsigned char) wc;
            return 2;
        } else
            return RET_TOO_SMALL;
    }

    return RET_ILSEQ;
}

35.295 ucs2be.h

1 /
2 /* UCS-2BE = UCS-2 big endian
3 */
5
6 static int
7 ucs2be_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
8 {
9     unsigned char c = 0;
10     if (wc < 0x0080) {
11         *r = wc;
12         return 1;
13     }
14
15     else if (wc >= 0x0e00 && wc < 0xe000) {
16         c = tis620_page0e[wc-0xe00];
17         if (c != 0) {
18             *r = c;
19             return 1;
20         }
21     }
22
23     return RET_ILSEQ;
24 }
25
26 static int
27 ucs2be_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
28 {
29     if (wc < 0x10000 && !(wc >= 0xd800 && wc < 0xe000)) {
30         if (n >= 2) {
31             r[0] = (unsigned char) (wc » 8);
32             r[1] = (unsigned char) wc;
33             return 2;
34         } else
35             return RET_TOO_SMALL;
36     }
37
38     return RET_ILSEQ;
39 }

35.296 utf8.h

2 /
3 /*
4 */
5 /* UTF-8 */
6 /*
7 */

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static int
utf8_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
{
  unsigned char c = s[0];

  if (c < 0x80) {
    *pwc = c;
    return 1;
  } else if (c < 0xc2) {
    return RET_ILSEQ;
  } else if (c < 0xe0) {
    if (n < 2)
      return RET_TOOFEW(0);
    *pwc = ((ucs4_t) (c & 0x1f) << 6) |
            (ucs4_t) (s[1] ^ 0x80);
    return 2;
  } else if (c < 0xf0) {
    if (n < 3)
      return RET_TOOFEW(0);
    if (!((s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40)
        && (c >= 0xe1 || s[1] >= 0xa0))
      return RET_ILSEQ;
    *pwc = ((ucs4_t) (c & 0x0f) << 12) |
            ((ucs4_t) (s[1] ^ 0x80) << 6) |
            (ucs4_t) (s[2] ^ 0x80);
    return 3;
  } else if (c < 0xf8) {
    if (n < 4)
      return RET_TOOFEW(0);
    if (!((s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40)
        && (s[3] ^ 0x80) < 0x40)
      return RET_ILSEQ;
    *pwc = ((ucs4_t) (c & 0x07) << 18) |
            ((ucs4_t) (s[1] ^ 0x80) << 12) |
            ((ucs4_t) (s[2] ^ 0x80) << 6) |
            (ucs4_t) (s[3] ^ 0x80);
    return 4;
  } else if (c < 0xfc) {
    if (n < 5)
      return RET_TOOFEW(0);
    if (!((s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40)
        && (s[3] ^ 0x80) < 0x40)
      return RET_ILSEQ;
    *pwc = ((ucs4_t) (c & 0x03) << 24) |
            ((ucs4_t) (s[1] ^ 0x80) << 18) |
            ((ucs4_t) (s[2] ^ 0x80) << 12) |
            ((ucs4_t) (s[3] ^ 0x80) << 6) |
            (ucs4_t) (s[4] ^ 0x80);
    return 5;
  } else if (c < 0xfe) {
    if (n < 6)
      return RET_TOOFEW(0);
    if (!((s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40)
        && (s[3] ^ 0x80) < 0x40)
      return RET_ILSEQ;
    *pwc = ((ucs4_t) (c & 0x01) << 30) |
            ((ucs4_t) (s[1] ^ 0x80) << 24) |
            ((ucs4_t) (s[2] ^ 0x80) << 18) |
            ((ucs4_t) (s[3] ^ 0x80) << 12) |
            ((ucs4_t) (s[4] ^ 0x80) << 6) |
            (ucs4_t) (s[5] ^ 0x80);
    return 6;
  } else
    return RET_ILSEQ;
}

static int
utf8_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) /* n == 0 is acceptable */
{
  int count;
  if (wc < 0x80)
    count = 1;
  else if (wc < 0x800)
    count = 2;
  else if (wc < 0x10000)
    count = 3;
  else if (wc < 0x200000)
    count = 4;
  else count = 5;

  return count;
}
else if (wc < 0x4000000)  
count = 5;
else if (wc <= 0x7fffffff)  
count = 6;
else
  return RET_ILSEQ;
if (n < count)
  return RET_TOO_SMALL;
  switch (count) { /* note: code falls through cases! */
case 6:
  r[5] = 0x80 | (wc & 0x3f);
  wc = wc >> 6;
  wc |= 0x4000000;
  break;
  case 5:
  r[4] = 0x80 | (wc & 0x3f);
  wc = wc >> 6;
  wc |= 0x200000;
  break;
  case 4:
  r[3] = 0x80 | (wc & 0x3f);
  wc = wc >> 6;
  wc |= 0x10000;
  break;
  case 3:
  r[2] = 0x80 | (wc & 0x3f);
  wc = wc >> 6;
  wc |= 0x800;
  break;
  case 2:
  r[1] = 0x80 | (wc & 0x3f);
  wc = wc >> 6;
  wc |= 0x20;
  break;
  case 1:
  r[0] = wc;
  break;
}
return count;
}

35.297 viscii.h

#include <viscii.h>

/* Specification: RFC 1456 */

static const unsigned short viscii_2uni_1[32] = {
  0x0000, 0x0001, 0x1eb2, 0x0003, 0x0004, 0x1eb4, 0x1eaa,
  0x0007, 0x0008, 0x0009, 0x000a, 0x000b, 0x000c, 0x000d,
  0x000e, 0x000f,
};

static const unsigned short viscii_2uni_2[128] = {
  0x1ea0, 0x1eae, 0x1eb0, 0x1eb6, 0x1ea4, 0x1ea6, 0x1ea8,
  0x1ead, 0x1ebc, 0x1eb8, 0x1eb4, 0x1eb2, 0x1eb0, 0x1eaa,
  0x1e8,

5 */

7 */ Specification: RFC 1456 */

9 static const unsigned short viscii_2uni_1[32] = {
10 /* 0x00 */
11 0x0000, 0x0001, 0x1eb2, 0x0003, 0x0004, 0x1eb4, 0x1eaa,
12 0x0007, 0x0008, 0x0009, 0x000a, 0x000b, 0x000c, 0x000d,
13 0x000e, 0x000f,
14 /* 0x10 */
15 0x0010, 0x0011, 0x0012, 0x0013,
16 /* 0x80 */
17 0x1ea0, 0x1eae, 0x1eb0, 0x1eb6, 0x1ea4, 0x1ea6, 0x1ea8,
18 0x1ead,
19 /* 0x90 */
20 0x1ed2, 0x1ed6, 0x1ed8, 0x1eda, 0x1edc, 0x1ede,
21 /* 0xa0 */
22 0x1ebd, 0x1ebf, 0x1ec1, 0x1ec3,
23 /* 0xb0 */
24 0x1eda, 0x1ec9, 0x1ec8, 0x1ea6, 0x0168, 0x0164, 0x0162,
25 /* 0xc0 */
26 0x1eaf, 0x1eb1, 0x1eb7, 0x1ea5, 0x1ea7, 0x1ea9, 0x1ead,
27 /* 0xd0 */
28 0x1ebd, 0x1ebf, 0x1ec1, 0x1ec3,
29 /* 0xe0 */
30 0x1ec9, 0x0128, 0x1ef3,
31 /* 0xf0 */
32 0x0111, 0x010f, 0x010d,
};

40 viscii_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n) {  
41 unsigned char c = *s;
42 if (c < 0x20)  
43 *pwc = (ucs4_t) viscii_2uni_1[c];
44 else if (c < 0x80)  
45 *pwc = (ucs4_t) viscii_2uni_2[c-0x80];
46 /* 0x80 */
47 0x1ed3, 0x1ed5, 0x1ed7,
48 0x1ed9, 0x01a0, 0x01c0, 0x01c2,
49 0x1edf,
50 /* 0xc0 */
51 0x1ebd, 0x1ebf, 0x1ec1, 0x1ec3,
52 /* 0xe0 */
53 0x1ec9, 0x0128, 0x1ef3,
54 /* 0xf0 */
55 0x0111, 0x010f, 0x010d,
56 );
57 static const unsigned short viscii_page00[64+184] = {
58 0x00, 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0a, 0x0b, 0x0c, 0x0d, 0x0e, 0x0f, 0x10,
59 /* 0x80 */
60 0x05, 0x06, 0x07, 0x08, 0x09, 0x0a, 0x0b, 0x0c, 0x0d, 0x0e, 0x0f, 0x10,
61 0x1f, 0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27, 0x28, 0x29, 0x2a, 0x2b, 0x2c, 0x2d, 0x2e, 0x2f,
62 0x30, 0x31, 0x32, 0x33, 0x34, 0x35, 0x36, 0x37, 0x38, 0x39, 0x3a, 0x3b, 0x3c, 0x3d, 0x3e, 0x3f,
63 0x40, 0x41, 0x42, 0x43, 0x44, 0x45, 0x46, 0x47, 0x48, 0x49, 0x4a, 0x4b, 0x4c, 0x4d, 0x4e, 0x4f,
# Ximint.h

```c
static const unsigned char viscii_page1e[96] = {
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
  0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹, 0蒹,
}

static int
viscii_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
{
  unsigned char c = 0;
  if (wc < 0蒹080 && (wc >= 0蒹08蒹0 && (1 << wc)) == 0) {
    *r = wc;
    return 1;
  }
  return RET_ILSEQ;
}
```

---

# Xlibint.h

```c
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```
_FL_DIAMOND_DOWN_BOX
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_FL_DIAMOND_UP_BOX
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_FL_ENGRAVED_LABEL
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_FL_GLEAM_DOWN_FRAME
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_FL_GLEAM_ROUND_DOWN_BOX
Enumerations.H, 1261
_FL_GLEAM_ROUND_UP_BOX
Enumerations.H, 1261
_FL_GLEAM_THIN_DOWN_BOX
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_FL_GLEAM_THIN_UP_BOX
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_FL_GLEAM_UP_BOX
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_FL_GLEAM_UP_FRAME
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_FL_GTK_DOWN_FRAME
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_FL_GTK_ROUND_DOWN_BOX
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_FL_GTK_ROUND_UP_BOX
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_FL_GTK_THIN_DOWN_BOX
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_FL_GTK_THIN_DOWN_FRAME
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_FL_GTK_THIN_UP_BOX
Enumerations.H, 1260
_FL_GTK_THIN_UP_FRAME
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_FL_GTK_UP_BOX
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_FL_OBLIQUE_DOWN_BOX
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_FL_OBLIQUE_UP_BOX
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_FL_OVAL_BOX
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_FL_OXY_BUTTON_UP_BOX
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_FL_OXY_DOWN_BOX
Enumerations.H, 1261
_FL_OXY_DOWN_FRAME
Enumerations.H, 1261
_FL_OXY_ROUND_DOWN_BOX
Enumerations.H, 1261
_FL_OXY_ROUND_UP_BOX
Enumerations.H, 1261
_FL_OXY_THIN_DOWN_BOX
Enumerations.H, 1261
_FL_OXY_THIN_DOWN_FRAME
Enumerations.H, 1261
_FL_OXY_THIN_UP_BOX
Enumerations.H, 1261
_FL_OXY_THIN_UP_FRAME
Enumerations.H, 1261
_FL_OXY_UP_BOX
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