

Sequencer64 Developer/Tester's Reference Manual

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Chapter 1

Sequencer64

Author(s) Chris Ahlstrom 2015-09-10

1.1 Introduction

Sequencer64 is a minor cleanup, refactoring, and documentation of the Seq24 live-play MIDI sequencer.

The current document describes the functions, classes, modules, and other entities used in this project.

For now, please read the ROADMAP and README files to understand the genesis of this project.

Also, we have pretty deeply documented *Seq24* and *Sequencer64* with PDF files that can be generated by git-cloning the following projects, installing a number of tools related to PDF and LaTeX, and running "make":

- <https://github.com/ahlstromcj/sequencer24-doc.git>

In the present document, we've left out a fair amount of side-material to cut down on the size of the document. For example, the main module, redundant Windows support, utility headers like `easy_macros.h`, simple stuff like the mutex module, the fruity variants (at least the ones already refactored into their own modules), etc., are all left out.

Chapter 2

User Testing of Sequencer64 with Yoshimi

Author(s) Chris Ahlstrom 2015-10-14

2.1 Introduction

This section describes user testing of Sequencer64 using Yoshimi. It will expand as we work our way through all the many use-cases that can be achieved with Sequencer64 and Yoshimi.

2.2 Smoke Test

Every so often we run Sequencer64 with a software synthesizer to make sure we haven't broken any functionality via our major refactoring efforts. We call it a "smoke test". We fire up the two application, and see if anything smokes.

This smoke test sets up Yoshimi with a very simple ALSA setup, and no instruments are loaded. Instead, only the "Simple Sound" is used on all channels. We've been doing this test with Yoshimi 1.3.6. The current Debian Sid ("testing") version of Yoshimi is 1.3.6-2, pulled from SourceForge. It seems to have issues, so we've been cloning and pulling the code from:

```
https://github.com/Yoshimi/yoshimi.git
```

After getting the application build and installed, the next step is to run it, using ALSA for MIDI and for audio:

```
$ yoshimi -a -A &
```

Next, fix up the configuration files for Sequencer64, `~/.config/sequencer64/sequencer64.rc` and `~/.config/sequencer64/sequencer64.usr`.

First hide `sequencer64.usr` somewhere, or delete it, as it will determine what MIDI devices are available, and we don't want that (yet). Second, make sure that `sequencer64.rc` makes the following setting:

```
[manual-alsa-ports]

# Set to 1 if you want seq24 to create its own ALSA ports and
# not connect to other clients

0    # number of manual ALSA ports
```

Next, run the newly-built version of Sequencer64. If desired, use the `--bus` option described below to force the buss number to the buss you need, as shown in the second version of the command:

```
$ sequencer64/sequencer64 &
$ sequencer64/sequencer64 --bus 5 &
```

In *File / Options / MIDI Clock*, observe the MIDI inputs made available by your system. Our system shows:

```
[0] 14:0 (Midi Through Port-0)
[1] 128:0 (TiMidity port 0)
[2] 128:0 (TiMidity port 1)
[3] 128:0 (TiMidity port 2)
[4] 128:0 (TiMidity port 3)
[5] 129:0 (input)
```

For some reason (a bug?), input "[5]" doesn't indicate that it is Yoshimi, but it is. Take note of that input number... that is the MIDI buss number that is needed to drive Yoshimi.

Also make sure that of the clock settings for those busses are "Off".

The next instruction still works, but it is easier to simply pass the option `-bus 5` to Sequencer64 when starting it up.

Now open the file `sequencer64/contrib/midi/b4uacuse-GM-format.midi` in Sequencer64. For all of the patterns (slots) that have lots of data in them, right click on the pattern and select *Midi Bus / [5] 129:0 (input)* and the desired channel number. (Doesn't matter much, just use up the lower channel numbers first).

Back in Yoshimi, select each Part corresponding to the channels you selected. Make sure *Enabled* is checked for each desired channel.

Back in Sequencer64, click on each pattern you want to hear, which highlights them in black. Now click the play button (green triangle). The song should play, with each part using the "Simple Sound". Not too bad for a bunch of sine waves, eh?

Now we can test the application more fully. Note that the instructions here are very light. Detailed instructions on the usage of Sequencer64 can be found in the following project, which contains a PDF file and the LaTeX code used to build it:

<https://github.com/ahlstromcj/sequencer24-doc.git>

Although it applies to an earlier version of the project, it still mostly holds true for Sequencer64.

2.3 Tests in the Patterns Window

Empty tracks (i.e. title-only tracks) are highlighted in yellow.

2.3.1 Patterns Window Key Shortcuts

2.3.2 The Sequencer64 User File

Chapter 3

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Author(s) Chris Ahlstrom 2015-09-10

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Chapter 4

Todo List

File `globals.h`

There are additional user-interface and MIDI scaling variables in the perroll module that we need to move here.

File `mainwnd.cpp`

Figure out best way to select non-legacy PPQN behavior, probably, for now, a command-line option.

- Add a GUI element that shows the actual PPQN in force, maybe next to the maintime object, or in the title caption.

Global `seq64::mainwnd::mainwnd (perform &a_p)`

Offload most of the work into an initialization function like options does; make the perform parameter a reference.

Global `seq64::mainwnd::on_key_press_event (GdkEventKey *a_ev)`

Test this functionality in old and new application.

Global `seq64::mainwnd::on_key_release_event (GdkEventKey *a_ev)`

Test this functionality in old and new application.

Global `seq64::mainwnd::open_performance_edit ()`

Try to find a way to set `m_modified` only if the song editor actually changes something, instead of just because it was opened.

Global `seq64::perfedit::perfedit (perform &p, int ppqn=c_ppqn, int bpm=DEFAULT_BEATS_PER_MEASURE, int bw=DEFAULT_BEAT_WIDTH)`

Offload most of the work into an initialization function like options does; make the perform parameter a reference.

Global `seq64::perform::set_bpm (int a_bpm)`

I think this logic is wrong, in that it needs only one of the two to be stopped before it sets the BPM, while it seems to me that both should be stopped; to be determined.

Global `seq64::perform::start_playing (bool flag=false)`

Verify the usage and nature of this flag.

Global `seq64::seqedit::get_measures ()`

Create a `sequence::set_units()` function or a `sequence::get_measures()` function to forward to.

Global `seq64::seqedit::seqedit (sequence &a_seq, perform &a_perf, int pos, int ppqn=c_ppqn)`

Offload most of the work into an initialization function like options does; make the sequence and perform parameters references.

Global `seq64::seqedit::set_background_sequence (int a_seq)`

Make the sequence pointer a reference.

Global `seq64::seqmenu::seq_clear_perf ()`

All of `seq_paste()` can be offloaded to a (new) perform member function.

Global `seq64::seqmenu::seq_copy()`

Can be offloaded to a perform member function that accepts a sequence clipboard non-const reference parameter.

Global `seq64::seqmenu::seq_cut()`

A lot of `seq_cut()` can be offloaded to a (new) perform member function that takes a sequence clipboard non-const reference parameter.

Global `seq64::seqmenu::seq_paste()`

All of `seq_paste()` can be offloaded to a (new) perform member function with a const clipboard reference parameter.

Global `seq64::sequence::remove(event *e)`

Use find instead in `sequence::remove()`!

Global `user_settings::bus_instrument(int buss, int channel)`

Do this for controllers values and for `user_instrument` members.

Chapter 5

Hierarchical Index

5.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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Chapter 6

Data Structure Index

6.1 Data Structures

Here are the data structures with brief descriptions:

seq64::AbstractPerfInput	Provides an abstract base class to provide the minimal interface for the various "perf input" classes	??
seq64::click	Encapsulates any possible mouse click	??
seq64::configfile	This class is the abstract base class for optionsfile and userfile	??
seq64::event	Provides events for management of MIDI events	??
seq64::event_list::event_key	Provides a key value for an event map	??
seq64::event_list	Receptable for MIDI events	??
seq64::font	This class provides a wrapper for rendering fonts that are encoded as a 16 x 16 pixmap file in XPM format	??
seq64::gui_assistant	This class provides an interface for some of the GUI support needed in Sequencer64	??
seq64::gui_assistant_gtk2	This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64	??
seq64::gui_drawingarea_gtk2	Implements the basic drawing areas of the application	??
seq64::gui_palette_gtk2	Implements a stock palette of Gdk::Color elements	??
seq64::gui_window_gtk2	This class supports a basic interface for Gtk::Window-derived objects	??
seq64::jack_assistant	This class provides the performance mode JACK support	??
seq64::jack_scratchpad	Provide a temporary structure for passing data and results between a perform and jack_assistant object	??
seq64::keybindentry	Class for management of application key-bindings	??
seq64::keys_perform	This class supports the performance mode	??
seq64::keys_perform_gtk2	This class supports the performance mode	??

seq64::keys_perform_transfer	Provides a data-transfer structure to make it easier to fill in a keys_perform object's members using sscanf()	??
seq64::keystroke	Encapsulates any practical keystroke	??
seq64::lash	This class supports LASH operations, if compiled with LASH support (i.e	??
seq64::maintime	This class provides the drawing of the progress bar at the top of the main window, along with the "pills" that move in time with the measures	??
seq64::mainwid	This class implement the piano roll area of the application	??
seq64::mainwnd	This class implements the functionality of the main window of the application, except for the Patterns Panel functionality, which is implemented in the mainwid class	??
seq64::midi_container	This class is the abstract base class for a container of MIDI track information	??
seq64::midi_list	This class is the std::list implementation of the midi_container	??
seq64::midi_vector	This class is the std::vector implementation of the midi_container	??
seq64::midifile	This class handles the parsing and writing of MIDI files	??
seq64::options	This class supports a full tabbed options dialog	??
seq64::optionsfile	Provides a file for reading and writing the application' main configuration file	??
seq64::perfedit	This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel, I think	??
seq64::perfnames	This class implements the left-side keyboard in the patterns window	??
seq64::perform	This class supports the performance mode	??
seq64::performcallback	Provides for notification of events	??
seq64::perfol	This class implements the performance roll user interface	??
seq64::perftime	This class implements drawing the piano time at the top of the "performance window" (the "song editor")	??
rc_settings	This class contains the options formerly named "global_XXXXXX"	??
seq64::gui_drawingarea_gtk2::rect	A small helper structure representing a rectangle	??
seq64::rect	A small helper class representing a rectangle	??
seq64::Seq24PerfInput	Implements the default performance input characteristics of this application	??
seq64::Seq24SeqEventInput	This structure implement the normal interaction methods for Seq24	??
seq64::Seq24SeqRollInput	Implements the Seq24 mouse interaction paradigm for the seqroll	??
seq64::seqdata	This class supports drawing piano-roll events on a window	??
seq64::seqedit	Implements the Pattern Editor, which has references to:	??

seq64::seqevent	Implements the piano event drawing area	??
seq64::seqkeys	This class implements the left side piano of the pattern/sequence editor	??
seq64::seqmenu	This class handles the right-click menu of the sequence slots in the pattern window	??
seq64::seqroll	Implements the piano roll section of the pattern editor	??
seq64::seqtime	This class implements the piano time, whatever that is	??
seq64::sequence	Firstly a receptacle for a single track of MIDI data read from a MIDI file or edited into a pattern	??
seq64::trigger	This class is used in playback	??
user_instrument	Provides data about the MIDI instruments, readable from the "user" configuration file	??
user_instrument_t	This structure corresponds to [user-instrument-N] definitions in the ~/.seq24usr or ~/.config/sequencer64/sequencer64.rc file	??
user_midi_bus	Provides data about the MIDI busses, readable from the "user" configuration file	??
user_midi_bus_t	This structure corresponds to [user-midi-bus-0] definitions in the ~/.seq24usr ("user") file	??
user_settings	Holds the current values of sequence settings and settings that can modify the number of se- quences and the configuration of the user-interface	??
seq64::userfile	Supports the user's ~/.seq24usr configuration file	??

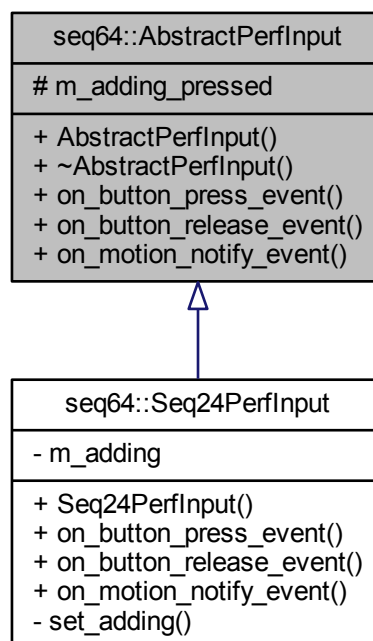
Chapter 7

Data Structure Documentation

7.1 seq64::AbstractPerfInput Class Reference

Provides an abstract base class to provide the minimal interface for the various "perf input" classes.

Inheritance diagram for seq64::AbstractPerfInput:



7.2 seq64::click Class Reference

Encapsulates any possible mouse click.

Public Member Functions

- [click](#) ()
The constructor for class click.
- [click](#) (int [x](#), int [y](#), int [button](#)=SEQ64_CLICK_BUTTON_LEFT, bool [press](#)=true, seq_modifier_t [modkey](#)=SEQ64_NO_MASK)
Principal constructor for class click.
- [click](#) (const [click](#) &[rhs](#))
Provides a stock copy constructor.
- [click](#) & [operator](#)= (const [click](#) &[rhs](#))
Provides a stock principal assignment operator.
- bool [is_press](#) () const
'Getter' function for member [m_is_press](#)
- bool [is_left](#) () const
'Getter' function for member [m_button](#) to test for the left button.
- bool [is_middle](#) () const
'Getter' function for member [m_button](#) to test for the middle button.
- bool [is_right](#) () const
'Getter' function for member [m_button](#) to test for the right button.
- int [x](#) () const
'Getter' function for member [m_x](#)
- int [y](#) () const
'Getter' function for member [m_y](#)
- int [button](#) () const
'Getter' function for member [m_button](#)
- seq_modifier_t [modifier](#) () const
'Getter' function for member [m_modifier](#)
- bool [mod_control](#) () const
'Getter' function for member [m_modifier](#) tested for Ctrl key.
- bool [mod_control_shift](#) () const
'Getter' function for member [m_modifier](#) tested for Ctrl and Shift key.
- bool [mod_super](#) () const
'Getter' function for member [m_modifier](#) tested for Mod4/Super/Windows key.

Private Attributes

- bool [m_is_press](#)
Determines if the click was a press or a release event.
- int [m_x](#)
The x-coordinate of the click.
- int [m_y](#)
The y-coordinate of the click.
- int [m_button](#)
The button that was pressed or released.
- seq_modifier_t [m_modifier](#)
The optional modifier value.

7.2.1 Detailed Description

Useful in passing more generic events to non-GUI classes.

7.2.2 Constructor & Destructor Documentation

7.2.2.1 seq64::click::click ()

Sets all members to false, zero, or the lowest good value.

7.2.2.2 seq64::click::click (int *x*, int *y*, int *button* = SEQ64_CLICK_BUTTON_LEFT, bool *press* = true, seq_modifier_t *modkey* = SEQ64_NO_MASK)

This function is the only way to set value for the click members (other than the copy constructor and principal assignment operator).

Parameters

<i>x</i>	The putative x value of the button click.
<i>y</i>	The putative y value of the button click.
<i>button</i>	The value of the button that was clicked, set to 1, 2, or 3.
<i>press</i>	Set to true if the event was a button press, false if it was a button release.
<i>modkey</i>	Indicates which modifier key (such as Ctrl or Alt), if any, was pressed at the same time as the click action.

7.2.2.3 seq64::click::click (const click & rhs)

It is nice to be explicit about these kinds of functions, even if it gets tedious.

Parameters

<i>rhs</i>	Provides the source object to be copied.
------------	--

7.2.3 Member Function Documentation

7.2.3.1 click & seq64::click::operator= (const click & rhs)

It is nice to be explicit about these kinds of functions, even if it gets tedious.

Parameters

<i>rhs</i>	Provides the source object to be assigned from. The assignment is not made if "this" has the same address as this parameter.
------------	--

7.2.4 Field Documentation

7.2.4.1 int seq64::click::m_x [private]

0 is the left-most coordinate.

7.2.4.2 int seq64::click::m_y [private]

0 is the top-most coordinate.

7.2.4.3 int seq64::click::m_button [private]

Left is 1, middle is 2, and right is 3. These numbers are defined via macros, and a Linux-specific and Gtk-specific.

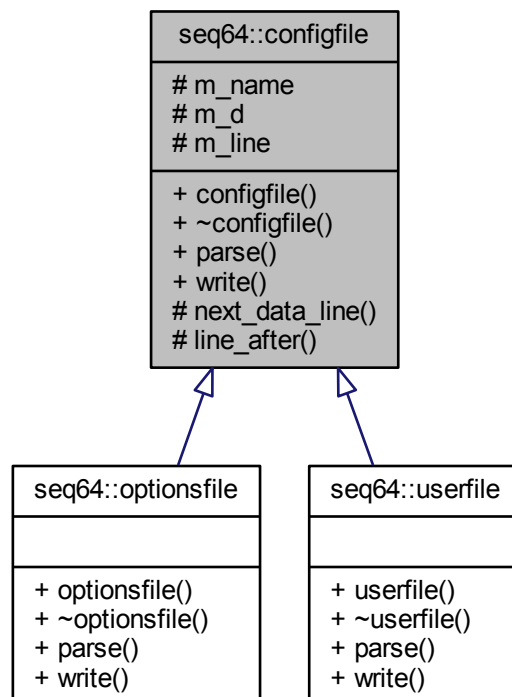
7.2.4.4 seq_modifier_t seq64::click::m_modifier [private]

Note that SEQ64_NO_MASK is our word for 0, meaning "no modifier".

7.3 seq64::configfile Class Reference

This class is the abstract base class for optionsfile and userfile.

Inheritance diagram for seq64::configfile:



Public Member Functions

- [configfile](#) (const std::string &a_name)
Provides the string constructor for a configuration file.
- virtual [~configfile](#) ()
A rote destructor needed for a base class.

Protected Member Functions

- void [next_data_line](#) (std::ifstream &a_file)
Gets the next line of data from an input stream.
- void [line_after](#) (std::ifstream &a_file, const std::string &a_tag)
This function gets a specific line of text, specified as a tag.

Protected Attributes

- `std::string m_name`
Provides the name of the file.
- `unsigned char * m_d`
Points to an allocated buffer that holds the data for the configuration file.
- `char m_line [SEQ64_LINE_MAX]`
The current line of text being processed.

7.3.1 Constructor & Destructor Documentation

7.3.1.1 seq64::configfile::configfile (const std::string & name)

Parameters

<i>name</i>	The name of the configuration file.
-------------	-------------------------------------

7.3.2 Member Function Documentation

7.3.2.1 void seq64::configfile::next_data_line (std::ifstream & file) [protected]

If the line starts with a number-sign, a space (!), or a null, it is skipped, to try the next line. This occurs until an EOF is encountered.

We may try to convert this item to a reference; pointers can be subject to problems. For example, what if someone passes a nullpointer? For speed, we don't check it.

Member `m_line` is a "global" return value.

Parameters

<i>a_file</i>	Points to an input stream.
---------------	----------------------------

7.3.2.2 void seq64::configfile::line_after (std::ifstream & file, const std::string & tag) [protected]

Parameters

<i>file</i>	Points to the input file stream.
<i>tag</i>	Provides a tag to be found. Lines are read until a match occurs with this tag.

7.3.3 Field Documentation

7.3.3.1 char seq64::configfile::m_line[SEQ64_LINE_MAX] [protected]

This member receives an input line, and so needs to be a character buffer.

7.4 seq64::event Class Reference

Provides events for management of MIDI events.

Public Member Functions

- [event](#) ()
This constructor simply initializes all of the class members.
- [~event](#) ()
This destructor explicitly deletes `m_sysex` and sets it to null.
- bool [operator<](#) (const [event](#) &rhsevent) const
If the current timestamp equal the event's timestamp, then this function returns true if the current rank is less than the event's rank.
- void [set_timestamp](#) (unsigned long time)
'Setter' function for member `m_timestamp`
- long [get_timestamp](#) () const
'Getter' function for member `m_timestamp`
- unsigned char [status](#) () const
'Getter' function for member `m_status`
- void [mod_timestamp](#) (unsigned long a_mod)
Calculates the value of the current timestamp modulo the given parameter.
- void [set_status](#) (char [status](#))
Sets the `m_status` member to the value of `a_status`.
- unsigned char [get_status](#) () const
'Getter' function for member `m_status`
- void [set_data](#) (char d1)
Clears the most-significant-bit of the `d1` parameter, and sets it into the first byte of `m_data`.
- void [set_data](#) (char d1, char d2)
Clears the most-significant-bit of both parameters, and sets them into the first and second bytes of `m_data`.
- void [get_data](#) (unsigned char &d0, unsigned char &d1)
Retrieves the two data bytes from `m_data[]` and copies each into its respective parameter.
- void [increment_data1](#) ()
Increments the first data byte (`m_data[1]`) and clears the most significant bit.
- void [decrement_data1](#) ()
Decrements the first data byte (`m_data[1]`) and clears the most significant bit.
- void [increment_data2](#) ()
Increments the second data byte (`m_data[1]`) and clears the most significant bit.
- void [decrement_data2](#) ()
Decrements the second data byte (`m_data[1]`) and clears the most significant bit.
- void [start_sysex](#) ()
Deletes and clears out the SYSEX buffer.
- bool [append_sysex](#) (unsigned char *[data](#), long size)
Appends SYSEX data to a new buffer.
- unsigned char * [get_sysex](#) () const
'Getter' function for member `m_sysex`
- void [set_size](#) (long a_size)
'Setter' function for member `m_size`
- long [get_size](#) () const
'Getter' function for member `m_size`
- void [link](#) ([event](#) *a_event)
Sets `m_has_link` and sets `m_link` to the provided event pointer.
- [event](#) * [get_linked](#) () const
'Getter' function for member `m_linked`
- bool [is_linked](#) () const
'Getter' function for member `m_has_link`

- void `clear_link` ()
'Setter' function for member m_has_link
- void `paint` ()
'Setter' function for member m_painted
- void `unpaint` ()
'Setter' function for member m_painted
- bool `is_painted` () const
'Getter' function for member m_painted
- void `mark` ()
'Setter' function for member m_marked
- void `unmark` ()
'Setter' function for member m_marked
- bool `is_marked` () const
'Getter' function for member m_marked
- void `select` ()
'Setter' function for member m_selected
- void `unselect` ()
'Setter' function for member m_selected
- bool `is_selected` () const
'Getter' function for member m_selected
- void `make_clock` ()
Sets m_status to EVENT_MIDI_CLOCK;.
- unsigned char `data` (int index) const
'Getter' function for member m_data[]
- unsigned char `get_note` () const
Assuming m_data[] holds a note, get the note number, which is in the first data byte, m_data[0].
- void `set_note` (char a_note)
Sets the note number, clearing off the most-significant-bit and assigning it to the first data byte, m_data[0].
- unsigned char `get_note_velocity` () const
'Getter' function for member m_data[1], the note velocity.
- void `set_note_velocity` (int a_vel)
Sets the note velocity, with is held in the second data byte, m_data[1].
- bool `is_note_on` () const
Returns true if m_status is EVENT_NOTE_ON.
- bool `is_note_off` () const
Returns true if m_status is EVENT_NOTE_OFF.
- void `print` ()
Prints out the timestamp, data size, the current status byte, any SYSEX data if present, or the two data bytes for the status byte.
- int `get_rank` () const
This function is used in sorting MIDI status events (e.g.

Private Attributes

- unsigned char `m_status`
This is status byte without the channel.
- unsigned char `m_data` [MIDI_DATA_BYTE_COUNT]
The two bytes of data for the MIDI event.
- unsigned char * `m_sysex`
Points to the data buffer for SYSEX messages.
- long `m_size`

- Gives the size of the SYSEX message.*

 - `event * m_linked`
This event is used to link Note Ons and Offs together.
- `bool m_has_link`
Indicates that a link has been made.
- `bool m_selected`
Answers the question "is this event selected in editing.".
- `bool m_marked`
Answers the question "is this event marked in processing.".
- `bool m_painted`
Answers the question "is this event being painted.".

7.4.1 Detailed Description

A MIDI event consists of 3 bytes:

```
-# Status byte, 1sssnnn, where the sss bits specify the type of
  message, and the nnnn bits denote the channel number.
  The status byte always starts with 0.
-# The first data byte, 0xxxxxxx, where the data byte always
  start with 0, and the xxxxxxx values range from 0 to 127.
-# The second data byte, 0xxxxxxx.
```

This class may have too many member functions.

7.4.2 Member Function Documentation

7.4.2.1 `bool seq64::event::operator< (const event & rhs) const`

Otherwise, it returns true if the current timestamp is less than the event's timestamp.

Warning

The less-than operator is supposed to support a "strict weak ordering", and is supposed to leave equivalent values in the same order they were before the sort. However, every time we load and save our sample MIDI file, events get reversed. Here are program-changes that get reversed:

```
Save N:      0070: 6E 00 C4 48 00 C4 0C 00  C4 57 00 C4 19 00 C4 26
Save N+1:    0070: 6E 00 C4 26 00 C4 19 00  C4 57 00 C4 0C 00 C4 48
```

The 0070 is the offset within the versions of the b4uacuse-seq24.midi file.

Because of this mis-feature, and the very slow speed of loading a MIDI file when Sequencer64 is built for debugging, we are exploring using an `std::map` instead of an `std::list`. Search for occurrences of the `USE_EVENT_MAP` macro. (This actually works better than a list, we have found).

Parameters

<i>rhs</i>	The object to be compared against.
------------	------------------------------------

Returns

Returns true if the time-stamp and "rank" are less than those of the comparison object.

7.4.2.2 `void seq64::event::mod_timestamp (unsigned long a_mod) [inline]`

Parameters

<i>a_mod</i>	The value to mod the timestamp against.
--------------	---

Returns

Returns a value ranging from 0 to *a_mod*-1.

7.4.2.3 void seq64::event::set_status (char *status*)

If *a_status* is a non-channel event, then the channel portion of the status is cleared using a bitwise AND against EVENT_CLEAR_CHAN_MASK..

7.4.2.4 void seq64::event::set_data (char *d1*)

Parameters

<i>d1</i>	The byte value to set. We should make these all "midibytes".
-----------	--

7.4.2.5 void seq64::event::set_data (char *d1*, char *d2*)

Parameters

<i>d1</i>	The first byte value to set. We should make these all "midibytes".
<i>d2</i>	The second byte value to set. We should make these all "midibytes".

7.4.2.6 void seq64::event::get_data (unsigned char & *d0*, unsigned char & *d1*)

Parameters

<i>d0</i>	[out] The return reference for the first byte.
<i>d1</i>	[out] The return reference for the first byte.

7.4.2.7 bool seq64::event::append_sysex (unsigned char * *a_data*, long *a_size*)

First, a buffer of size *m_size*+*a_size* is created. The existing SYSEX data (stored in *m_sysex*) is copied to this buffer. Then the data represented by *a_data* and *a_size* is appended to that data buffer. Then the original SYSEX buffer, *m_sysex*, is deleted, and *m_sysex* is assigned to the new buffer..

Warning

This function does not check any pointers.

Parameters

<i>a_data</i>	Provides the additional SYSEX data.
<i>a_size</i>	Provides the size of the additional SYSEX data.

Returns

Returns false if there was an EVENT_SYSEX_END byte in the appended data.

7.4.2.8 `int seq64::event::get_rank () const`

The ranking, from high to low, is note off, note on, aftertouch, channel pressure, and pitch wheel, control change, and program changes.

note on/off, aftertouch, control change, etc.) The sort order is not determined by the actual status values.

The lower the ranking the more upfront an item comes in the sort order.

Returns

Returns the rank of the current `m_status` byte.

7.4.3 Field Documentation

7.4.3.1 `unsigned char seq64::event::m_status [private]`

The channel will be appended on the MIDI bus. The high nibble = type of event; The low nibble = channel. Bit 7 is present in all status bytes.

7.4.3.2 `unsigned char seq64::event::m_data[MIDI_DATA_BYTE_COUNT] [private]`

Remember that the most-significant bit of a data byte is always 0.

7.4.3.3 `unsigned char* seq64::event::m_sysex [private]`

This really ought to be a Boost or STD scoped pointer.

7.4.3.4 `bool seq64::event::m_has_link [private]`

This item is used [via the `get_link()` and `link()` accessors] in the sequence class.

7.5 `seq64::event_list::event_key` Class Reference

Provides a key value for an event map.

Public Member Functions

- `event_key` (unsigned long tstamp, int rank)
Principal `event_key` constructor.
- `event_key` (const `event` &e)
Event-based constructor.
- `bool operator<` (const `event_key` &rhs) const
Provides the minimal operator needed to sort events using an `event_key`.

Private Attributes

- unsigned long `m_timestamp`
The primary key-value for the key.
- int `m_rank`
The sub-key-value for the key.

7.5.1 Detailed Description

Its types match the `m_timestamp` and `get_rank()` function of this event class.

7.5.2 Constructor & Destructor Documentation

7.5.2.1 seq64::event_list::event_key::event_key (unsigned long *tstamp*, int *rank*)

Parameters

<i>tstamp</i>	The time-stamp is the primary part of the key. It is the most important key item.
<i>rank</i>	Rank is an arbitrary number used to prioritize events that have the same time-stamp. See the event::get_rank() function for more information.

7.5.2.2 seq64::event_list::event_key::event_key (const event & *rhs*)

This constructor makes it even easier to create an [event_key](#). Note that the call to [event::get_rank\(\)](#) makes a simple calculation based on the status of the event.

Parameters

<i>rhs</i>	Provides the event key to be copied.
------------	--------------------------------------

7.5.3 Member Function Documentation

7.5.3.1 bool seq64::event_list::event_key::operator< (const event_key & *rhs*) const

Parameters

<i>e</i>	Provides the event key to be compared against.
----------	--

7.5.4 Field Documentation

7.5.4.1 unsigned long seq64::event_list::event_key::m_timestamp [private]

7.5.4.2 int seq64::event_list::event_key::m_rank [private]

7.6 seq64::event_list Class Reference

The [event_list](#) class is a receptable for MIDI events.

Data Structures

- class [event_key](#)
Provides a key value for an event map.

Public Member Functions

- [event_list](#) ()
Principal constructor.
- [event_list](#) (const [event_list](#) &*a_rhs*)
Copy constructor.

- `event_list & operator= (const event_list &a_rhs)`
Principal assignment operator.
- `~event_list ()`
A rote destructor.
- `iterator begin ()`
'Getter' function for member m_events.begin(), non-constant version.
- `const_iterator begin () const`
'Getter' function for member m_events.begin(), constant version.
- `iterator end ()`
'Getter' function for member m_events.end(), non-constant version.
- `const_iterator end () const`
'Getter' function for member m_events.end(), constant version.
- `int count () const`
Returns the number of events stored in m_events.
- `void add (const event &e, bool postsort=true)`
Adds an event to the internal event list in an optionally sorted manner.
- `void remove (iterator ie)`
Provides a wrapper for the iterator form of erase(), which is the only one that sequence uses.
- `void clear ()`
Provides a wrapper for clear().
- `void merge (event_list &el, bool presort=true)`
Provides a merge operation for the event multimap analogous to the merge operation for the event list.
- `void sort ()`
Wrapper for std::list::sort(), or, since multimaps are always sorted, an empty function.

Static Public Member Functions

- `static event & dref (iterator ie)`
Dereference access for list or map.
- `static const event & dref (const_iterator ie)`
Dereference const access for list or map.

Private Types

- `typedef std::multimap< event_key, event > Events`
Types to use to swap between list and multimap implementations.

Private Member Functions

- `void link_new ()`
Links a new event.
- `void clear_links ()`
Clears all event links and unmarks them all.
- `void verify_and_link (long slength)`
This function verifies state: all note-ons have an off, and it links note-offs with their note-ons.
- `void mark_selected ()`
Marks all selected events.
- `void mark_out_of_range (long slength)`
Marks all events that have a time-stamp that is out of range.
- `void unmark_all ()`

- Unmarks all events.*
- void `unpaint_all` ()
 - Unpaints all list-events.*
- int `count_selected_notes` ()
 - Counts the selected note-on events in the event list.*
- int `count_selected_events` (unsigned char status, unsigned char cc)
 - Counts the selected events, with the given status, in the event list.*
- void `select_all` ()
 - Selects all events, unconditionally.*
- void `unselect_all` ()
 - Deselects all events, unconditionally.*
- void `print` ()
 - Prints a list of the currently-held events.*
- const `Events & events` () const
 - 'Getter' function for member m_events*

Private Attributes

- `Events m_events`
 - This list holds the current pattern/sequence events.*

7.6.1 Detailed Description

Two implementations, an `std::multimap`, and the original, an `std::list`, are provided for comparison, and are selected at build time, by manually defining the `USE_EVENT_MAP` macro near the top of this module.

7.6.2 Constructor & Destructor Documentation

7.6.2.1 seq64::event_list::event_list (const event_list & rhs)

Parameters

<i>rhs</i>	Provides the event list to be copied.
------------	---------------------------------------

7.6.3 Member Function Documentation

7.6.3.1 event_list & seq64::event_list::operator= (const event_list & rhs)

Follows the stock rules for such an operator, just assigning member values.

Parameters

<i>rhs</i>	Provides the event list to be assigned.
------------	---

7.6.3.2 int seq64::event_list::count () const `[inline]`

We like returning an integer instead of `size_t`, and rename the function so nobody is fooled.

7.6.3.3 void seq64::event_list::add (const event & e, bool *postsort* = true)

It is a wrapper, wrapper for insert() or push_front(), with an option to call [sort\(\)](#).

For the std::multimap implementation, This is an option if we want to make sure the insertion succeed.

```
std::pair<Events::iterator, bool> result = m_events.insert(p);
return result.second;
```

Warning

This pushing (and, in writing the MIDI file, the popping), causes events with identical timestamps to be written in reverse order. Doesn't affect functionality, but it's puzzling until one understands what is happening. That's why we're exploring using a multimap as the container.

Parameters

<i>e</i>	Provides the event to be added to the list.
<i>postsort</i>	If true, and the std::list implementation has been built in, then the event list is sorted after the addition. This is a time-consuming operation.

7.6.3.4 void seq64::event_list::merge (event_list & el, bool *presort* = true)

We have certain constraints to preserve, as the following discussion shows.

For std::list, sequence merges list T into list A by first calling T.sort(), and then A.merge(T). The [merge\(\)](#) operation merges T into A by transferring all of its elements, at their respective ordered positions, into A. Both containers must already be ordered.

The merge effectively removes all the elements in T (which becomes empty), and inserts them into their ordered position within container (which expands in size by the number of elements transferred). The operation is performed without constructing nor destroying any element, whether T is an lvalue or an rvalue, or whether the value-type supports move-construction or not.

Each element of T is inserted at the position that corresponds to its value according to the strict weak ordering defined by operator <. The resulting order of equivalent elements is stable (i.e. equivalent elements preserve the relative order they had before the call, and existing elements precede those equivalent inserted from x). The function does nothing if (&x == this).

For std::multimap, sorting is automatic. However, unless move-construction is supported, merging will be less efficient than for the list version. Also, we need a way to include duplicates of each event, so we need to use a multimap. Once all this setup, merging is really just insertion. And, since sorting isn't needed, the multimap actually turns out to be faster.

Parameters

<i>el</i>	Provides the event list to be merged into the current event list.
<i>presort</i>	If true, the events are presorted. This is a requirement for merging an std::list, but is a no-op for the std::multimap implementation.

7.6.3.5 void seq64::event_list::link_new () [private]

This function checks for a note on, then look for its note off. This function is provided in the [event_list](#) because it does not depend on any external data. Also note that any desired thread-safety must be provided by the caller.

7.6.3.6 void seq64::event_list::verify_and_link (long *length*) [private]

Threadsafe

Parameters

<i>slength</i>	Provides the length beyond which events will be pruned.
----------------	---

7.6.3.7 void seq64::event_list::mark_out_of_range (long *slength*) [private]

Used for killing (pruning) those events not in range. If the current time-stamp is greater than the length, then the event is marked for pruning.

Parameters

<i>slength</i>	Provides the length beyond which events will be pruned.
----------------	---

7.6.3.8 int seq64::event_list::count_selected_events (unsigned char *status*, unsigned char *cc*) [private]

If the event is a control change (CC), then it must also match the given CC value.

7.7 seq64::font Class Reference

This class provides a wrapper for rendering fonts that are encoded as a 16 x 16 pixmap file in XPM format.

Public Types

- enum [Color](#) {
[BLACK](#),
[WHITE](#),
[BLACK_ON_YELLOW](#),
[YELLOW_ON_BLACK](#) }

Public Member Functions

- [font](#) ()
rote default constructor.
- void [init](#) (Glib::RefPtr< Gdk::Window > a_window)
Initialization function for a window on which fonts will be drawn.
- void [render_string_on_drawable](#) (Glib::RefPtr< Gdk::GC > m_gc, int x, int y, Glib::RefPtr< Gdk::Drawable > a_draw, const char *str, [font::Color](#) col)
Draws a text string.

Private Attributes

- Glib::RefPtr< Gdk::Pixmap > * [m_pixmap](#)
Points to the current pixmap (m_black_pixmap or m_white_pixmap) to use to render a string.
- Glib::RefPtr< Gdk::Pixmap > [m_black_pixmap](#)
The pixmap in the file src/pixmaps/font_b.xpm is loaded into this object.
- Glib::RefPtr< Gdk::Pixmap > [m_white_pixmap](#)
The pixmap in the file src/pixmaps/font_b.xpm is loaded into this object.
- Glib::RefPtr< Gdk::Pixmap > [m_b_on_y_pixmap](#)
The pixmap in the file src/pixmaps/font_y.xpm is loaded into this object.
- Glib::RefPtr< Gdk::Pixmap > [m_y_on_b_pixmap](#)

The pixmap in the file `src/pixmaps/font_yb.xpm` is loaded into this object.

- `Glib::RefPtr< Gdk::Bitmap > m_clip_mask`

This object is instantiated as a default object.

7.7.1 Member Enumeration Documentation

7.7.1.1 enum `seq64::font::Color`

Enumerator

BLACK A simple enumeration to describe the basic colors used in writing text. Basically, these two values cause the selection of one or another pixmap (`font_b_xpm` and `font_w_xpm`). We've added two more pixmaps to draw black text on a yellow background (`font_y.xpm`) and yellow text on a black background (`font_yb.xpm`).

The first supported color. A black font on a white background.

WHITE The second supported color. A white font on a black background.

BLACK_ON_YELLOW A new color, for drawing black text on a yellow background.

YELLOW_ON_BLACK A new color, for drawing yellow text on a black background.

7.7.2 Member Function Documentation

7.7.2.1 void `seq64::font::init (Glib::RefPtr< Gdk::Window > a_window)`

This function loads two pixmaps that contain the characters to be used to draw text strings. Both pixmaps provide a 16 x 16 grid of boxes, and each box contains one of the 256 characters in this font set.

One pixmap has white characters on a black background, and other other has black characters on a white background. See the descriptions of the `c_text_x` and `c_text_y` variables in the `globals` module.

7.7.2.2 void `seq64::font::render_string_on_drawable (Glib::RefPtr< Gdk::GC > a_gc, int x, int y, Glib::RefPtr< Gdk::Drawable > a_draw, const char * str, font::Color col)`

This function grabs the proper font bitmap, extracts the current character pixmap from it, and slaps it down where it needs to be to render the character in the string.

Parameters

<code>a_gc</code>	Provides the graphics context for drawing the text using GTK+.
<code>x</code>	The horizontal location of the text.
<code>y</code>	The vertical location of the text.
<code>a_draw</code>	The drawable object on which to draw the text.
<code>str</code>	The string to draw. Should use a constant string reference instead.
<code>col</code>	The font color to use to draw the string. The only support values are <code>font::BLACK</code> and <code>font::WHITE</code> , and the correct colors are provided by selecting one of two font pixmaps, as described in the <code>init()</code> function.

7.7.3 Field Documentation

7.7.3.1 `Glib::RefPtr<Gdk::Pixmap>* seq64::font::m_pixmap` `[private]`

This member used to be an object, but it's probably a bit faster to just use a pointer (or a reference).

7.7.3.2 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_black_pixmap [private]

It contains a black font on a white background.

7.7.3.3 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_white_pixmap [private]

It contains a black font on a white background.

7.7.3.4 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_b_on_y_pixmap [private]

It contains a black font on a yellow background.

7.7.3.5 Glib::RefPtr<Gdk::Pixmap> seq64::font::m_y_on_b_pixmap [private]

It contains a yellow font on a black background.

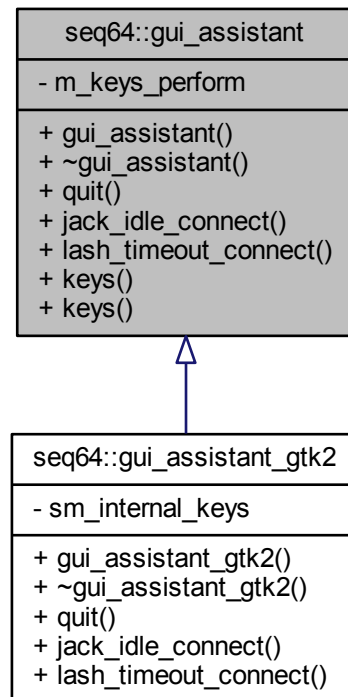
7.7.3.6 Glib::RefPtr<Gdk::Bitmap> seq64::font::m_clip_mask [private]

All we know is it seems to be a requirement for creating a pixmap object from an XMP file.

7.8 seq64::gui_assistant Class Reference

This class provides an interface for some of the GUI support needed in Sequencer64.

Inheritance diagram for seq64::gui_assistant:



Public Member Functions

- [gui_assistant](#) ([keys_perform](#) &kp)
This constructor wires in some externally (for now) created objects.
- virtual [~gui_assistant](#) ()
Stock base-class implementation of a virtual destructor.
- const [keys_perform](#) & [keys](#) () const
'Getter' function for member m_keys_perform The const getter.
- [keys_perform](#) & [keys](#) ()
'Getter' function for member m_keys_perform The un-const getter.

Private Attributes

- [keys_perform](#) & [m_keys_perform](#)
Provides a reference to the app-specific GUI-specific keys_perform-derived object that an application is going to use for handling sequence-control keys.

7.8.1 Detailed Description

It also contain a number of helper objects that all kind of go together; only this assistant object will need to be passed around (by non-GUI code).

7.8.2 Constructor & Destructor Documentation

7.8.2.1 seq64::gui_assistant::gui_assistant (keys_perform & kp)

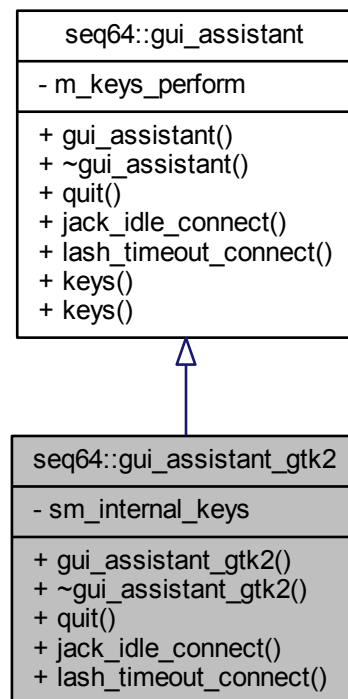
Parameters

<i>kp</i>	Provides a set of key codes to be used by the perform object to control patterns and their performance.
-----------	---

7.9 seq64::gui_assistant_gtk2 Class Reference

This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64.

Inheritance diagram for seq64::gui_assistant_gtk2:



Public Member Functions

- [gui_assistant_gtk2 \(\)](#)
This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64.
- virtual void [quit \(\)](#)
Calls the Glib Main object's [quit\(\)](#) function.
- virtual void [jack_idle_connect \(jack_assistant &jack\)](#)
Connects the JACK session-event callback to the Glib idle object.
- virtual void [lash_timeout_connect \(lash &lashobject\)](#)
Connects the LASH timeout-event callback to the Glib timeout object.

- [~gui_drawingarea_gtk2](#) ()
Provides a destructor to delete allocated objects.
- int [window_x](#) () const
'Getter' function for member m_window_x
- int [window_y](#) () const
'Getter' function for member m_window_y
- int [current_x](#) () const
'Getter' function for member m_current_x
- int [current_y](#) () const
'Getter' function for member m_current_y
- int [drop_x](#) () const
'Getter' function for member m_drop_x
- int [drop_y](#) () const
'Getter' function for member m_drop_y

Protected Member Functions

- [perform](#) & [perf](#) ()
'Getter' function for member m_mainperf
- void [on_realize](#) ()
For this GTK callback, on realization of window, initialize the shiz.

Protected Attributes

- [perform](#) & [m_mainperf](#)
A frequent hook into the main perform object.
- int [m_window_x](#)
Window sizes.
- int [m_current_x](#)
The x and y value of the current location of the mouse (during dragging?)
- int [m_drop_x](#)
These values are used when roping and highlighting a bunch of events.

Private Member Functions

- void [gtk_drawarea_init](#) ()
Does basic initialization for each of the constructors.

Additional Inherited Members

7.10.1 Detailed Description

Note that this class really "isn't a" [gui_palette_gtk2](#); it should simply have one. But that base class must be derived from [Gtk::DrawingArea](#). We don't want to waste some space by using a "has-a" relationship, and also put up with having to access the palette indirectly. So, in this case, we tolerate the less strict implementation.

7.10.2 Member Function Documentation

7.10.2.1 void seq64::gui_drawingarea_gtk2::on_realize () [protected]

It allocates any additional resources that weren't initialized in the constructor.

Protected Types

- typedef Gdk::Color [Color](#)

Provides a type for the color object.

7.11.1 Detailed Description

Note that this class must be derived from `Gtk::DrawingArea` (or `Gtk::Widget`) in order to get access to the `get_↔default_colormap()` function used in the constructor.

7.11.2 Constructor & Destructor Documentation

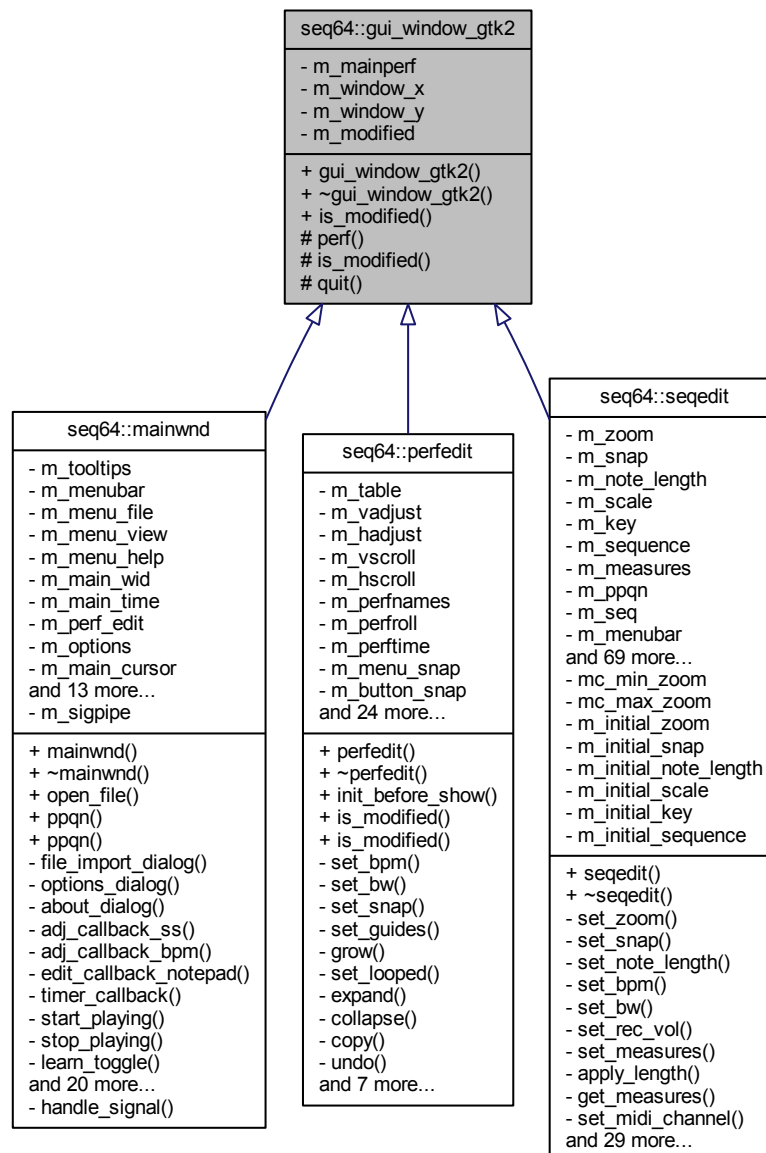
7.11.2.1 seq64::gui_palette_gtk2::gui_palette_gtk2 ()

In the constructor you can only allocate colors; `get_window()` returns 0 because this window has not be realized.

7.12 seq64::gui_window_gtk2 Class Reference

This class supports a basic interface for `Gtk::Window`-derived objects.

Inheritance diagram for seq64::gui_window_gtk2:



Public Member Functions

- [gui_window_gtk2](#) ([perform](#) &p, int window_x=0, int window_y=0)

Principal constructor, has a reference to the all-important perform object.

- [~gui_window_gtk2](#) ()

This rote constructor does nothing.

- bool [is_modified](#) () const

'Getter' function for member m_modified

Protected Member Functions

- [perform](#) & [perf](#) ()
'Getter' function for member m_mainperf
- void [is_modified](#) (bool flag)
'Setter' function for member m_modified

Private Attributes

- int [m_window_x](#)
Window sizes.

7.12.1 Constructor & Destructor Documentation

7.12.1.1 seq64::gui_window_gtk2::gui_window_gtk2 ([perform](#) & *p*, int *window_x* = 0, int *window_y* = 0)

Parameters

a_perf	Refers to the main performance object.
------------------------	--

7.12.2 Field Documentation

7.12.2.1 int seq64::gui_window_gtk2::m_window_x [private]

Could make this constant, but some windows are resizable.

7.13 seq64::jack_assistant Class Reference

This class provides the performance mode JACK support.

Public Member Functions

- [jack_assistant](#) ([perform](#) & [parent](#), int ppqn=c_ppqn)
This constructor initializes a number of member variables, some of them public!
- [~jack_assistant](#) ()
The destructor doesn't need to do anything yet.
- bool [is_running](#) () const
'Getter' function for member m_jack_running
- bool [is_master](#) () const
'Getter' function for member m_jack_master
- [perform](#) & [parent](#) ()
'Getter' function for member m_jack_parent Needed for external callbacks.
- bool [init](#) ()
Initializes JACK support.
- void [deinit](#) ()
Tears down the JACK infrastructure.
- void [start](#) ()
If JACK is supported, starts the JACK transport.
- void [stop](#) ()
If JACK is supported, stops the JACK transport.

- void `position` (bool `a_state`)
If JACK is supported and running, sets the position of the transport.
- bool `output` (`jack_scratchpad` &`pad`)
Performance output function for JACK, called by the perform function of the same name.

Friends

- int `jack_sync_callback` (`jack_transport_state_t` `state`, `jack_position_t` *`pos`, void *`arg`)
Global functions for JACK support and JACK sessions.
- void `jack_shutdown` (void *`arg`)
Shutdown JACK by clearing the `perform::m_jack_running` flag.
- void `jack_timebase_callback` (`jack_transport_state_t` `state`, `jack_nframes_t` `nframes`, `jack_position_t` *`pos`, int `new_pos`, void *`arg`)
This function sets the JACK position structure.

7.13.1 Constructor & Destructor Documentation

7.13.1.1 `seq64::jack_assistant::jack_assistant (perform &parent, int ppqn = c_ppqn)`

Parameters

<code>parent</code>	Provides a reference to the main perform object that needs to control JACK event.
---------------------	---

7.13.2 Member Function Documentation

7.13.2.1 `bool seq64::jack_assistant::init ()`

Then we become a new client of the JACK server.

Who calls this routine?

Returns

Returns true if JACK is now considered to be running (or if it was already running.)

7.13.2.2 `void seq64::jack_assistant::position (bool a_state)`

Warning

A lot of this code is effectively disabled by an early return statement.

Parameters

<code>state</code>	If true, the current tick is set to the leftmost tick.
--------------------	--

7.13.2.3 `bool seq64::jack_assistant::output (jack_scratchpad &pad)`

Parameters

<i>pad</i>	Provide a JACK scratchpad, whatever that is.
------------	--

Returns

Returns true if JACK is running.

7.13.3 Friends And Related Function Documentation

7.13.3.1 `int jack_sync_callback (jack_transport_state_t state, jack_position_t * pos, void * arg)` [*friend*]

This JACK synchronization callback informs the specified perform object of the current state and parameters of JACK.

Parameters

<i>state</i>	The JACK Transport state.
<i>pos</i>	The JACK position value.
<i>arg</i>	The pointer to the perform object. Currently not checked for nullity.

7.13.3.2 `void jack_shutdown (void * arg)` [*friend*]

Parameters

<i>arg</i>	Points to the jack_assistant in charge of JACK support for the perform object.
------------	--

7.13.3.3 `void jack_timebase_callback (jack_transport_state_t state, jack_nframes_t nframes, jack_position_t * pos, int new_pos, void * arg)` [*friend*]

Parameters

<i>state</i>	Indicates the current state of JACK transport.
<i>nframes</i>	The number of JACK frames.
<i>pos</i>	Provides the position structure to be filled in.
<i>new_pos</i>	The new positions to be set.
<i>arg</i>	Provides the jack_assistant pointer, currently unchecked for nullity.

7.14 seq64::jack_scratchpad Struct Reference

Provide a temporary structure for passing data and results between a perform and [jack_assistant](#) object.

7.14.1 Detailed Description

The [jack_assistant](#) class already has access to the members of perform, but it needs access to and modification of local variables in [perform::output_func\(\)](#).

7.15 seq64::keybindentry Class Reference

Class for management of application key-bindings.

Inherits Entry.

Public Member Functions

- `keybindentry` (`type` `t`, unsigned int `*location_to_write=NULLPTR`, `perform` `*p=NULLPTR`, long `s=0`)
This constructor initializes the member with values dependent on the value type provided in the first parameter.
- void `set` (unsigned int `val`)
Gets the key name from the integer value; if there is one, then it is printed into a temporary buffer, otherwise the value is printed into that buffer as is.
- virtual bool `on_key_press_event` (GdkEventKey `*event`)
Handles a key press by calling `set()` with the event's key value.

Private Types

- enum `type` {
`location`,
`events`,
`groups` }

Private Attributes

- unsigned int `* m_key`
Points to the value of the key that is part of this key-binding.
- `type m_type`
Stores the type of key-binding.
- `perform * m_perf`
Stores an optional pointer to a perform object.
- long `m_slot`
Provides???

7.15.1 Member Enumeration Documentation

7.15.1.1 `enum seq64::keybindentry::type` [private]

Enumerator

`location` Provides the type of keybindings that can be made. Used for handling a keystroke made while a keyboard-options field is active, for selecting a key via the keyboard, and binding to pattern/sequence boxes, we think. It is used in the options class to associate a key with the binding.

`events` Used for binding to events.

`groups` Used for binding to groups.

7.15.2 Constructor & Destructor Documentation

7.15.2.1 `seq64::keybindentry::keybindentry (type t, unsigned int * location_to_write = NULLPTR, perform * p = NULLPTR, long s = 0)`

Usage In options, a pointer to a new key-binding entry is managed by calling `keybindentry (keybindentry←::location, &perf->keyname)`.

Parameters

<i>t</i>	Provides the type of key-binding: location, events, or groups.
<i>location_to_write</i>	The location that holds the value of the key associated with the key-binding. The default value of this parameter is the null pointer.
<i>p</i>	Points to the performance object used with this key-binding. The default value of this parameter is the null pointer.
<i>s</i>	Provides the slot value for this key-binding. The default value of this parameter is zero.

7.15.3 Member Function Documentation

7.15.3.1 void seq64::keybindentry::set (unsigned int *val*)

Then we call set_text(buf). The set_width_char() function is then called.

7.15.3.2 bool seq64::keybindentry::on_key_press_event (GdkEventKey * *event*) [virtual]

This value is used to set the event or key depending on the value of m_type.

7.15.4 Field Documentation

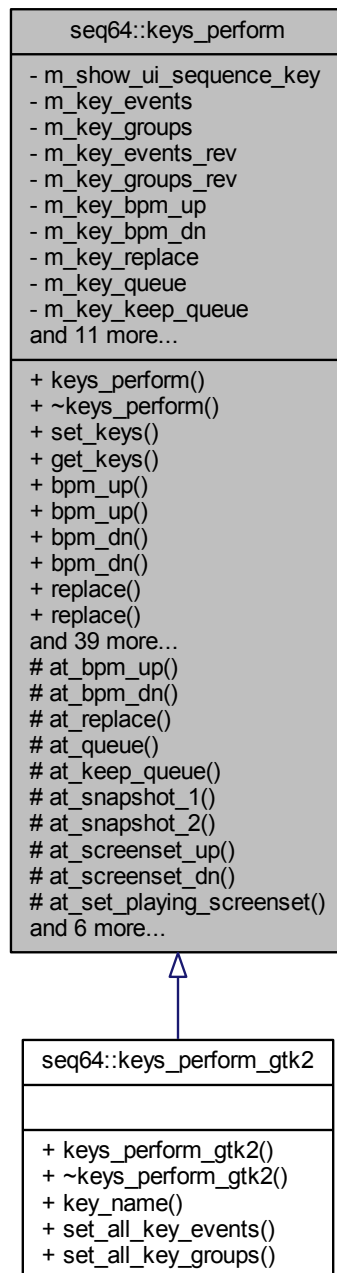
7.15.4.1 unsigned int* seq64::keybindentry::m_key [private]

Not yet sure by the address of this key value is needed. It can be a null pointer, as well.

7.16 seq64::keys_perform Class Reference

This class supports the performance mode.

Inheritance diagram for seq64::keys_perform:



Public Member Functions

- [keys_perform](#) ()

This construction initializes a vast number of member variables, some of them public!

- [~keys_perform](#) ()

The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.

- void [set_keys](#) (const [keys_perform_transfer](#) &kpt)
Copies fields from the transfer structure in this object.
- void [get_keys](#) ([keys_perform_transfer](#) &kpt)
Copies fields from this object into the transfer structure.
- bool [show_ui_sequence_key](#) () const
Accessor *m_key_show_ui_sequency_key*
- virtual std::string [key_name](#) (unsigned int key) const
Obtains the name of the key.
- virtual void [set_all_key_events](#) ()
Provides base class functionality.
- virtual void [set_all_key_groups](#) ()
Provides base class functionality.
- void [set_key_event](#) (unsigned int keycode, long sequence_slot)
At construction time, this function sets up one keycode and one event slot.
- void [set_key_group](#) (unsigned int keycode, long group_slot)
At construction time, this function sets up one keycode and one group slot.

Protected Types

- typedef std::map< unsigned int, long > [SlotMap](#)
This typedef defines a map in which the key is the keycode, that is, the integer value of a keystroke, and the value is the pattern/sequence number or slot.
- typedef std::map< long, unsigned int > [RevSlotMap](#)
This typedef is like SlotMap, but used for lookup in the other direction.

Private Attributes

- unsigned int [m_key_bpm_up](#)
Provides key assignments for some key sequencer features.

7.16.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

7.16.2 Constructor & Destructor Documentation

7.16.2.1 seq64::keys_perform::~~keys_perform ()

Finally, any active patterns/sequences are deleted.

7.16.3 Member Function Documentation

7.16.3.1 void seq64::keys_perform::set_keys (const keys_perform_transfer & kpt)

This structure holds all of the key settings from the File / Options / Keyboard tab dialog.

Parameters

<i>kpt</i>	The structure that holds the values of the keys to be used for various purposes in controlling a performance live.
------------	--

7.16.3.2 void seq64::keys_perform::get_keys (keys_perform_transfer & kpt)

Parameters

<i>kpt</i>	The structure that holds the values of the keys to be used for various purposes in controlling a performance live.
------------	--

7.16.3.3 bool seq64::keys_perform::show_ui_sequence_key () const [inline]

Used in mainwid, options, optionsfile, userfile, and perform.

7.16.3.4 std::string seq64::keys_perform::key_name (unsigned int key) const [virtual]

In gtkmm, this is done via the gdk_keyval_name() function. Here, in the base class, we just provide an easy-to-create string.

Parameters

<i>key</i>	Provides the numeric value of the keystroke.
------------	--

Returns

Returns the name of the key, in the format "Key 0xkkkk".

Reimplemented in [seq64::keys_perform_gtk2](#).

7.16.3.5 virtual void seq64::keys_perform::set_all_key_events () [inline],[virtual]

Must be called by the derived-class's override of this function.

Reimplemented in [seq64::keys_perform_gtk2](#).

7.16.3.6 virtual void seq64::keys_perform::set_all_key_groups () [inline],[virtual]

Must be called by the derived-class's override of this function.

Reimplemented in [seq64::keys_perform_gtk2](#).

7.16.3.7 void seq64::keys_perform::set_key_event (unsigned int keycode, long sequence_slot)

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

Parameters

<i>keycode</i>	The key to be assigned.
<i>sequence_slot</i>	The perform event slot into which the keycode will be assigned.

7.16.3.8 void seq64::keys_perform::set_key_group (unsigned int keycode, long group_slot)

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

Parameters

<i>keycode</i>	The key to be assigned.
<i>group_slot</i>	The perform group slot into which the keycode will be assigned.

7.16.4 Field Documentation

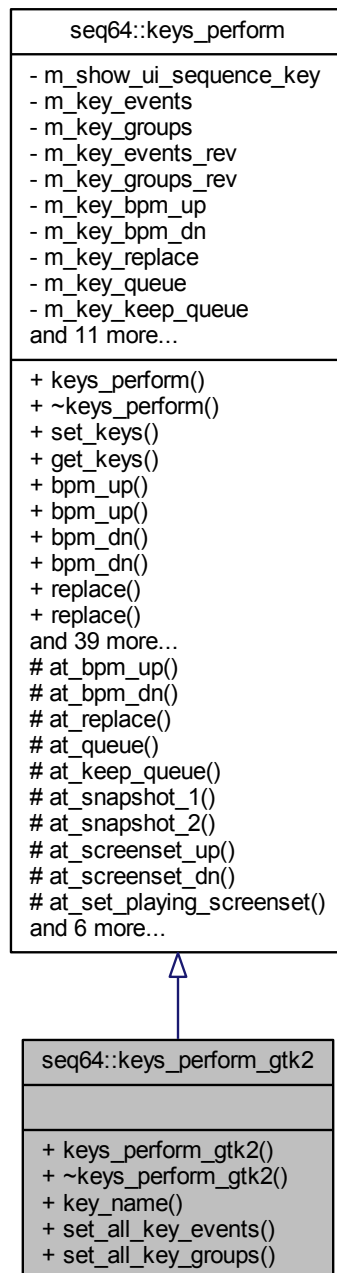
7.16.4.1 unsigned int seq64::keys_perform::m_key_bpm_up [private]

Used in mainwnd, options, optionsfile, perfedit, seqroll, userfile, and perform.

7.17 seq64::keys_perform_gtk2 Class Reference

This class supports the performance mode.

Inheritance diagram for seq64::keys_perform_gtk2:



Public Member Functions

- [keys_perform_gtk2 \(\)](#)

This construction initializes a vast number of member variables, some of them public!

- `virtual ~keys_perform_gtk2 ()`

The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.

- virtual std::string [key_name](#) (unsigned int key) const
Obtains the name of the key.
- virtual void [set_all_key_events](#) ()
Sets up the keys for arming/unmuting events in the Gtk-2 environment.
- virtual void [set_all_key_groups](#) ()
Sets up the keys for group events in the Gtk-2 environment.

Additional Inherited Members

7.17.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

7.17.2 Constructor & Destructor Documentation

7.17.2.1 seq64::keys_perform_gtk2::~~keys_perform_gtk2 () [virtual]

Finally, any active patterns/sequences are deleted.

7.17.3 Member Function Documentation

7.17.3.1 std::string seq64::keys_perform_gtk2::key_name (unsigned int key) const [virtual]

In gtkmm, this is done via the gdk_keyval_name() function. Here, in the base class, we just provide an easy-to-create string.

Reimplemented from [seq64::keys_perform](#).

7.17.3.2 void seq64::keys_perform_gtk2::set_all_key_events () [virtual]

The base-class function call makes sure the the related lists are cleared before rebuilding them here.

Reimplemented from [seq64::keys_perform](#).

7.17.3.3 void seq64::keys_perform_gtk2::set_all_key_groups () [virtual]

The base-class function call makes sure the the related lists are cleared before rebuilding them here.

Reimplemented from [seq64::keys_perform](#).

7.18 seq64::keys_perform_transfer Struct Reference

Provides a data-transfer structure to make it easier to fill in a [keys_perform](#) object's members using sscanf().

7.19 seq64::keystroke Class Reference

Encapsulates any practical keystroke.

Public Member Functions

- [keystroke](#) ()
The default constructor for class keystroke.
- [keystroke](#) (unsigned int [key](#), bool press=SEQ64_KEYSTROKE_PRESS, int modkey=int(SEQ64_NO_MASK))
The principal constructor.
- [keystroke](#) (const [keystroke](#) &rhs)
Provides the rote copy constructor.
- [keystroke](#) & [operator=](#) (const [keystroke](#) &rhs)
Provides the rote principal assignment operator.
- bool [is_press](#) () const
'Getter' function for member m_is_press
- bool [is_letter](#) (int ch=SEQ64_KEYSTROKE_BAD_VALUE) const
'Getter' function for member m_key to test letters, handles ASCII only.
- bool [is_delete](#) () const
m_key to test for a delete-causing key.
- unsigned int [key](#) () const
'Getter' function for member m_key
- seq_modifier_t [modifier](#) () const
'Getter' function for member m_modifier
- bool [mod_control](#) () const
'Getter' function for member m_modifier tested for Ctrl key.
- bool [mod_control_shift](#) () const
'Getter' function for member m_modifier tested for Ctrl and Shift key.
- bool [mod_super](#) () const
'Getter' function for member m_modifier tested for Mod4/Super/Windows key.

Private Attributes

- bool [m_is_press](#)
Determines if the key was a press or a release.
- unsigned int [m_key](#)
The key that was pressed or released.
- seq_modifier_t [m_modifier](#)
The optional modifier value.

7.19.1 Detailed Description

Useful in passing more generic events to non-GUI classes.

7.19.2 Constructor & Destructor Documentation

- 7.19.2.1 [seq64::keystroke::keystroke](#) (unsigned int *key*, bool *press* = SEQ64_KEYSTROKE_PRESS, int *modkey* = int (SEQ64_NO_MASK))

Parameters

<i>key</i>	The keystroke number of the key that was pressed or released.
<i>press</i>	If true, the keystroke action was a press, otherwise it was a release.
<i>modkey</i>	The modifier key combination that was pressed, if any, in the form of a bit-mask, as defined in the gdk_basic_keys module. Common mask values are SEQ64_SHIFT_MASK, SEQ64_↵_CONTROL_MASK, SEQ64_MOD1_MASK, and SEQ64_MOD4_MASK. If no modifier, this value is SEQ64_NO_MASK.

7.19.2.2 seq64::keystroke::keystroke (const keystroke & rhs)

Parameters

<i>rhs</i>	The object to be copied.
------------	--------------------------

7.19.3 Member Function Documentation

7.19.3.1 keystroke & seq64::keystroke::operator= (const keystroke & rhs)

Parameters

<i>rhs</i>	The object to be assigned.
------------	----------------------------

Returns

Returns the reference to the current object, for use in assignment chains.

7.19.3.2 bool seq64::keystroke::is_letter (int ch = SEQ64_KEYSTROKE_BAD_VALUE) const

Parameters

<i>ch</i>	An optional character to test as an ASCII letter.
-----------	---

Returns

If a character is not provided, true is returned if it is an upper or lower-case letter. Otherwise, true is returned if the m_key value matches the character case-insensitively.

Tricky Code

7.19.4 Field Documentation

7.19.4.1 bool seq64::keystroke::m_is_press [private]

See the SEQ64_KEYSTROKE_PRESS and SEQ64_KEYSTROKE_RELEASE readability macros.

7.19.4.2 unsigned int seq64::keystroke::m_key [private]

Generally, the extended ASCII range (0 to 255) is supported. However, Gtk-2.x/3.x will generally support the full gamut of characters defined in the gdk_basic_keys.h module. We define minimum and maximum range macros for keystrokes that are a bit generous.

7.19.4.3 seq_modifier_t seq64::keystroke::m_modifier [private]

Note that SEQ64_NO_MASK is our word for 0, meaning "no modifier".

7.20 seq64::lash Class Reference

This class supports LASH operations, if compiled with LASH support (i.e.

Public Member Functions

- [lash](#) ([perform](#) &p, int argc, char **argv)
This constructor calls `lash_extract()`, using the command-line arguments, if `SEQ64_LASH_SUPPORT` is enabled.
- void [set_alsa_client_id](#) (int id)
Make ourselves a LASH ALSA client.
- void [start](#) ()
Process any LASH events every 250 msec, which is an arbitrarily chosen interval.
- bool [process_events](#) ()
Process LASH events.

Private Member Functions

- bool [init](#) ()
Initializes LASH support, if enabled.
- void [handle_event](#) (lash_event_t *conf)
Handle a LASH event.
- void [handle_config](#) (lash_config_t *conf)
Handle a LASH configuration item.

Private Attributes

- [perform](#) & [m_perform](#)
A hook into the single perform object in the application.

7.20.1 Detailed Description

SEQ64_LASH_SUPPORT is defined). All of the #ifdef skeleton work is done in this class in such a way that any other part of the code can use this class whether or not lash support is actually built in; the functions will just do nothing.

7.20.2 Constructor & Destructor Documentation

7.20.2.1 seq64::lash::lash ([perform](#) & p, int argc, char ** argv)

We fixed the crazy usage of argc and argv here and in the client code in the seq24 module.

Parameters

<i>p</i>	The perform object that needs to implement LASH support.
<i>argc</i>	The number of command-line arguments.
<i>argv</i>	The command-line arguments.

7.20.3 Member Function Documentation

7.20.3.1 `void seq64::lash::set_alsa_client_id (int id)`

/param *id* The ALSA client ID to be set.

7.20.3.2 `bool seq64::lash::process_events ()`

Returns

Always returns true.

7.20.3.3 `bool seq64::lash::init ()` [private]

Returns

Returns true if the LASH subsystem was able to be initialized, and a LASH client representative (*m_client*) was allocated.

7.20.3.4 `void seq64::lash::handle_event (lash_event_t* ev)` [private]

Parameters

<i>ev</i>	Provides the event to be handled.
-----------	-----------------------------------

7.20.3.5 `void seq64::lash::handle_config (lash_config_t* conf)` [private]

Currently incomplete.

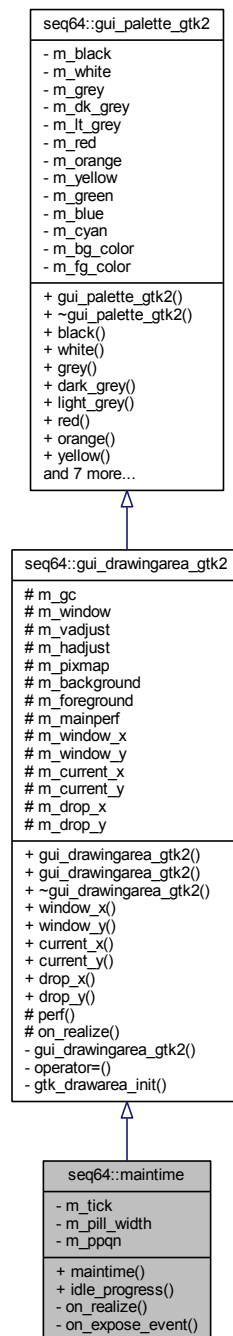
Parameters

<i>conf</i>	Provides the configuration item to handle.
-------------	--

7.21 seq64::maintime Class Reference

This class provides the drawing of the progress bar at the top of the main window, along with the "pills" that move in time with the measures.

Inheritance diagram for seq64::maintime:



Public Member Functions

- **maintime** (perform &p, int ppqn=c_ppqn, int pillwidth=c_pill_width, int x=c_maintime_x, int y=c_maintime_y)
This constructor sets up the colors black, white, and grey, and then allocates them.
- int **idle_progress** (long ticks)
This function clears the window, sets the foreground to black, draws the "time" window's rectangle, and then draws a rectangle for noting the progress of the beat, and the progress for a bar.

Private Member Functions

- void [on_realize](#) ()

Handles realization of the window.

- bool [on_expose_event](#) (GdkEventExpose *ev)

This function merely idles.

Additional Inherited Members

7.21.1 Constructor & Destructor Documentation

7.21.1.1 `seq64::maintime::maintime (perform & p, int ppqn = c_ppqn, int pillwidth = c_pill_width, int x = c_maintime_x, int y = c_maintime_y)`

In the constructor you can only allocate colors; `get_window()` would return 0 because the windows has not yet been realized.

7.21.2 Member Function Documentation

7.21.2.1 `int seq64::maintime::idle_progress (long ticks)`

Idle hands do the devil's work. We should eventually support some generic coloring for "dark themes". The default coloring is better for "light themes".

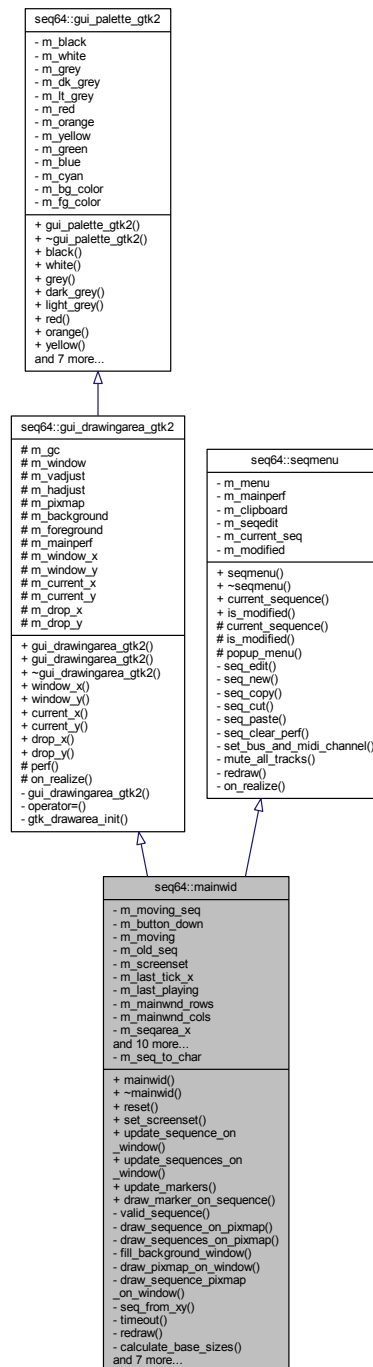
7.21.2.2 `void seq64::maintime::on_realize () [private]`

It performs the base class's [on_realize\(\)](#) function. It then allocates some additional resources: a window, a GC (?), and it clears the window. Then it sets the default size of the window, specified by GUI constructor parameters.

7.22 seq64::mainwid Class Reference

This class implement the piano roll area of the application.

Inheritance diagram for seq64::mainwid:



Public Member Functions

- [mainwid](#) (perform &p)

This constructor sets a lot of the members, but not all.

- [~mainwid](#) ()

A rote destructor.

- void [reset](#) ()

- This function redraws everything and queues up a redraw operation.*
- void [set_screenset](#) (int ss)
Set the current screen-set.
- void [update_sequence_on_window](#) (int seq)
Updates the image of one sequencer.
- void [update_sequences_on_window](#) ()
Updates the image of multiple sequencers.
- void [update_markers](#) (int ticks)
Draw the cursors (long vertical bars) on each sequence, so that they follow the playing progress of each sequence in the mainwid (Patterns Panel.)
- void [draw_marker_on_sequence](#) (int seq, int tick)
Does the actual drawing of one pattern/sequence position marker, a vertical progress bar.

Private Member Functions

- bool [valid_sequence](#) (int seq)
Common-code helper function.
- void [draw_sequence_on_pixmap](#) (int seq)
This function draws a specific pattern/sequence on the pixmap located in the main window of the application, the Patterns Panel.
- void [draw_sequences_on_pixmap](#) ()
This function fills the pixmap with sequences.
- void [fill_background_window](#) ()
This function updates the background window, clearing it.
- void [draw_pixmap_on_window](#) ()
This function queues the blit of pixmap to window.
- void [draw_sequence_pixmap_on_window](#) (int seq)
This function draws something in the Patterns Panel.
- int [seq_from_xy](#) (int x, int y)
Translates XY coordinates in the Patterns Panel to a sequence number.
- int [timeout](#) ()
Is this a nullified callback?
- void [redraw](#) (int seq)
Draw the the given pattern/sequence again.
- void [calculate_base_sizes](#) (int seq, int &basex, int &basey)
Provides a way to calculate the base x and y size values for the pattern map.
- void [on_realize](#) ()
For this GTK callback, on realization of window, initialize the shiz.
- bool [on_expose_event](#) (GdkEventExpose *ev)
Implements the GTK expose event callback.
- bool [on_button_press_event](#) (GdkEventButton *ev)
Handles a press of a mouse button.
- bool [on_button_release_event](#) (GdkEventButton *ev)
Handles a release of a mouse button.
- bool [on_motion_notify_event](#) (GdkEventMotion *p0)
Handle the motion of the mouse if a mouse button is down and in another sequence and if the current sequence is not in edit mode.
- bool [on_focus_in_event](#) (GdkEventFocus *)
Handles an on-focus event.
- bool [on_focus_out_event](#) (GdkEventFocus *)
Handles an out-of-focus event.

Private Attributes

- int `m_mainwnd_rows`

These values are assigned to the values given by the constants of similar names in `globals.h`, and we will make them parameters later.

Additional Inherited Members

7.22.1 Constructor & Destructor Documentation

7.22.1.1 `seq64::mainwid::mainwid (perform & p)`

And it asks for a size of `c_mainwid_x` by `c_mainwid_y`. It adds GDK masks for button presses, releases, and motion, and key presses and focus changes.

Parameters

<code>p</code>	Provides the reference to the all-important perform object.
----------------	---

7.22.2 Member Function Documentation

7.22.2.1 `void seq64::mainwid::set_screenset (int a_ss)`

Parameters

<code>a_ss</code>	Provides the screen-set number to set.
-------------------	--

7.22.2.2 `void seq64::mainwid::update_sequence_on_window (int seqnum)`

Parameters

<code>seqnum</code>	Provides the number of the sequence to update.
---------------------	--

7.22.2.3 `void seq64::mainwid::update_markers (int ticks)`

Parameters

<code>ticks</code>	Starting point for drawing the markers.
--------------------	---

7.22.2.4 `void seq64::mainwid::draw_marker_on_sequence (int seqnum, int tick)`

If the sequence has no events, this function doesn't bother even drawing a position marker.

Parameters

<code>seqnum</code>	Provides the number of the sequence to draw.
<code>tick</code>	Provides the location to draw the marker.

7.22.2.5 `bool seq64::mainwid::valid_sequence (int seqnum)` `[private]`

Parameters

<i>seqnum</i>	Provides the number of the sequence to validate.
---------------	--

Returns

Returns true if the sequence number is valid for the current m_screenset value.

7.22.2.6 void seq64::mainwid::draw_sequence_on_pixmap (int *seqnum*) [private]

The sequence is drawn only if it is in the current screen set (indicated by m_screenset).

Note

If only the main window is up, then the sequences just appear to play – the progress bars move in each pattern. Gaps in the song don't change the appearance of the patterns. But, if the Song (performance) Editor window is up, and the song is started using the controls in the Song (performance) Editor windows, then the active patterns are black (!) while playing, and white when gaps in the song are encountered. Also, the muting status in the main window seems to be ignored (based on coloring, anyway). However, the muting in the Song (performance) windows does seem to be in force.

Parameters

<i>seqnum</i>	Provides the number of the sequence slot that needs to be drawn.
---------------	--

7.22.2.7 void seq64::mainwid::draw_sequence_pixmap_on_window (int *seqnum*) [private]

The sequence is drawn only if it is in the current screen set (indicated by m_screenset). However, if we comment out this code, we can't see any difference in the Patterns Panel, even when playback is ongoing!

Parameters

<i>seqnum</i>	Provides the number of the sequence to draw.
---------------	--

7.22.2.8 int seq64::mainwid::seq_from_xy (int *a_x*, int *a_y*) [private]

Parameters

<i>a_x</i>	Provides the x coordinate.
<i>a_y</i>	Provides the y coordinate.

Returns

Returns -1 if the sequence number cannot be calculated.

7.22.2.9 int seq64::mainwid::timeout () [private]

Returns

Always returns true.

7.22.2.10 void seq64::mainwid::redraw (int *seqnum*) [private], [virtual]

Parameters

<i>seqnum</i>	Provides the number of the sequence to draw.
---------------	--

Implements [seq64::seqmenu](#).

7.22.2.11 `void seq64::mainwid::calculate_base_sizes (int seqnum, int & basex, int & basey)` [private]

The values are returned as side-effects.

Parameters

<i>seqnum</i>	Provides the number of the sequence to calculate.
<i>basex</i>	A return parameter for the x coordinate of the base size.
<i>basey</i>	A return parameter for the y coordinate of the base size.

7.22.2.12 `void seq64::mainwid::on_realize ()` [private]

It allocates any additional resources that weren't initialized in the constructor.

7.22.2.13 `bool seq64::mainwid::on_expose_event (GdkEventExpose * a_e)` [private]

Parameters

<i>a_e</i>	The expose event.
------------	-------------------

Returns

Always returns true.

7.22.2.14 `bool seq64::mainwid::on_button_press_event (GdkEventButton * p0)` [private]

It grabs the focus, calculates the pattern/sequence over which the button press occurred, and sets the `m_button_down` flag if it is over a pattern.

Parameters

<i>p0</i>	Provides the parameters of the button event.
-----------	--

Returns

Always returns true.

7.22.2.15 `bool seq64::mainwid::on_button_release_event (GdkEventButton * p0)` [private]

This event is a lot more complex than a press.

Parameters

<i>p0</i>	Provides the parameters of the button event.
-----------	--

Returns

Always returns true.

7.22.2.16 `bool seq64::mainwid::on_motion_notify_event (GdkEventMotion * p0)` [private]

Parameters

<i>p0</i>	Provides the parameters of the button event.
-----------	--

Returns

Always returns true.

7.22.2.17 `bool seq64::mainwid::on_focus_in_event (GdkEventFocus *) [private]`

Just sets the Gtk::HAS_FOCUS flag.

Returns

Always returns false.

7.22.2.18 `bool seq64::mainwid::on_focus_out_event (GdkEventFocus *) [private]`

Just unsets the Gtk::HAS_FOCUS flag.

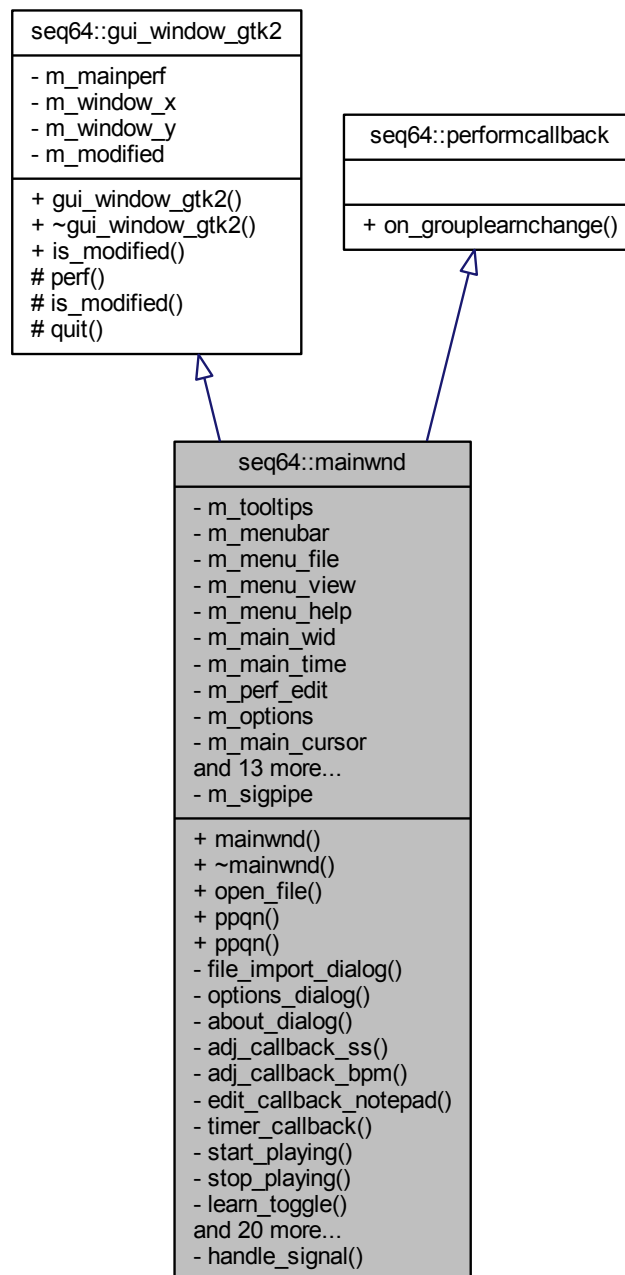
Returns

Always returns false.

7.23 seq64::mainwnd Class Reference

This class implements the functionality of the main window of the application, except for the Patterns Panel functionality, which is implemented in the mainwid class.

Inheritance diagram for seq64::mainwnd:



Public Member Functions

- `mainwnd` (`perform` &`a_p`)

The constructor the main window of the application.

- `~mainwnd` ()

This destructor must explicitly delete some allocated resources.

- void `open_file` (const std::string &)

- *Opens and parses (reads) a MIDI file.*
- int `ppqn` () const
'Getter' function for member m_ppqn
- void `ppqn` (int ppqn)
'Setter' function for member m_ppqn We can't set the PPQN value when the mainwnd is created, we have to do it later, using this function.

Private Member Functions

- void `file_import_dialog` ()
Presents a file dialog to import a MIDI file.
- void `options_dialog` ()
Opens the File / Options dialog.
- void `about_dialog` ()
Presents a Help / About dialog.
- void `adj_callback_ss` ()
This function is the callback for adjusting the screen-set value.
- void `adj_callback_bpm` ()
This function is the callback for adjusting the BPM value.
- void `edit_callback_notepad` ()
A callback function for handling an edit to the screen-set notepad.
- bool `timer_callback` ()
This function is the GTK timer callback, used to draw our current time and BPM on_events (the main window).
- void `learn_toggle` ()
Toggle the group-learn status.
- void `open_performance_edit` ()
Opens the Performance Editor (Song Editor).
- void `sequence_key` (int seq)
Use the sequence key to toggle the playing of an active pattern in the current screen-set.
- void `update_window_title` ()
Updates the title shown in the title bar of the window.
- void `toLower` (std::string &)
Converts a string to lower-case letters.
- void `file_new` ()
A callback function for the File / New menu entry.
- void `file_open` ()
A callback function for the File / Open menu entry.
- void `file_save` ()
A callback function for the File / Save menu entry.
- void `file_save_as` ()
A callback function for the File / Save As menu entry.
- void `file_exit` ()
A callback function for the File / Exit menu entry.
- void `new_file` ()
Actually does the work of setting up for a new file.
- bool `save_file` ()
Saves the current state in a MIDI file.
- void `choose_file` ()
Creates a file-chooser dialog.
- int `query_save_changes` ()
Queries the user to save the changes made while the application was running.

- bool [is_save](#) ()
If the data is modified, then the user is queried, and the file is save if okayed.
- bool [install_signal_handlers](#) ()
Installs the signal handlers and pipe code.
- bool [signal_action](#) (Glib::IOCondition condition)
Handles saving or exiting actions when signalled.
- bool [on_delete_event](#) (GdkEventAny *a_e)
This callback function handles a delete event from ...?
- bool [on_key_press_event](#) (GdkEventKey *a_ev)
Handles a key press event.
- bool [on_key_release_event](#) (GdkEventKey *a_ev)
Handles a key release event.
- virtual void [on_grouplearnchange](#) (bool state)
Notification handler for learn mode toggle.

Static Private Member Functions

- static void [handle_signal](#) (int sig)
This function is the handler for system signals (SIGUSR1, SIGINT...) It writes a message to the pipe and leaves as soon as possible.

Private Attributes

- Gtk::MenuBar * [m_menubar](#)
Theses objects support the menu and its sub-menus.
- [mainwid](#) * [m_main_wid](#)
The biggest sub-components of mainwnd.
- [maintime](#) * [m_main_time](#)
Is this the bar at the top that shows moving squares?
- [perfedit](#) * [m_perf_edit](#)
A pointer to the song/performance editor.
- [options](#) * [m_options](#)
A pointer to the program options.
- Gdk::Cursor [m_main_cursor](#)
Mouse cursor?
- Gtk::Button * [m_button_learn](#)
This button is the learn button, otherwise known as the "L" button.
- Gtk::Button * [m_button_stop](#)
Implements the red square stop button.
- Gtk::Button * [m_button_play](#)
Implements the green triangle play button.
- Gtk::Button * [m_button_perfedit](#)
The button for bringing up the Song Editor (Performance Editor).
- Gtk::SpinButton * [m_spinbutton_bpm](#)
The spin/adjustment controls for the BPM (beats-per-minute) value.
- Gtk::SpinButton * [m_spinbutton_ss](#)
The spin/adjustment controls for the screen set value.
- Gtk::SpinButton * [m_spinbutton_load_offset](#)
The spin/adjustment controls for the load offset value.
- Gtk::Entry * [m_entry_notes](#)

What is this?

- sigc::connection [m_timeout_connect](#)

Provides a timeout handler.

- int [m_ppqn](#)

Saves the PPQN value obtained from the MIDI file (or the default value, c_ppqn, if SEQ64_USE_DEFAULT_PPQN was specified in reading the MIDI file.

Static Private Attributes

- static int [m_sigpipe](#) [2]

Interesting; what is this used for.

Additional Inherited Members

7.23.1 Constructor & Destructor Documentation

7.23.1.1 seq64::mainwnd::mainwnd (perform & p)

This constructor is way too large; it would be nicer to provide a number of well-named initialization functions.

Parameters

p	Refers to the main performance object.
-------------------	--

Todo Offload most of the work into an initialization function like options does; make the perform parameter a reference.

File menu items, their accelerator keys, and their hot keys.

View menu items and their hot keys.

Help menu items

Top panel items, including the logo (updated for the new version of this application) and the "timeline" progress bar.

7.23.2 Member Function Documentation

7.23.2.1 void seq64::mainwnd::open_file (const std::string & fn)

We leave the ppqn parameter set to the SEQ64_USE_DEFAULT for now, to preserve the legacy behavior of using c_ppqn, and scaling the running time against the PPQN read from the MIDI file. Later, we can provide a value like 0, that will certainly be changed by reading the MIDI file.

We don't need to specify the "propformat" parameter of the midifile constructor when reading the MIDI file, since reading handles both the old and new formats.

Parameters

fn	Provides the file-name for the MIDI file to be opened.
--------------------	--

7.23.2.2 void seq64::mainwnd::file_import_dialog () [private]

Note that every track of the MIDI file will be imported, even if the track is only a label track (without any MIDI events) or a very long track.

7.23.2.3 void seq64::mainwnd::about_dialog () [private]

I (Chris) took the liberty of tacking my name at the end, and hope to eventually have done enough work to warrant having it there.

7.23.2.4 void seq64::mainwnd::adj_callback_ss () [private]

Sets the screen set value in the Performance/Song window, the Patterns, and something about setting the text based on a screen-set notepad from the Performance/Song window.

Screen-set notepad?

7.23.2.5 void seq64::mainwnd::open_performance_edit () [private]

Todo Try to find a way to set m_modified only if the song editor actually changes something, instead of just because it was opened.

7.23.2.6 void seq64::mainwnd::update_window_title () [private]

Note that the name of the application is obtained by the "(SEQ64_PACKAGE)" construction. Never saw that thing before. Perhaps it is a Glib thing.

7.23.2.7 bool seq64::mainwnd::save_file () [private]

Here we specify the current value of m_ppqn, which was set when reading the MIDI file.

7.23.2.8 bool seq64::mainwnd::signal_action (Glib::IOCondition *condition*) [private]

Returns

Returns true if the signalling was able to be completed, even if it was an unexpected signal.

7.23.2.9 bool seq64::mainwnd::on_delete_event (GdkEventAny * *a_e*) [private]

Any changed data is saved. If the pattern is playing, then it is stopped.

7.23.2.10 bool seq64::mainwnd::on_key_press_event (GdkEventKey * *a_ev*) [private]

It also handles the control-key and modifier-key combinations matching the entries in its list of if statements.

Todo Test this functionality in old and new application.

7.23.2.11 bool seq64::mainwnd::on_key_release_event (GdkEventKey * *a_ev*) [private]

Is this worth turning into a switch statement? Or offloading to a perform member function? The latter.

Todo Test this functionality in old and new application.

Returns

Always returns false.

7.23.2.12 void seq64::mainwnd::on_grouplearnchange (bool *state*) [private],[virtual]

This handler responds to a learn-mode change from [perf\(\)](#).

Reimplemented from [seq64::performcallback](#).

7.23.3 Field Documentation

7.23.3.1 int seq64::mainwnd::m_sigpipe [static],[private]

This static member provides a couple of pipes for signalling/messaging.

7.23.3.2 mainwid* seq64::mainwnd::m_main_wid [private]

The first is the Patterns Panel.

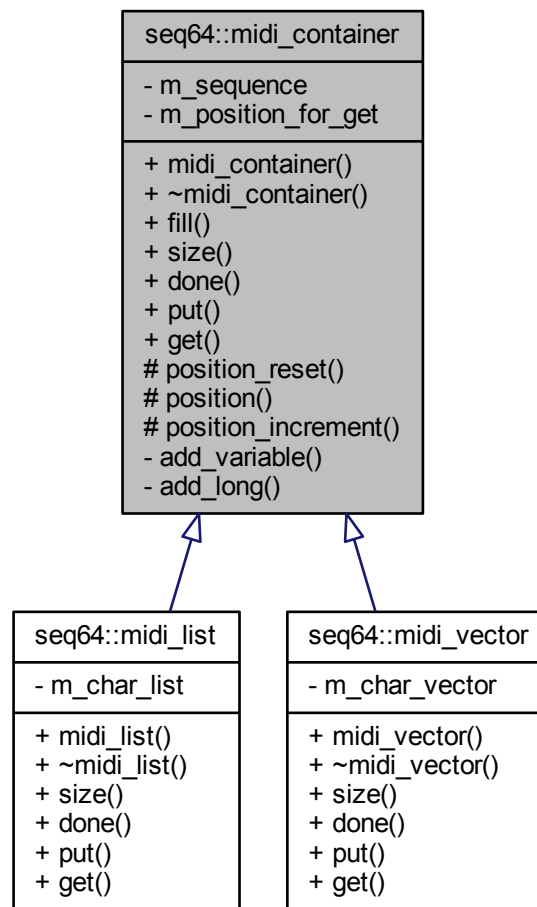
7.23.3.3 Gtk::SpinButton* seq64::mainwnd::m_spinbutton_load_offset [private]

However, where is this button located? It is handled in the code, but I've never seen the button!

7.24 seq64::midi_container Class Reference

This class is the abstract base class for a container of MIDI track information.

Inheritance diagram for seq64::midi_container:



Public Member Functions

- **midi_container** ([sequence](#) &seq)
Fills in the few members of this class.
- virtual **~midi_container** ()
A rote constructor needed for a base class.
- void **fill** (int tracknumber)
This function fills the given character list with MIDI data from the current sequence, preparatory to writing it to a file.
- virtual std::size_t **size** () const
Returns the size of the container, in midibytes.
- virtual bool **done** () const
Instead of checking for the size of the container when "emptying" it [see the [midifile::write\(\)](#) function], use this function, which is overridden to match the type of container being used.
- virtual void **put** (midibyte b)=0
Provides a way to add a MIDI byte into the container.
- virtual midibyte **get** ()=0
Provide a way to get the next byte from the container.

Protected Member Functions

- unsigned int [position](#) () const
Returns the current position.

Private Member Functions

- void [add_variable](#) (long v)
This function masks off the lower 8 bits of the long parameter, then shifts it right 7, and, if there are still set bits, it encodes it into the buffer in reverse order.
- void [add_long](#) (long x)
What is the difference between this function and [add_list_var\(\)](#)?

Private Attributes

- [sequence](#) & [m_sequence](#)
Provide a hook into a sequence so that we can exchange data with a sequence object.
- unsigned int [m_position_for_get](#)
Provides the position in the container when making a series of [get\(\)](#) calls on the container.

7.24.1 Member Function Documentation

7.24.1.1 void seq64::midi_container::fill (int *tracknumber*)

Note that some of the events might not come out in the same order they were stored in (we see that with program-change events).

This function replaces [sequence::fill_container\(\)](#).

Now, for sequence 0, an alternate format for writing the sequencer number chunk is "FF 00 00". But that format can only occur in the first track, and the rest of the tracks then don't need a sequence number, since it is assume to increment. This application doesn't bother with that shortcut.

Not threadsafe The sequence object bound to this container needs to provide the locking mechanism when calling this function.

Parameters

<i>tracknumber</i>	Provides the track number. This number is masked into the track information.
--------------------	--

7.24.1.2 virtual void seq64::midi_container::put (midibyte *b*) [pure virtual]

The original seq24 container used an std::list and a push_front operation.

Implemented in [seq64::midi_list](#), and [seq64::midi_vector](#).

7.24.1.3 virtual midibyte seq64::midi_container::get () [pure virtual]

It also increments [m_position_for_get](#).

Implemented in [seq64::midi_list](#), and [seq64::midi_vector](#).

7.24.1.4 unsigned int seq64::midi_container::position () const [inline], [protected]

Before the return, the position counter is incremented to the next position.

7.24.1.5 `void seq64::midi_container::add_variable (long v) [private]`

This function "replaces" `sequence::add_list_var()`.

7.24.1.6 `void seq64::midi_container::add_long (long x) [private]`

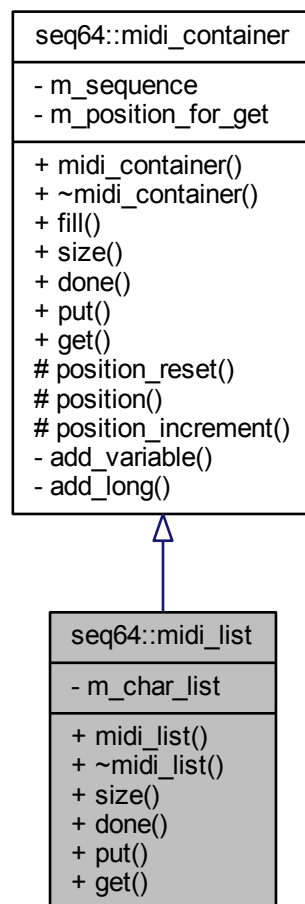
This function "replaces" `sequence::add_long_list()`.

This was a *global* internal function called `addLongList()`. Let's at least make it a private member now, and hew to the naming conventions of this class.

7.25 seq64::midi_list Class Reference

This class is the `std::list` implementation of the [midi_container](#).

Inheritance diagram for `seq64::midi_list`:



Public Member Functions

- [midi_list](#) ([sequence](#) &seq)
This constructor fills in the members.
- virtual [~midi_list](#) ()
A rote constructor needed for a base class.
- virtual `std::size_t` [size](#) () const
Returns the size of the container, in midibytes.
- virtual `bool` [done](#) () const
For popping data from the MIDI list, we are done when the container is empty.
- virtual `void` [put](#) (midibyte b)
Provides a way to add a MIDI byte into the list.
- virtual `midibyte` [get](#) ()
Provide a way to get the next byte from the container.

Private Types

- `typedef std::list< midibyte >` [CharList](#)
Provides the type of this container.

Private Attributes

- [CharList](#) [m_char_list](#)
The container itself.

Additional Inherited Members

7.25.1 Member Typedef Documentation

7.25.1.1 `typedef std::list<midibyte> seq64::midi_list::CharList` [private]

This type is basically the same as the container used in the midifile module, and almost identical to the CharList type defined in the sequence module.

7.25.2 Member Function Documentation

7.25.2.1 `virtual void seq64::midi_list::put (midibyte b)` [inline],[virtual]

The original seq24 list used an `std::list` and a `push_front` operation.

Implements [seq64::midi_container](#).

7.25.2.2 `virtual midibyte seq64::midi_list::get ()` [inline],[virtual]

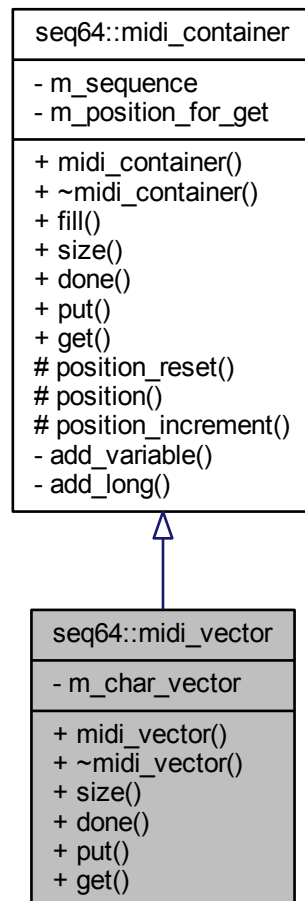
In this implement, `m_position_for_get` is not used. The elements of the container are popped of backward!

Implements [seq64::midi_container](#).

7.26 seq64::midi_vector Class Reference

This class is the std::vector implementation of the [midi_container](#).

Inheritance diagram for seq64::midi_vector:



Public Member Functions

- [midi_vector](#) ([sequence](#) &seq)
This constructor fills in the members.
- virtual [~midi_vector](#) ()
A rote constructor needed for a base class.
- virtual std::size_t [size](#) () const
Returns the size of the container, in midibytes.
- virtual bool [done](#) () const
For iterating through the data in the MIDI vector, we are done when we've gotten the last element of the container.
- virtual void [put](#) (midibyte b)
Provides a way to add a MIDI byte into the list.
- virtual midibyte [get](#) ()
Provide a way to get the next byte from the container.

Private Types

- typedef std::vector< midibyte > [CharVector](#)
Provides the type of this container.

Private Attributes

- [CharVector m_char_vector](#)
The container itself.

Additional Inherited Members

7.26.1 Member Function Documentation

7.26.1.1 virtual void seq64::midi_vector::put (midibyte *b*) [inline],[virtual]

The original seq24 list used an std::list and a push_front operation.

Implements [seq64::midi_container](#).

7.26.1.2 virtual midibyte seq64::midi_vector::get () [inline],[virtual]

In this implement, m_position_for_get is not used. The elements of the container are popped of backward!

Implements [seq64::midi_container](#).

7.27 seq64::midifile Class Reference

This class handles the parsing and writing of MIDI files.

Public Member Functions

- [midifile](#) (const std::string &name, int [ppqn](#)=SEQ64_USE_DEFAULT_PPQN, bool propformat=true)
Principal constructor.
- [~midifile](#) ()
A rote destructor.
- bool [parse](#) ([perform](#) &a_perf, int a_screen_set)
This function opens a binary MIDI file and parses it into sequences and other application objects.
- bool [write](#) ([perform](#) &a_perf)
Write the whole MIDI data and Seq24 information out to the file.
- int [ppqn](#) () const
'Getter' function for member m_ppqn Provides a way to get the actual value of PPQN used in processing the sequences when [parse\(\)](#) was called.

Private Member Functions

- unsigned long [parse_prop_header](#) (int file_size)
Parse the proprietary header, figuring out if it is the new format, or the legacy format, for sequencer-specific data.
- bool [parse_proprietary_track](#) ([perform](#) &a_perf, int file_size)
After all of the conventional MIDI tracks are read, we're now at the "proprietary" Seq24 data section, which describes the various features that Seq24 supports.

- unsigned long `read_long ()`
Reads 4 bytes of data using `read_byte()`.
- unsigned short `read_short ()`
Reads 2 bytes of data using `read_byte()`.
- unsigned char `read_byte ()`
Reads 1 byte of data directly into the `m_data` vector, incrementing `m_pos` after doing so.
- unsigned long `read_varinum ()`
Read a MIDI Variable-Length Value (VLV), which has a variable number of bytes.
- void `write_long (unsigned long)`
Writes 4 bytes, using the `write_byte()` function.
- void `write_short (unsigned short)`
Writes 2 bytes, using the `write_byte()` function.
- void `write_byte (unsigned char c)`
Writes 1 byte.
- void `write_varinum (unsigned long)`
Writes a MIDI Variable-Length Value (VLV), which has a variable number of bytes.
- void `write_track_name (const std::string &trackname)`
Writes out a track name.
- void `write_seq_number (unsigned short seqnum)`
Writes out a sequence number.
- void `write_track_end ()`
Writes out the end-of-track marker.
- void `write_prop_header (unsigned long tag, long len)`
We want to write:
- bool `write_proprietary_track (perform &a_perf)`
Writes out the proprietary section, using the new format if the legacy format is not in force.
- long `varinum_size (long len) const`
Calculates the length of a variable length value.
- long `prop_item_size (long datalen) const`
Calculates the size of a proprietary item, as written by the `write_prop_header()` function, plus whatever is called to write the data.
- long `track_name_size (const std::string &trackname) const`
Calculates the size of a trackname and the meta event that specifies it.
- long `seq_number_size () const`
Returns the size of a sequence-number event, which is always 5 bytes, plus one byte for the delta time that precedes it.
- long `track_end_size () const`
Returns the size of a track-end event, which is always 3 bytes.

Private Attributes

- int `m_pos`
Holds the position in the MIDI file.
- const std::string `m_name`
The unchanging name of the MIDI file.
- std::vector< unsigned char > `m_data`
This vector of characters holds our MIDI data.
- std::list< unsigned char > `m_char_list`
Provides a list of characters.
- bool `m_new_format`
Use the new format for the proprietary footer section of the Seq24 MIDI file.
- int `m_ppqn`
Provides the current value of the PPQN, which used to be the constant `c_ppqn`.

7.27.1 Detailed Description

In addition to the standard MIDI tracks, it also handles some "private" or "proprietary" tracks specific to Seq24. It does not, however, handle SYSEX events.

7.27.2 Constructor & Destructor Documentation

7.27.2.1 `seq64::midifile::midifile (const std::string & name, int ppqn = SEQ64_USE_DEFAULT_PPQN, bool propformat = true)`

Parameters

<i>name</i>	Provides the name of the MIDI file to be read or written.
<i>ppqn</i>	Provides the initial value of the PPQN setting. It is handled differently for parsing (reading) versus writing the MIDI file. <ul style="list-style-type: none"> • Reading. <ul style="list-style-type: none"> – If set to SEQ64_USE_DEFAULT_PPQN, the legacy application behavior is used. The m_ppqn member is set to the default PPQN, c_ppqn. The value read from the MIDI file, ppqn, is then use to scale the running-time of the sequence relative to c_ppqn. – Otherwise, m_ppqn is set to the value read from the MIDI file. No scaling is done. Since the value gets written, specify ppqn as 0, an obviously bogus value. • Writing. This value is written to the MIDI file in the header chunk of the song.
<i>propformat</i>	If true, write out the MIDI file using the new MIDI-compliant sequencer-specific format for the seq24-specific SeqSpec tags defined in the globals module. This option is true by default. Note that this option is only used in writing; reading can handle either format transparently.

7.27.3 Member Function Documentation

7.27.3.1 `bool seq64::midifile::parse (perform & a_perf, int a_screen_set)`

In addition to the standard MIDI track data in a normal track, Seq24 adds four sequencer-specific events just before the end of the track:

```
c_triggers_new:   SeqSpec FF 7F 1C 24 24 00 08 00 00 ...
c_midibus:        SeqSpec FF 7F 05 24 24 00 01 00
c_timesig:        SeqSpec FF 7F 06 24 24 00 06 04 04
c_midich:         SeqSpec FF 7F 05 24 24 00 02 06
```

Standard MIDI provides for the port and channel specifications, but they are apparently considered obsolete:

```
Obsolete meta-event:      Replacement:

MIDI port (buss):   FF 21 01 po      Device (port) name: FF 09 len text
MIDI channel:      FF 20 01 ch
```

What do other applications use for specifying port/channel?

7.27.3.2 `int seq64::midifile::ppqn () const [inline]`

The PPQN will be either c_ppqn (legacy behavior) or the value read from the file, depending on the ppqn parameter passed to the midifile constructor.

7.27.3.3 unsigned long seq64::midifile::parse_prop_header (int *file_size*) [private]

The new format creates a final track chunk, starting with "MTrk". Then comes the delta-time (here, 0), and the event. An event is a MIDI event, a SysEx event, or a Meta event.

A MIDI Sequencer Specific meta message includes either a delta time or absolute time, and the MIDI Sequencer Specific event encoded as follows:

```
0xFF 0x7F 0x02 length data
```

For convenience, this function first checks the amount of file data left. Then it reads a long value. If the value starts with FF, then that signals the new format. Otherwise, it is probably the old format, and the long value is a control tag (0x242400nn), which can be returned immediately.

If it is the new format, we back up to the FF, then get the next byte, which should be a 7F. If so, then we read the length (a variable length value) of the data, and then read the long value, which should be the control tag, which, again, is returned by this function.

Note

Most sequencers seem to be tolerant of both the lack of an "MTrk" marker and of the presence of an unwrapped control tag, and so can handle both the old and new formats of the final proprietary track.

Parameters

<i>file_size</i>	The size of the data file. This value is compared against the member <code>m_pos</code> (the position inside <code>m_data[]</code>), to make sure there is enough data left to process.
------------------	--

Returns

Returns the control-tag value found. These are the values, such as `c_midich`, found in the `globals` module, that indicate the type of sequencer-specific data that comes next. If there is not enough data to process, then 0 is returned.

7.27.3.4 bool seq64::midifile::parse_proprietary_track (perform & *a_perf*, int *file_size*) [private]

It consists of series of tags:

- `c_midictrl`
- `c_midiclocks`
- `c_notes`
- `c_bpmtag`
- `c_mutegroups`

(There are more tags defined in the `globals` module, but they are not used in this function. This doesn't quite make sense, as there are also some "triggers" values, and we're pretty sure the application uses them.)

The format is (1) tag ID; (2) length of data; (3) the data.

Change Note ca 2015-08-16 First, we separate out this function for a little more clarify. Then we add code to handle reading both the legacy Seq24 format and the new, MIDI-compliant format. Note that the format is not quite correct, since it doesn't handle a MIDI manufacturer's ID, making it a single byte that is part of the data.

Parameters

<i>a_perf</i>	The performance object that is being set via the incoming MIDI file.
<i>file_size</i>	The file size as determined in the parse() function.

There is also an implicit parameter in the `m_pos` member variable.

7.27.3.5 unsigned long seq64::midifile::read_long () [private]

Warning

This code looks endian-dependent and integer-size dependent.

7.27.3.6 unsigned short seq64::midifile::read_short () [private]

Warning

This code looks endian-dependent.

7.27.3.7 unsigned long seq64::midifile::read_varinum () [private]

This function reads the bytes while bit 7 is set in each byte. Bit 7 is a continuation bit. See [write_varinum\(\)](#) for more information.

7.27.3.8 void seq64::midifile::write_long (unsigned long a_x) [private]

Warning

This code looks endian-dependent.

7.27.3.9 void seq64::midifile::write_short (unsigned short a_x) [private]

Warning

This code looks endian-dependent.

7.27.3.10 void seq64::midifile::write_byte (unsigned char c) [inline], [private]

The byte is written to the `m_char_list` member, using a call to `push_back()`.

7.27.3.11 void seq64::midifile::write_varinum (unsigned long value) [private]

A MIDI file Variable Length Value is stored in bytes. Each byte has two parts: 7 bits of data and 1 continuation bit. The highest-order bit is set to 1 if there is another byte of the number to follow. The highest-order bit is set to 0 if this byte is the last byte in the VLV.

To recreate a number represented by a VLV, first you remove the continuation bit and then concatenate the leftover bits into a single number.

To generate a VLV from a given number, break the number up into 7 bit units and then apply the correct continuation bit to each byte.

In theory, you could have a very long VLV number which was quite large; however, in the standard MIDI file specification, the maximum length of a VLV value is 5 bytes, and the number it represents can not be larger than 4 bytes.

Here are some common cases:

- Numbers between 0 and 127 (0x7F) are represented by a single byte.
- 0x80 is represented as "0x81 0x00".
- 0xFFFFFFFF (the largest number) is represented as "0xFF 0xFF 0xFF 0x7F".

Also see the [varinum_size\(\)](#) function.

7.27.3.12 void seq64::midifile::write_track_name (const std::string & trackname) [private]

Note that we have to precede this "event" with a delta time value, set to 0.

7.27.3.13 void seq64::midifile::write_seq_number (unsigned short seqnum) [private]

The format is "FF 00 02 ss ss", where "02" is actually the constant length of the data. We have to precede these values with a 0 delta time, of course.

Now, for sequence 0, an alternate format is "FF 00 00". But that format can only occur in the first track, and the rest of the tracks then don't need a sequence number, since it is assume to increment. This application doesn't bother with that shortcut.

7.27.3.14 void seq64::midifile::write_prop_header (unsigned long control_tag, long data_length) [private]

- 0x4D54726B. The track tag "MTrk". The MIDI spec requires that software can skip over non-standard chunks. "Prop"? Would require a fix to midicvt.
- 0xaabbccdd. The length of the track. This needs to be calculated somehow.
- 0x00. A zero delta time.
- 0x7f7f, The sequence number, a special value, well out of our normal range.
- The name of the track:
 - "Seq24-Spec"
 - "Sequencer24-S"

Then follows the proprietary data, written in the normal manner.

Finally, tack on the track-end meta-event.

Components of final track size:

```
-# Delta time. 1 byte, always 0x00.
-# Sequence number. 5 bytes. OPTIONAL. We won't write it.
-# Track name. 3 + 10 or 3 + 15
-# Series of proprietary specs:
  -# Prop header:
    -# If legacy format, 4 bytes.
    -# Otherwise, 2 bytes + varinum_size(length) + 4 bytes.
    -# Length of the prop data.
-# Track End. 3 bytes.
```

Writes a "proprietary" Seq24 footer header in either the new MIDI-compliant format, or the legacy Seq24 format. This function does not write the data. It replaces calls such as "write_long(c_midich)" in the proprietary section of [write\(\)](#).

The legacy format just writes the control tag (0x242400xx). The new format writes 0x00 0xFF 0x7F len 0x242400xx; the first 0x00 is the delta time.

In the new format, the 0x24 is a kind of "manufacturer ID". At <http://www.midi.org/techspecs/manid.php> we see that most manufacturer IDs start with 0x00, and are thus three bytes long, or start with codes at 0x40 and above. Similarly, <http://sequence15.blogspot.com/2008/12/midi-manufacturer-ids.html> shows that no manufacturer uses 0x24.

Warning

Currently, the manufacturer ID is not handled; it is part of the data, which can be misleading in programs that analyze MIDI files.

Parameters

<i>control_tag</i>	Determines the type of sequencer-specific section to be written. It should be one of the value in the globals module, such as <code>c_midibus</code> or <code>c_mutegroups</code> .
<i>data_length</i>	The amount of data that will be written. This parameter does not count the length of the header itself.

7.27.3.15 `bool seq64::midifile::write_proprietary_track (perform & a_perf) [private]`

The first thing to do, for the new format only, is calculate the length of this big section of data. This was quite tricky; we tweaked and adjusted until the `midicvt` program handled the whole new-format file without emitting any errors.

7.27.3.16 `long seq64::midifile::varinum_size (long len) const [private]`

This function is needed when calculating the length of a track. Note that it handles only the following situations:

https://en.wikipedia.org/wiki/Variable-length_quantity

```

1 byte:  0x00 to 0x7F
2 bytes: 0x80 to 0x3FFF
3 bytes: 0x4000 to 0x001FFFFF
4 bytes: 0x200000 to 0x0FFFFFFF

```

Returns

Returns values as noted above. Anything beyond that range returns 0.

7.27.3.17 `long seq64::midifile::prop_item_size (long data_length) const [private]`

If using the new format, the length includes the sum of sequencer-specific tag (`0xFF 0x7F`) and the size of the variable-length value. Then, for legacy and new format, 4 bytes are added for the Seq24 MIDI control value, and the the data length is added.

7.27.3.18 `long seq64::midifile::seq_number_size () const [inline],[private]`

7.27.4 Field Documentation

7.27.4.1 `int seq64::midifile::m_pos [private]`

This is at least a 31-bit value in the recent architectures running Linux and Windows, so it will handle up to 2 Gb of data. This member is used as the offset into the `m_data` vector.

7.27.4.2 `std::vector<unsigned char> seq64::midifile::m_data [private]`

We could also use a string of characters, unsigned. This member is resized to the putative size of the MIDI file, in the `parse()` function. Then the whole file is read into it, as if it were an array. This member is an input buffer.

7.27.4.3 `std::list<unsigned char> seq64::midifile::m_char_list` [private]

The class pushes each MIDI byte into this list using the [write_byte\(\)](#) function. Also note that the [write\(\)](#) function calls `sequence::fill_list()` to fill a temporary `std::list<char>` (!) buffer, then writes that data *backwards* to this member. This member is an output buffer.

7.27.4.4 `bool seq64::midifile::m_new_format` [private]

In this new format, each sequencer-specific value (0x242400xx, as defined in the `globals` module) is preceded by the sequencer-specific prefix, 0xFF 0x7F len id/date). By default, this value is true, but the user can specify the `-legacy` (-l) option, or make a soft link to the `sequence24` binary called "seq24", to write the data in the old format. [We will eventually add the `-legacy` option to the `~/ .seq24rc` configuration file.] Note that reading can handle either format transparently.

7.28 `seq64::options` Class Reference

This class supports a full tabbed options dialog.

Inherits Dialog.

Private Types

- enum [button](#)

Defines buttons indices or IDs for some controls related to JACK.

Private Attributes

- [perform](#) & [m_mainperf](#)

The performance object to which some of these options apply.

- `Gtk::Button *` [m_button_ok](#)

The famous "OK" button's pointer.

- `Gtk::Notebook *` [m_notebook](#)

Not sure yet what this notebook is for.

7.28.1 Field Documentation

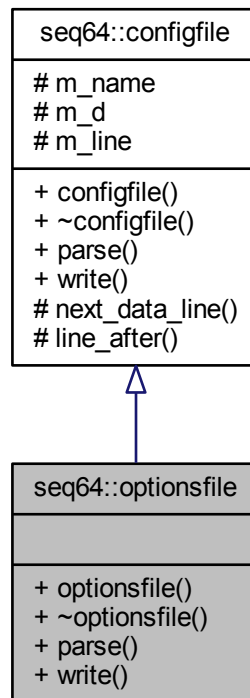
7.28.1.1 `Gtk::Notebook* seq64::options::m_notebook` [private]

Must be a GTK thing.

7.29 `seq64::optionsfile` Class Reference

Provides a file for reading and writing the application's main configuration file.

Inheritance diagram for seq64::optionsfile:



Public Member Functions

- `optionsfile` (const std::string &name)
Principal constructor.
- `~optionsfile` ()
A rote destructor.
- bool `parse` (perform &perf)
Parse the `~/seq24rc` or `~/config/sequencer64/sequencer64.rc` file.
- bool `write` (const perform &perf)
This options-writing function is just about as complex as the options-reading function.

Additional Inherited Members

7.29.1 Detailed Description

The settings that are passed around are provided or used by the perform class.

7.29.2 Member Function Documentation

7.29.2.1 bool seq64::optionsfile::parse (perform & a_perf) [virtual]

[midi-control]

Get the number of sequence definitions provided in the [midi-control] section. Ranges from 32 on up. Then read in all of the sequence lines. The first 32 apply to the first screen set. There can also be a comment line "# mute in group" followed by 32 more lines. Then there are additional comments and single lines for BPM up, BPM down, Screen Set Up, Screen Set Down, Mod Replace, Mod Snapshot, Mod Queue, Mod Gmute, Mod Glearn, and Screen Set Play. These are all forms of MIDI automation useful to control the playback while not sitting near the computer.

[mute-group]

The mute-group starts with a line that indicates up to 32 mute-groups are defined. A common value is 1024, which means there are 32 groups times 32 keys. But this value is currently thrown away. This value is followed by 32 lines of data, each contained 4 sets of 8 settings. See the seq24-doc project on GitHub for a much more detailed description of this section.

[midi-clock]

The MIDI-clock section defines the clocking value for up to 16 output busses. The first number, 16, indicates how many busses are specified. Generally, these busses are shown to the user with names such as "[1] seq24 1".

[keyboard-control]

The keyboard control defines the keys that will toggle the stage of each of up to 32 patterns in a pattern/sequence box. These keys are displayed in each box as a reminder. The first number specifies the Key number, and the second number specifies the Sequence number.

[keyboard-group]

The keyboard group specifies more automation for the application. The first number specifies the Key number, and the second number specifies the Group number. This section should be better described in the seq24-doc project on GitHub.

[jack-transport]

This section covers various JACK settings, one setting per line. In order, the following numbers are specified:

- jack_transport - Enable sync with JACK Transport.
- jack_master - Seq24 will attempt to serve as JACK Master.
- jack_master_cond - Seq24 will fail to be Master if there is already a Master set.
- jack_start_mode:
 - 0 = Playback will be in Live mode. Use this to allow muting and unmuting of loops.
 - 1 = Playback will use the Song Editor's data.

[midi-input]

This section covers the MIDI input busses, and has a format similar to "[midi-clock]". Generally, these busses are shown to the user with names such as "[1] seq24 1", and currently there is only one input buss. The first field is the port number, and the second number indicates whether it is disabled (0), or enabled (1).

[midi-clock-mod-ticks]

This section covers.... One common value is 64.

[manual-alsa-ports]

This section covers.... Set to 1 if you want seq24 to create its own ALSA ports and not connect to other clients.

[last-used-dir]

This section simply holds the last path-name that was used to read or write a MIDI file. We still need to add a check for a valid path, and currently the path must start with a "/", so it is not suitable for Windows.

[interaction-method]

This section specified the kind of mouse interaction.

- 0 = 'seq24' (original Seq24 method).
- 1 = 'fruity' (similar to a certain fruity sequencer we like).

The second data line is set to "1" if Mod4 can be used to keep seq24 in note-adding mode even after the right-click is released, and "0" otherwise.

Implements [seq64::configfile](#).

7.29.2.2 `bool seq64::optionsfile::write (const perform & a_perf) [virtual]`

Parameters

<i>a_perf</i>	Provides a const reference to the main perform object. However, we have to cast away the constness, because too many of the perform getter functions are used in non-const contexts.
---------------	--

Returns

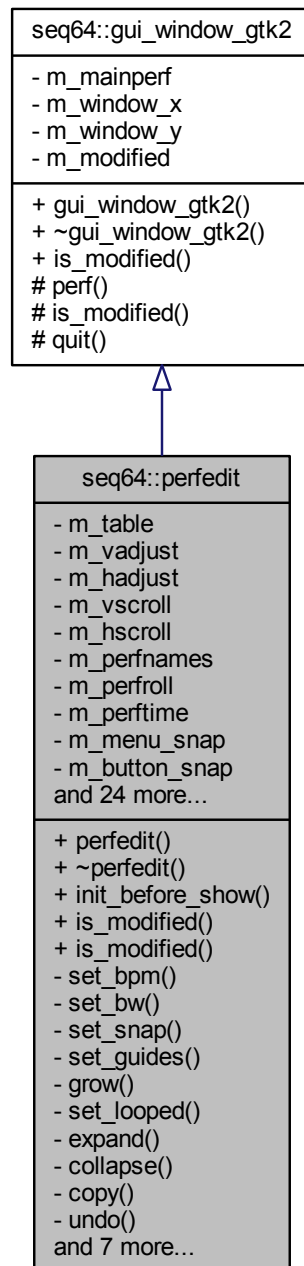
Returns true if the write operations all succeeded.

Implements [seq64::configfile](#).

7.30 seq64::perfedit Class Reference

This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel, I think.

Inheritance diagram for seq64::perfedit:



Public Member Functions

- `perfedit` (`perform` &p, int ppqn=c_ppqn, int bpm=DEFAULT_BEATS_PER_MEASURE, int bw=DEFAULT_BEAT_WIDTH)

Principal constructor, has a reference to a perform object.

- `~perfedit` ()

This rote constructor does nothing.

- void `init_before_show` ()
This function forwards its call to the `perroll` function of the same name.
- void `is_modified` (bool flag)
'Setter' function for member `m_modified`
- bool `is_modified` () const
'Getter' function for member `m_modified`

Private Member Functions

- void `set_bpm` (int beats_per_measure)
Sets the BPM (beats per minute) text and values to the given value, and then calls `set_guides()`.
- void `set_bw` (int beat_width)
Sets the BW (beat width, or the denominator in the time signature) text and values to the given value, and then calls `set_guides()`.
- void `set_snap` (int snap)
Sets the snap text and values to the given value, and then calls `set_guides()`.
- void `set_guides` ()
Sets the guides, which are the L and R user-interface elements.
- void `grow` ()
Increments the size of the `perroll` and `perftime` objects.
- void `set_looped` ()
Set the looping in the `perform` object.
- void `expand` ()
Implement the expand action.
- void `collapse` ()
Implement the collapse action.
- void `copy` ()
Implement the copy (actually, expand-and-copy) action.
- void `undo` ()
Implement the undo feature (Ctrl-Z).
- void `popup_menu` (Gtk::Menu *menu)
Opens the given popup menu.
- bool `timeout` ()
Handles a drawing timeout.
- void `start_playing` ()
Implement the playing.
- void `stop_playing` ()
Stop the playing.
- void `on_realize` ()
This callback function calls the base-class `on_realize()` function, and then connects the `perfedit::timeout()` function to the Glib signal-timeout, with a redraw timeout of `m_redraw_ms`.
- bool `on_key_press_event` (GdkEventKey *ev)
This function is the callback for a key-press event.
- bool `on_delete_event` (GdkEventAny *)
All this callback function does is return false.

Private Attributes

- Gtk::Menu * `m_menu_bpm`
Menus for time signature, beats per measure, beat width.
- int `m_snap`
Set snap-to in "pulses".

Additional Inherited Members

7.30.1 Detailed Description

It has a seqroll and piano roll? No, it has a perform, a perfnames, a perfroll, and a perftime.

7.30.2 Constructor & Destructor Documentation

7.30.2.1 `seq64::perfedit::perfedit (perform & p, int ppqn = c_ppqn, int bpm = DEFAULT_BEATS_PER_MEASURE, int bw = DEFAULT_BEAT_WIDTH)`

We've reordered the pointer members and put them in the initializer list to make the constructor a bit cleaner.

Parameters

<i>p</i>	Refers to the main performance object.
----------	--

Todo Offload most of the work into an initialization function like options does; make the perform parameter a reference.

7.30.2.2 `seq64::perfedit::~~perfedit ()`

We're going to have to run the application through valgrind to make sure that nothing is left behind.

7.30.3 Member Function Documentation

7.30.3.1 `void seq64::perfedit::init_before_show ()`

It does not seem to need to also forward to the perftime function of the same name.

7.30.3.2 `void seq64::perfedit::set_guides () [private]`

See the [set_snap\(\)](#) function.

7.30.3.3 `void seq64::perfedit::expand () [private]`

This action opens up a space events between the L and R (left and right) markers. This action is preceded by pushing an Undo operation in the perform object, moving its triggers, and telling the perfroll to redraw.

7.30.3.4 `void seq64::perfedit::collapse () [private]`

This action removes all events between the L and R (left and right) markers. This action is preceded by pushing an Undo operation in the perform object, not moving its triggers (they go away), and telling the perfroll to redraw.

7.30.3.5 `void seq64::perfedit::copy () [private]`

This action opens up a space events between the L and R (left and right) markers, and copies the information from the same amount of event that follow the R marker. This action is preceded by pushing an Undo operation in the perform object, copying its triggers, and telling the perfroll to redraw.

7.30.3.6 `void seq64::perfedit::undo () [private]`

We pop an Undo trigger, and then ask the perfroll to queue up a (re)drawing action.

7.30.3.7 `bool seq64::perfedit::timeout () [private]`

It redraws "dirty" sequences in the perfroll and the perfnames objects, and shows draw progress on the perfroll.

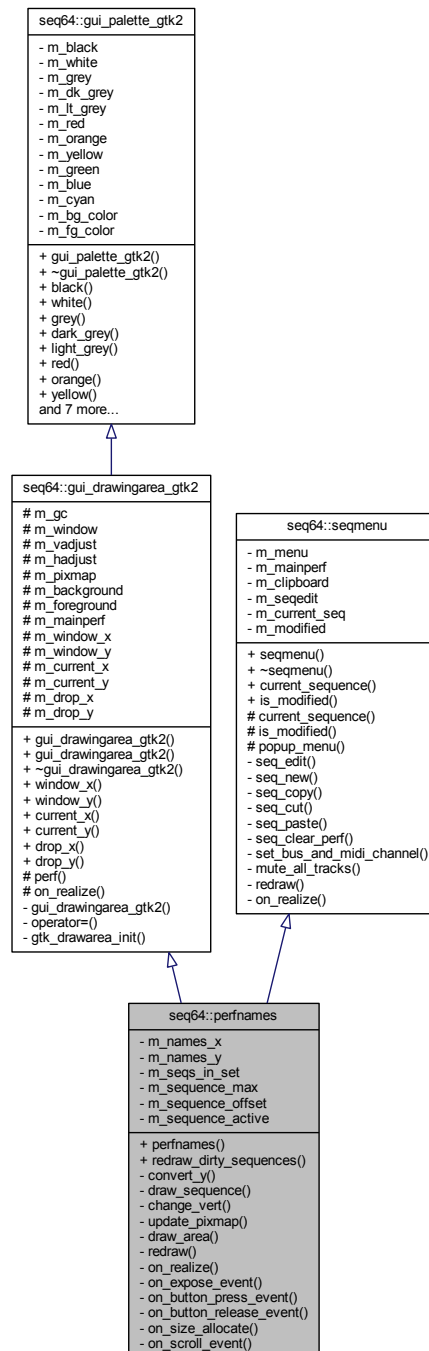
7.30.3.8 `void seq64::perfedit::start_playing () [inline], [private]`

JACK will be used if it is present and, in the application, enabled.

7.31 seq64::perfnames Class Reference

This class implements the left-side keyboard in the patterns window.

Inheritance diagram for seq64::perfname:



Public Member Functions

- [perfnames](#) ([perform](#) &p, Gtk::Adjustment &vadjust)

Principal constructor for this user-interface object.

- void [redraw_dirty_sequences](#) ()

Redraws sequences that have been modified.

Private Member Functions

- int [convert_y](#) (int y)
Converts a y-value into a sequence number and returns it.
- void [draw_sequence](#) (int [sequence](#))
Draw the given sequence.
- void [change_vert](#) ()
Change the vertical offset of a sequence/pattern.
- void [update_pixmap](#) ()
This function does nothing.
- void [draw_area](#) ()
This function does nothing.
- void [redraw](#) (int [sequence](#))
Redraw the given sequence.
- void [on_realize](#) ()
Handles the callback when the window is realized.
- bool [on_expose_event](#) (GdkEventExpose *ev)
Handles an on-expose event.
- bool [on_button_press_event](#) (GdkEventButton *ev)
Provides the callback for a button press, and it handles only a left mouse button.
- bool [on_button_release_event](#) (GdkEventButton *ev)
Handles a button-release for the right button, bringing up a popup menu.
- void [on_size_allocate](#) (Gtk::Allocation &)
Handles a size-allocation event.
- bool [on_scroll_event](#) (GdkEventScroll *ev)
Handle the scrolling of the window.

Additional Inherited Members

7.31.1 Detailed Description

Obsolete Note the usage of virtual base classes. Since these can add some extra overhead, we should determine if we can do without the virtuality (and indeed it doesn't seem to be needed).

7.31.2 Constructor & Destructor Documentation

7.31.2.1 seq64::perfnames::perfnames (perform & p, Gtk::Adjustment & vadjust)

Weird is that the window (x,y) are set to (c_names_x, 100), when c_names_y is 22 in globals.h.

7.31.3 Member Function Documentation

7.31.3.1 void seq64::perfnames::on_realize () [private]

It first calls the base-class version of [on_realize\(\)](#). Then it allocates any additional resources needed.

7.31.3.2 bool seq64::perfnames::on_expose_event (GdkEventExpose * a_e) [private]

It draws all of the sequences.

7.31.3.3 void seq64::perfnames::on_size_allocate (Gtk::Allocation & a) [private]

It first calls the base-class version of this function.

7.32 seq64::perform Class Reference

This class supports the performance mode.

Public Member Functions

- [perform](#) ([gui_assistant](#) &mygui, int ppqn=c_ppqn)

This construction initializes a vast number of member variables, some of them public (but we're working on that)!
- [~perform](#) ()

The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.
- const [gui_assistant](#) & [gui](#) () const

'Getter' function for member m_gui_support The const getter.
- [gui_assistant](#) & [gui](#) ()

'Getter' function for member m_gui_support The un-const getter.
- const [keys_perform](#) & [keys](#) () const

'Getter' function for member m_gui_support.keys() The const getter.
- [keys_perform](#) & [keys](#) ()

'Getter' function for member m_gui_support.keys() The un-const getter.
- mastermidibus & [master_bus](#) ()

'Getter' function for member m_master_bus
- bool [is_running](#) () const

'Getter' function for member m_running
- bool [is_learn_mode](#) () const

'Getter' function for member m_mode_group_learn
- void [enregister](#) ([performcallback](#) *pfc)

Adds a pointer to an object to be notified by this perform object.
- void [init](#) ()

Initializes the master MIDI bus.
- void [clear_all](#) ()

Clears all of the patterns/sequences.
- void [launch_input_thread](#) ()

Creates the input thread using input_thread_func().
- void [launch_output_thread](#) ()

Creates the output thread using output_thread_func().
- void [init_jack](#) ()

Initializes JACK support, if SEQ64_JACK_SUPPORT is defined.
- void [deinit_jack](#) ()

Tears down the JACK infrastructure.
- void [add_sequence](#) ([sequence](#) *a_seq, int a_perf)

Adds a pattern/sequence pointer to the list of patterns.
- void [delete_sequence](#) (int a_num)

Deletes a pattern/sequence by number.
- bool [is_sequence_in_edit](#) (int a_num)

Check if the pattern/sequence, given by number, has an edit in progress.
- void [clear_sequence_triggers](#) (int a_seq)

- Clears the patterns/sequence for the given sequence, if it is active.*
- bool `is_sequence_valid` (int a_sequence) const
Provides common code to check for the bounds of a sequence number.
- bool `is_sequence_invalid` (int a_sequence) const
Provides common code to check for the bounds of a sequence number.
- void `set_left_tick` (long a_tick)
Set the left marker at the given tick.
- long `get_left_tick` () const
'Getter' function for member m_left_tick
- void `set_starting_tick` (long a_tick)
'Setter' function for member m_starting_tick
- long `get_starting_tick` () const
'Getter' function for member m_starting_tick
- void `set_right_tick` (long a_tick)
Set the right marker at the given tick.
- long `get_right_tick` () const
'Getter' function for member m_right_tick
- void `move_triggers` (bool a_direction)
If the left tick is less than the right tick, then, for each sequence that is active, its triggers are moved by the difference between the right and left in the specified direction.
- void `copy_triggers` ()
If the left tick is less than the right tick, then, for each sequence that is active, its triggers are copied, offset by the difference between the right and left.
- void `push_trigger_undo` ()
For every active sequence, call that sequence's `push_trigger_undo()` function.
- void `pop_trigger_undo` ()
For every active sequence, call that sequence's `pop_trigger_undo()` function.
- void `print` ()
An information printing function with its body commented out.
- midi_control * `get_midi_control_toggle` (unsigned int a_seq)
Retrieves a value from m_midi_cc_toggle[].
- midi_control * `get_midi_control_on` (unsigned int a_seq)
Retrieves a value from m_midi_cc_on[].
- midi_control * `get_midi_control_off` (unsigned int a_seq)
Retrieves a value from m_midi_cc_off[].
- void `handle_midi_control` (int a_control, bool a_state)
Handle the MIDI Control values that provide some automation for the application.
- const std::string & `get_screen_set_notepad` (int a_screen_set) const
Retrieves the given string from m_screen_set_notepad[].
- const std::string & `current_screen_set_notepad` () const
Returns the notepad text for the current screen-set.
- void `set_screen_set_notepad` (int screenset, const std::string ¬e)
Copies the given string into m_screen_set_notepad[].
- void `set_current_screen_set_notepad` (const std::string ¬e)
Sets the notepad text for the current screen-set.
- void `set_screenset` (int a_ss)
Sets the m_screen_set value (the index or ID of the current screen set).
- int `get_screenset` () const
'Getter' function for member m_screen_set
- void `set_playing_screenset` ()
Sets the screen set that is active, based on the value of m_playing_screen.

- int [get_playing_screenset](#) () const
'Getter' function for member m_playing_screen
- void [mute_group_tracks](#) ()
Will need to study this one more closely.
- void [select_and_mute_group](#) (int a_g_group)
Select a mute group and then mutes the track in the group.
- void [set_mode_group_mute](#) ()
'Setter' function for member m_mode_group
- void [unset_mode_group_mute](#) ()
'Setter' function for member m_mode_group Unsets this member.
- void [select_group_mute](#) (int a_g_mute)
Makes some checks and sets the group mute flag.
- void [set_mode_group_learn](#) ()
Sets the group-mute mode, then the group-learn mode, then notifies all of the notification subscribers.
- void [unset_mode_group_learn](#) ()
Notifies all of the notification subscribers that group-learn is being turned off.
- void [select_mute_group](#) (int a_group)
Will need to study this one more closely.
- void [start](#) (bool a_state)
If JACK is not running, call [inner_start\(\)](#) with the given state.
- void [stop](#) ()
If JACK is not running, call [inner_stop\(\)](#).
- void [start_jack](#) ()
If JACK is supported, starts the JACK transport.
- void [stop_jack](#) ()
If JACK is supported, stops the JACK transport.
- void [position_jack](#) (bool a_state)
If JACK is supported and running, sets the position of the transport.
- void [off_sequences](#) ()
For all active patterns/sequences, set the playing state to false.
- void [all_notes_off](#) ()
For all active patterns/sequences, turn off its playing notes.
- void [set_active](#) (int a_sequence, bool a_active)
Sets or unsets the active state of the given pattern/sequence number.
- void [set_was_active](#) (int a_sequence)
Sets was-active flags: main, edit, perf, and names.
- bool [is_active](#) (int a_sequence)
Checks the pattern/sequence for activity.
- bool [is_dirty_main](#) (int a_sequence)
Checks the pattern/sequence for main-dirtiness.
- bool [is_dirty_edit](#) (int a_sequence)
Checks the pattern/sequence for edit-dirtiness.
- bool [is_dirty_perf](#) (int a_sequence)
Checks the pattern/sequence for perf-dirtiness.
- bool [is_dirty_names](#) (int a_sequence)
Checks the pattern/sequence for names-dirtiness.
- void [new_sequence](#) (int a_sequence)
Creates a new pattern/sequence for the given slot, and sets the new pattern's master MIDI bus address.
- [sequence](#) * [get_sequence](#) (int a_sequence)
Retrieves the actual sequence, based on the pattern/sequence number.
- void [reset_sequences](#) ()

- For all active patterns/sequences, get its playing state, turn off the playing notes, set playing to false, zero the markers, and, if not in playback mode, restore the playing state.*

 - void [play](#) (long a_tick)

Plays all notes to the current tick.
 - void [set_orig_ticks](#) (long a_tick)

For every pattern/sequence that is active, sets the "original ticks" value for the pattern.
 - void [set_bpm](#) (int a_bpm)

Sets the value of the BPM into the master MIDI buss, after making sure it is squelched to be between 20 and 500.
 - int [get_bpm](#) ()

Retrieves the BPM setting of the master MIDI buss.
 - void [set_looping](#) (bool a_looping)

'Setter' function for member m_looping
 - void [set_sequence_control_status](#) (int a_status)

If the given status is present in the c_status_snapshot, the playing state is saved.
 - void [unset_sequence_control_status](#) (int a_status)

If the given status is present in the c_status_snapshot, the playing state is restored.
 - void [set_group_mute_state](#) (int a_g_track, bool a_mute_state)

'Setter' function for member m_mute_group
 - bool [get_group_mute_state](#) (int a_g_track)

'Getter' function for member m_mute_group
 - void [mute_all_tracks](#) ()

Mutes all tracks in the current set of active patterns/sequences.
 - void [output_func](#) ()

Performance output function.
 - void [input_func](#) ()

This function is called by input_thread_func().
 - long [get_max_trigger](#) ()

Locates the largest trigger value among the active sequences.
 - void [set_offset](#) (int a_offset)

Calculates the offset into the screen sets.
 - void [save_playing_state](#) ()

For all active patterns/sequences, this function gets the playing status and saves it in m_sequence_state[i].
 - void [restore_playing_state](#) ()

For all active patterns/sequences, this function gets the playing status from m_sequence_state[i] and sets it for the sequence.
 - bool [show_ui_sequence_key](#) () const

Accessor m_show_ui_sequency_key
 - void [start_playing](#) (bool flag=false)

Encapsulates a series of calls used in mainwnd.
 - void [stop_playing](#) ()

Encapsulates a series of calls used in mainwnd.
 - void [learn_toggle](#) ()

Encapsulates some calls used in mainwnd.
 - int [decrement_bpm](#) ()

Encapsulates some calls used in mainwnd.
 - int [increment_bpm](#) ()

Encapsulates some calls used in mainwnd.
 - int [decrement_screenset](#) ()

Encapsulates some calls used in mainwnd.
 - int [increment_screenset](#) ()

Encapsulates some calls used in mainwnd.

- void [sequence_key](#) (int seq)
Handle a sequence key to toggle the playing of an active pattern in the selected screen-set.
- void [set_input_bus](#) (int bus, bool input_active)
Sets the input bus, and handles the special "key-labels-on-sequence" functionality.
- bool [mainwnd_key_event](#) (const [keystroke](#) &k)
Provided for [mainwnd::on_key_press_event\(\)](#) and [mainwnd::on_key_release_event\(\)](#) to call.
- bool [perffroll_key_event](#) (const [keystroke](#) &k, int drop_sequence)
Provided for [perffroll::on_key_press_event\(\)](#) and [perffroll::on_key_release_event\(\)](#) to call.

Private Member Functions

- void [set_running](#) (bool running)
'Setter' function for member [m_running](#)
- void [set_playback_mode](#) (bool playbackmode)
'Setter' function for member [m_playback_mode](#)
- void [inner_start](#) (bool a_state)
Locks on [m_condition_var](#).
- void [inner_stop](#) ()
Unconditionally, and without locking, clears the running status, resets the sequences, and set [m_usemidiclock](#) false.
- void [set_key_event](#) (unsigned int keycode, long sequence_slot)
At construction time, this function sets up one keycode and one event slot.
- void [set_key_group](#) (unsigned int keycode, long group_slot)
At construction time, this function sets up one keycode and one group slot.
- int [clamp_track](#) (int track) const
Provides common code to keep the track value valid.

Private Attributes

- [gui_assistant](#) & [m_gui_support](#)
Support for a wide range of GUI-related operations.
- bool [m_mute_group](#) [[c_gmute_tracks](#)]
Mute group support.
- int [m_playing_screen](#)
Playing screen support.
- [sequence](#) * [m_seqs](#) [[c_max_sequence](#)]
Provides a vector of patterns/sequences.
- mastermidibus [m_master_bus](#)
Provides our MIDI buss.
- pthread_t [m_out_thread](#)
Provides information for managing pthreads.
- bool [m_playback_mode](#)
Specifies the playback mode.
- long [m_tick](#)
MIDI Clock support.

Friends

- int [jack_sync_callback](#) (jack_transport_state_t state, jack_position_t *pos, void *arg)
Global functions for JACK support and JACK sessions.

7.32.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

7.32.2 Constructor & Destructor Documentation

7.32.2.1 seq64::perform::perform ([gui_assistant](#) & *mygui*, int *ppqn* = `c_ppqn`)

Parameters

<i>mygui</i>	Provides access to the GUI assistant that holds many things, including the containers of keys and the "events" they provide. This is a base-class reference; for a real class, see the gui_assistant_gtk2 class in the seq_gtkmm2 GUI-specific library. Note that we access the <code>m_gui_support</code> member using the gui() accessor function.
--------------	--

7.32.2.2 seq64::perform::~~perform ()

Finally, any active patterns/sequences are deleted.

7.32.3 Member Function Documentation

7.32.3.1 void seq64::perform::init ()

Who calls this routine?

7.32.3.2 void seq64::perform::launch_input_thread ()

This might be a good candidate for a small thread class derived from a small base class.

7.32.3.3 void seq64::perform::launch_output_thread ()

This might be a good candidate for a small thread class derived from a small base class.

7.32.3.4 void seq64::perform::init_jack ()

Who calls this routine?

7.32.3.5 void seq64::perform::add_sequence ([sequence](#) * *a_seq*, int *a_perf*)

No check is made for a null pointer.

Check for preferred. This occurs if *a_perf* is in the valid range (0 to `m_sequence_max`) and it is not active. If preferred, then add it and activate it.

Otherwise, iterate through all patterns from *a_perf* to `m_sequence_max` and add and activate the first one that is not active, and then quit.

Warning

The logic of the if-statement in this function was such that *a_perf* could be out-of-bounds in the else-clause. We reworked the logic to be airtight. This bug was caught by gcc 4.8.3 on CentOS, but not on gcc 4.9.3 on Debian Sid!

Parameters

<i>a_seq</i>	The number or index of the pattern/sequence to add.
<i>a_perf</i>	The performance number of the pattern? If this value is out-of-range, then it is ignored.

7.32.3.6 void seq64::perform::clear_sequence_triggers (int *a_seq*)

Parameters

<i>a_seq</i>	Provides the desired sequence. Hopefull, the is_active() function validates this value.
--------------	---

7.32.3.7 bool seq64::perform::is_sequence_valid (int *a_sequence*) const [inline]

Returns

Returns true if the sequence number is valid.

7.32.3.8 bool seq64::perform::is_sequence_invalid (int *a_sequence*) const [inline]

Returns

Returns true if the sequence number is invalid.

7.32.3.9 void seq64::perform::move_triggers (bool *a_direction*)

Parameters

<i>a_direction</i>	Specifies the desired direction; false = left, true = right.
--------------------	--

7.32.3.10 void seq64::perform::copy_triggers ()

This copies the triggers between the L marker and R marker to the R marker.

7.32.3.11 midi_control * seq64::perform::get_midi_control_toggle (unsigned int *a_seq*)

Parameters

<i>a_seq</i>	Provides a control value (such as <code>c_midi_control_bpm_up</code>) to use to retrieve the desired <code>midi_control</code> object. Note that this value is unsigned simply to make the legality check of the parameter easier.
--------------	---

7.32.3.12 midi_control * seq64::perform::get_midi_control_on (unsigned int *a_seq*)

Parameters

<i>a_seq</i>	Provides a control value (such as <code>c_midi_control_bpm_up</code>) to use to retrieve the desired <code>midi_control</code> object.
--------------	---

7.32.3.13 midi_control * seq64::perform::get_midi_control_off (unsigned int *a_seq*)

Parameters

<i>a_seq</i>	Provides a control value (such as <code>c_midi_control_bpm_up</code>) to use to retrieve the desired <code>midi_control</code> object.
--------------	---

7.32.3.14 `const std::string & seq64::perform::get_screen_set_notepad (int screenset) const`

Parameters

<i>screenset</i>	The ID number of the string set, an index into the <code>m_screen_set_notepad[]</code> array. This value is validated.
------------------	--

Returns

Returns a reference to the desired string, or to an empty string if the screen-set number is invalid.

7.32.3.15 `void seq64::perform::set_screen_set_notepad (int screenset, const std::string & notepad)`

Parameters

<i>screenset</i>	The ID number of the string set, an index into the <code>m_screen_set_xxx[]</code> arrays.
<i>notepad</i>	Provides the string data to copy into the notepad. Not sure why a pointer is used, instead of nice "const std::string &" parameter. And this pointer isn't checked.

7.32.3.16 `void seq64::perform::set_screenset (int a_ss)`

Parameters

<i>a_ss</i>	The index of the desired string set. It is forced to range from 0 to <code>c_max_sets - 1</code> .
-------------	--

7.32.3.17 `void seq64::perform::set_playing_screenset ()`

For each value up to `c_seqs_in_set` (32), the index of the current sequence in the currently screen set (`m_playing_↔_screen`) is obtained. If it is active and the sequence actually exists

Modifies `m_playing_screen`, and mutes the group tracks.

7.32.3.18 `void seq64::perform::unset_mode_group_learn ()`

Then unsets the group-learn mode flag..

7.32.3.19 `void seq64::perform::select_mute_group (int a_group)`

Parameters

<i>a_group</i>	Provides the group to mute. Note that this parameter is essentially a track or sequence number.
----------------	---

7.32.3.20 `void seq64::perform::start (bool a_state)`

Parameters

<i>a_state</i>	What does this state mean?
----------------	----------------------------

7.32.3.21 void seq64::perform::stop ()

The logic seems backward here, in that we call [inner_stop\(\)](#) if JACK is not running. Or perhaps we misunderstand the meaning of `m_jack_running`?

7.32.3.22 void seq64::perform::position_jack (bool *a_state*)

Warning

A lot of this code is effectively disabled by an early return statement.

7.32.3.23 void seq64::perform::all_notes_off ()

Then flush the MIDI buss.

7.32.3.24 void seq64::perform::set_was_active (int *a_sequence*)

Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

7.32.3.25 bool seq64::perform::is_active (int *a_sequence*)

Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

Returns

Returns the value of the active-flag, or false if the pattern was invalid.

7.32.3.26 bool seq64::perform::is_dirty_main (int *a_sequence*)

Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

Returns

Returns the was-active-main flag value, before setting it to false. Returns false if the pattern was invalid.

7.32.3.27 bool seq64::perform::is_dirty_edit (int *a_sequence*)

Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

Returns

Returns the was-active-edit flag value, before setting it to false. Returns false if the pattern was invalid.

7.32.3.28 bool seq64::perform::is_dirty_perf (int *a_sequence*)

Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

Returns

Returns the was-active-perf flag value, before setting it to false. Returns false if the pattern/sequence number was invalid.

7.32.3.29 bool seq64::perform::is_dirty_names (int *a_sequence*)

Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

Returns

Returns the was-active-names flag value, before setting it to false. Returns false if the pattern/sequence number was invalid.

7.32.3.30 void seq64::perform::new_sequence (int *a_sequence*)

Then it activates the pattern.

It doesn't deal with thrown exceptions.

7.32.3.31 void seq64::perform::reset_sequences ()

Then flush the MIDI buss.

7.32.3.32 void seq64::perform::play (long *a_tick*)

Starts the playing of all the patterns/sequences.

This function just runs down the list of sequences and has them dump their events.

Parameters

<i>a_tick</i>	Provides the tick at which to start playing.
---------------	--

7.32.3.33 void seq64::perform::set_orig_ticks (long *a_tick*)

Parameters

<i>a_tick</i>	
---------------	--

7.32.3.34 `void seq64::perform::set_bpm (int a_bpm)`

The value is set only if neither JACK nor this performance object are running.

Todo I think this logic is wrong, in that it needs only one of the two to be stopped before it sets the BPM, while it seems to me that both should be stopped; to be determined.

7.32.3.35 `void seq64::perform::set_sequence_control_status (int a_status)`

Then the given status is OR'd into the m_control_status.

7.32.3.36 `void seq64::perform::unset_sequence_control_status (int a_status)`

Then the given status is reversed in m_control_status.

7.32.3.37 `void seq64::perform::output_func ()`

1. Get delta time (current - last).
2. Get delta ticks from time.
3. Add to current_ticks.
4. Compute prebuffer ticks.
5. Play from current tick to prebuffer.

Figure out how much time we need to sleep, and do it.

7.32.3.38 `long seq64::perform::get_max_trigger ()`

Returns

Returns the highest trigger value, or zero. It is not clear why this function doesn't return a "no trigger found" value. Is there always at least one trigger, at 0?

7.32.3.39 `void seq64::perform::set_offset (int a_offset) [inline]`

Sets m_offset = a_offset * c_mainwnd_rows * c_mainwnd_cols;

Parameters

<i>a_offset</i>	The desired offset.
-----------------	---------------------

7.32.3.40 `bool seq64::perform::show_ui_sequence_key () const [inline]`

Used in mainwid, options, optionsfile, userfile, and perform.

7.32.3.41 `void seq64::perform::start_playing (bool flag = false) [inline]`

We've reversed the `start()` and `start_jack()` calls so that JACK is started first, to match all of the other use-cases for playing that we've found in the code.

Todo Verify the usage and nature of this flag.

7.32.3.42 `int seq64::perform::decrement_bpm () [inline]`

Actually does a lot of work in those function calls.

7.32.3.43 `int seq64::perform::increment_bpm () [inline]`

Actually does a lot of work in those function calls.

7.32.3.44 `void seq64::perform::set_input_bus (int bus, bool input_active)`

This function is called by `options::input_callback()`.

7.32.3.45 `bool seq64::perform::mainwnd_key_event (const keystroke & k)`

Returns

Returns true if the key was handled.

7.32.3.46 `bool seq64::perform::perfroll_key_event (const keystroke & k, int drop_sequence)`

Returns

Returns true if the key was handled.

7.32.3.47 `void seq64::perform::inner_start (bool a_state) [private]`

Then, if not `is_running()`, the playback mode is set to the given state. If that state is true, call `off_sequences()`. Set the running status, and signal the condition. Then unlock.

7.32.3.48 `void seq64::perform::set_key_event (unsigned int keycode, long sequence_slot) [private]`

It is called 32 times, corresponding to the pattern/sequence slots in the Patterns window.

It first removes the given key-code from the regular and reverse slot-maps. Then it removes the sequence-slot from the regular and reverse slot-maps.

Finally, it adds the sequence-slot with a key value of key-code, and adds the key-code with a value of sequence-slot.

Why are we erasing four items instead of just two?

7.32.3.49 `void seq64::perform::set_key_group (unsigned int keycode, long group_slot) [private]`

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

Compare it to the `set_key_events()` function.

7.32.3.50 `int seq64::perform::clamp_track (int track) const` `[inline],[private]`

Note the bug we found, where we checked for `track > c_seqs_in_set`, but set it to `c_seqs_in_set - 1` in that case!

7.32.4 Friends And Related Function Documentation

7.32.4.1 `int jack_sync_callback (jack_transport_state_t state, jack_position_t * pos, void * arg)` `[friend]`

This JACK synchronization callback informs the specified perform object of the current state and parameters of JACK.

Parameters

<i>state</i>	The JACK Transport state.
<i>pos</i>	The JACK position value.
<i>arg</i>	The pointer to the perform object. Currently not checked for nullity.

7.32.5 Field Documentation

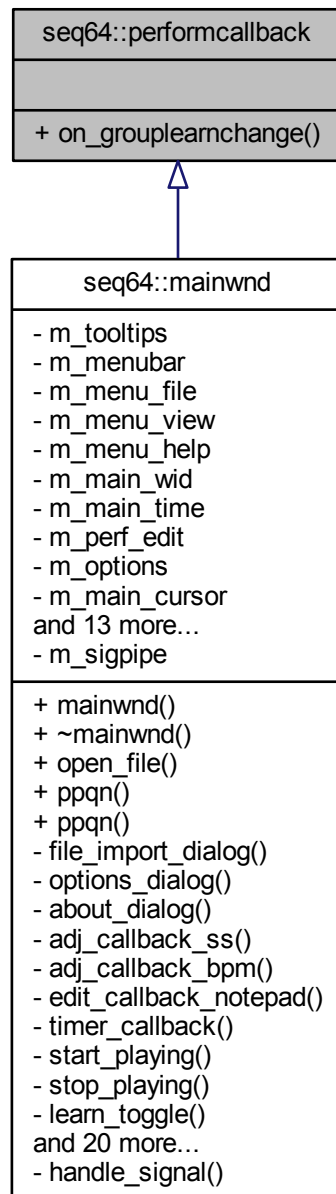
7.32.5.1 `bool seq64::perform::m_playback_mode` `[private]`

There are two, "live" and "song", but we're not yet sure what "true" indicates.

7.33 seq64::performcallback Struct Reference

Provides for notification of events.

Inheritance diagram for seq64::performcallback:



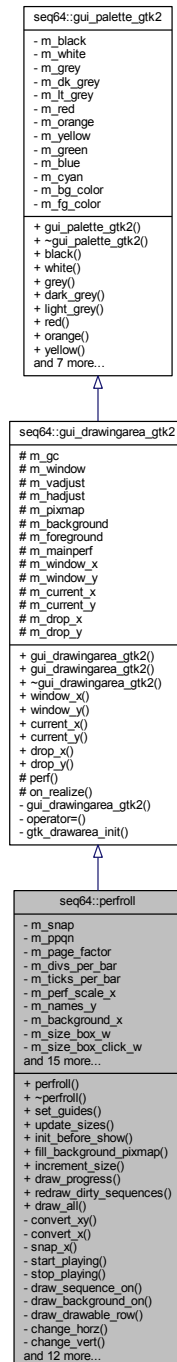
7.33.1 Detailed Description

Provide a response to a group-learn change event.

7.34 seq64::perfroll Class Reference

This class implements the performance roll user interface.

Inheritance diagram for seq64::perffroll:



Public Member Functions

- [perffroll](#) ([perform](#) &a_perf, Gtk::Adjustment &a_hadjust, Gtk::Adjustment &a_vadjust, int ppqn=c_ppqn)
Principal constructor.
- [~perffroll](#) ()
This destructor deletes the interaction object.
- void [set_guides](#) (int a_snap, int a_measure, int a_beat)

- This function sets the snap, measure, and beats members, fills in the background, and queues up a draw operation.*
- void [update_sizes](#) ()
Updates the sizes of various items.
- void [init_before_show](#) ()
Sets the roll-lengths ticks member.
- void [fill_background_pixmap](#) ()
This function updates the background of the Performance roll.
- void [increment_size](#) ()
*Increments the value of m_roll_length_ticks by the PPQN * 512, then calls [update_sizes](#)().*
- void [draw_progress](#) ()
Draws the progress line that shows where we are in the performance.
- void [redraw_dirty_sequences](#) ()
Redraws patterns/sequences that have been modified.
- void [draw_all](#) ()
Provides a very common sequence of calls used in perfroll_input.

Private Member Functions

- void [convert_xy](#) (int x, int y, long &ticks, int &seq)
Converts a tick-offset....
- void [convert_x](#) (int x, long &ticks)
Converts a tick-offset on the x coordinate.
- void [snap_x](#) (int &x)
This function performs a 'snap' action on x.
- void [start_playing](#) ()
Start the performance playing.
- void [stop_playing](#) ()
Stop the performance playing.
- void [draw_sequence_on](#) (Glib::RefPtr< Gdk::Drawable > a_draw, int a_sequence)
Draws the given pattern/sequence on the given drawable area.
- void [draw_background_on](#) (Glib::RefPtr< Gdk::Drawable > a_draw, int a_sequence)
Draws the given pattern/sequence background on the given drawable area.
- void [draw_drawable_row](#) (Glib::RefPtr< Gdk::Drawable > a_dest, Glib::RefPtr< Gdk::Drawable > a_src, long a_y)
Not quite sure what this draws yet.
- void [change_horz](#) ()
Changes the 4-bar horizontal offset member and queues up a draw operation.
- void [change_vert](#) ()
Changes the 4-bar vertical offset member and queues up a draw operation.
- void [split_trigger](#) (int a_sequence, long a_tick)
Splits a trigger, whatever than means.
- void [on_realize](#) ()
Provides the on-realization callback.
- bool [on_expose_event](#) (GdkEventExpose *a_ev)
Handles the on-expose event.
- bool [on_button_press_event](#) (GdkEventButton *a_ev)
This callback function handles a button press by forwarding it to the interaction object's button-press function.
- bool [on_button_release_event](#) (GdkEventButton *a_ev)
This callback function handles a button release by forwarding it to the interaction object's button-release function.
- bool [on_motion_notify_event](#) (GdkEventMotion *a_ev)

Handles motion notification by forwarding it to the interaction object's motion-notification callback function.

- bool `on_scroll_event` (GdkEventScroll *a_ev)

Handles horizontal and vertical scrolling.

- bool `on_focus_in_event` (GdkEventFocus *)

This callback handles an in-focus event by setting the flag to HAS_FOCUS.

- bool `on_focus_out_event` (GdkEventFocus *)

This callback handles an out-of-focus event by resetting the flag HAS_FOCUS.

- void `on_size_allocate` (Gtk::Allocation &)

Upon a size allocation event, this callback calls the base-class version of this function, then sets `m_window_x` and `m_window_y`, and calls `update_sizes()`.

- bool `on_key_press_event` (GdkEventKey *a_p0)

This callback function handles a key-press event.

- void `on_size_request` (GtkRequisition *)

This callback throws away a size request.

Additional Inherited Members

7.34.1 Member Function Documentation

7.34.1.1 void seq64::perroll::update_sizes ()

Note

Trying to figure out what the 16 is. So take the "bars-visible" calculation, the `c_perf_scale_x` value, assume that "ticks" is another name for "pulses", and assume that "beats" is a quarter note. Ignoring the numbers, the units come out to:

$$\text{bars} = \frac{\text{pixels} * \text{ticks} / \text{pixel}}{\text{ticks} / \text{beat} * \text{beats} / \text{bar}}$$

Thus, the 16 is a "beats per bar" or "beats per measure" value. This doesn't quite make sense, but there are 16 divisions per beat on the perroll user-interface. So for now we'll call it the latter, and make a variable called "`m_divs_per_bar`", see its definition in the class initializer list.

7.34.1.2 void seq64::perroll::init_before_show ()

First, it gets the largest trigger value among the active sequences. Then it truncates this value to the nearest PPQN * 16 ticks. Then it adds PPQN * 4096 ticks.

7.34.1.3 void seq64::perroll::convert_xy (int x, int y, long & a_tick, int & a_seq) [private]

The results are returned via the `a_tick` and `a_seq` parameters.

7.34.1.4 void seq64::perroll::convert_x (int x, long & tick) [private]

The result is returned via the `a_tick` parameter.

7.34.1.5 `void seq64::perftroll::snap_x(int & x) [private]`

- `m_snap` = number pulses to snap to
- `m_perf_scale_x` = number of pulses per pixel

Therefore `mod = m_snap/m_perf_scale_x` equals the number pixels to snap to.

7.34.1.6 `void seq64::perftroll::start_playing() [private]`

We need to keep in sync with `perftedit's start_playing()`... wish we could call it directly. Well, now we go to the source, calling `perform::start_playing()`.

7.34.1.7 `void seq64::perftroll::stop_playing() [private]`

We need to keep in sync with `perftedit's stop_playing()`... wish we could call it directly. Well, now we go to the source, calling `perform::stop_playing()`.

7.34.1.8 `void seq64::perftroll::draw_sequence_on(Glib::RefPtr< Gdk::Drawable > a_draw, int a_sequence) [private]`

Statement nesting from hell!

7.34.1.9 `void seq64::perftroll::on_realize() [private]`

Calls the base-class version first.

Then it allocates the additional resources need, that couldn't be initialized in the constructor, and makes some connections.

7.34.1.10 `bool seq64::perftroll::on_button_press_event(GdkEventButton * ev) [private]`

This gives us Seq24 versus Fruity behavior.

7.34.1.11 `bool seq64::perftroll::on_button_release_event(GdkEventButton * ev) [private]`

This gives us Seq24 versus Fruity behavior.

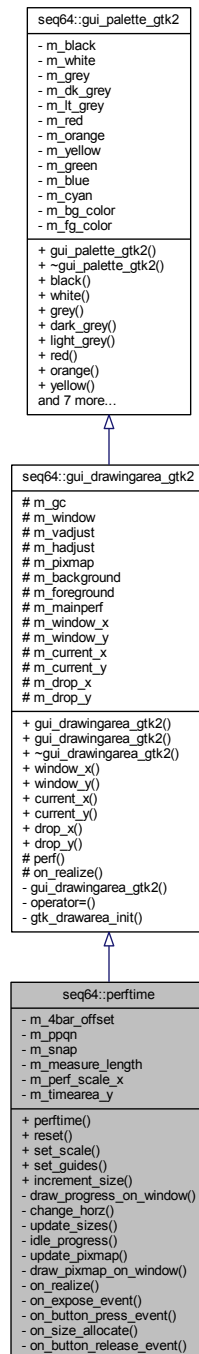
7.34.1.12 `bool seq64::perftroll::on_key_press_event(GdkEventKey * ev) [private]`

If we don't check the event type first, then the `ev->keyval` value is something weird like 65507.

7.35 seq64::perftime Class Reference

This class implements drawing the piano time at the top of the "performance window" (the "song editor").

Inheritance diagram for seq64::perftime:



Public Member Functions

- [perftime](#) ([perform](#) &[perf](#), `Gtk::Adjustment` &`hadjust`)
Principal constructor.
- void [set_guides](#) (int snap, int measure)
Sets the snap value and the measure-length members.
- void [increment_size](#) ()

This function does nothing.

Private Member Functions

- void `change_horz` ()
Change the `m_4bar_offset` and queue a draw operation.
- void `update_sizes` ()
This function does nothing.
- int `idle_progress` ()
This function just returns true.
- void `update_pixmap` ()
This function does nothing.
- void `draw_pixmap_on_window` ()
This function does nothing.
- void `on_realize` ()
Implements the on-realization event, then allocates some resources the could not be allocated in the constructor.
- bool `on_expose_event` (GdkEventExpose *ev)
Implements the on-expose event.
- bool `on_button_press_event` (GdkEventButton *ev)
Implement the button-press event.
- void `on_size_allocate` (Gtk::Allocation &r)
Implements a size-allocation event.
- bool `on_button_release_event` (GdkEventButton *)
This button-release handler does nothing.

Additional Inherited Members

7.35.1 Constructor & Destructor Documentation

7.35.1.1 seq64::perftime::perftime (perform & p, Gtk::Adjustment & hadjust)

In the constructor you can only allocate colors; `get_window()` returns 0 because we have not been realized.

Note

Note that we still have to use a global constant in the base-class constructor; we cannot assign it to the corresponding member beforehand.

7.35.2 Member Function Documentation

7.35.2.1 void seq64::perftime::on_realize () [private]

It is important to call the base-class version of this function.

7.35.2.2 bool seq64::perftime::on_expose_event (GdkEventExpose * ev) [private]

Note

The `perfedit` object is created early on. When brought on-screen from `mainwnd` (the main window), first, `perftime::on_realize()` is called, then this event is called.

It crashes trying to set the foreground color.

7.36 rc_settings Class Reference

This class contains the options formerly named "global_xxxxxx".

Public Member Functions

- [rc_settings](#) ()
Default constructor.
- [rc_settings](#) (const [rc_settings](#) &rhs)
Copy constructor.
- [rc_settings](#) & [operator=](#) (const [rc_settings](#) &rhs)
Principal assignment operator.
- std::string [home_config_directory](#) () const
Provides the directory for the configuration file, and also creates the directory if necessary.
- std::string [config_filespec](#) () const
Constructs the full path and file specification for the "rc" file based on whether or not the legacy Seq24 filenames are being used.
- std::string [user_filespec](#) () const
Constructs the full path and file specification for the "user" file based on whether or not the legacy Seq24 filenames are being used.
- void [set_defaults](#) ()
Sets the default values.
- void [set_globals](#) ()
Copies the current values of the member variables into their corresponding global variables.
- void [get_globals](#) ()
Copies the current values of the global variables into their corresponding member variables.
- bool [legacy_format](#) () const
Accessor *m_legacy_format*
- bool [lash_support](#) () const
Accessor *m_lash_support*
- bool [allow_mod4_mode](#) () const
Accessor *m_allow_mod4_mode*
- bool [show_midi](#) () const
Accessor *m_show_midi*
- bool [priority](#) () const
Accessor *m_priority*
- bool [stats](#) () const
Accessor *m_stats*
- bool [pass_sysex](#) () const
Accessor *m_pass_sysex*
- bool [with_jack_transport](#) () const
Accessor *m_with_jack_transport*
- bool [with_jack_master](#) () const
Accessor *m_with_jack_master*
- bool [with_jack_master_cond](#) () const
Accessor *m_with_jack_master_cond*
- bool [jack_start_mode](#) () const
Accessor *m_jack_start_mode*
- bool [manual_alsa_ports](#) () const
Accessor *m_manual_alsa_ports*
- bool [is_pattern_playing](#) () const

- **Accessor** *m_is_pattern_playing*
- bool [print_keys](#) () const
- **Accessor** *m_print_keys*
- bool [device_ignore](#) () const
- **Accessor** *m_device_ignore*
- int [device_ignore_num](#) () const
- *'Getter' function for member m_device_ignore_num*
- interaction_method_t [interaction_method](#) () const
- *'Getter' function for member m_interaction_method*
- const std::string & [filename](#) () const
- *'Getter' function for member m_filename*
- const std::string & [jack_session_uuid](#) () const
- *'Getter' function for member m_jack_session_uuid*
- const std::string & [last_used_dir](#) () const
- *'Getter' function for member m_last_used_dir*
- const std::string & [config_directory](#) () const
- *'Getter' function for member m_config_directory*
- const std::string & [config_filename](#) () const
- *'Getter' function for member m_config_filename*
- const std::string & [user_filename](#) () const
- *'Getter' function for member m_user_filename*
- const std::string & [config_filename_alt](#) () const
- *'Getter' function for member m_config_filename_alt;*
- const std::string & [user_filename_alt](#) () const
- *'Getter' function for member m_user_filename_alt*
- void [device_ignore_num](#) (int value)
- *'Setter' function for member m_device_ignore_num However, please note that this value, while set in the options processing of the main module, does not appear to be used anywhere in the code in seq24, Sequencer24, and this application.*
- void [interaction_method](#) (interaction_method_t value)
- *'Setter' function for member m_interaction_method*
- void [filename](#) (const std::string &value)
- *'Setter' function for member m_filename*
- void [jack_session_uuid](#) (const std::string &value)
- *'Setter' function for member m_jack_session_uuid*
- void [last_used_dir](#) (const std::string &value)
- *'Setter' function for member m_last_used_dir*
- void [config_directory](#) (const std::string &value)
- *'Setter' function for member m_config_directory*
- void [config_filename](#) (const std::string &value)
- *'Setter' function for member m_config_filename*
- void [user_filename](#) (const std::string &value)
- *'Setter' function for member m_user_filename*
- void [config_filename_alt](#) (const std::string &value)
- *'Setter' function for member m_config_filename_alt;*
- void [user_filename_alt](#) (const std::string &value)
- *'Setter' function for member m_user_filename_alt*

Private Member Functions

- bool [make_directory](#) (const std::string &pathname) const
- *An internal function to ensure that the ~/.config/sequencer64 directory exists.*

Private Attributes

- `std::string m_filename`

Provides the name of current MIDI file.

7.36.1 Member Function Documentation

7.36.1.1 `std::string rc_settings::home_config_directory () const`

If the legacy format is in force, then the home directory for the configuration is (in Linux) `"/home/username"`, and the configuration file is `".seq24rc"`.

If the new format is in force, then the home directory is (in Linux) `"/home/username/.config/sequencer64"`, and the configuration file is `"sequencer64.rc"`.

Returns

Returns the selection home configuration directory. If it does not exist or could not be created, then an empty string is returned.

7.36.1.2 `bool rc_settings::make_directory (const std::string & pathname) const [private]`

This function is actually a little more general than that, but it is not sufficiently general, in general.

Parameters

<i>pathname</i>	Provides the name of the path to create. The parent directory of the final directory must already exist.
-----------------	--

Returns

Returns true if the path-name exists.

7.37 `seq64::gui_drawingarea_gtk2::rect` Struct Reference

A small helper structure representing a rectangle.

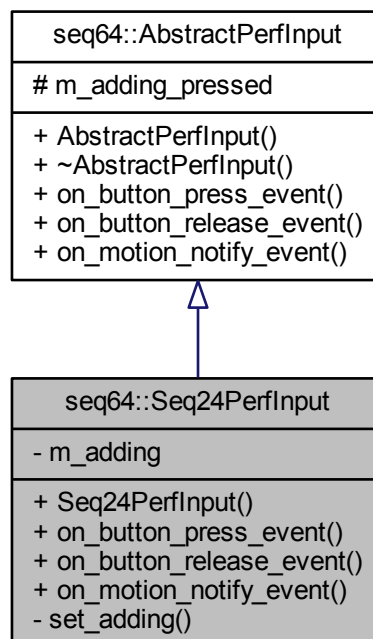
7.38 `seq64::rect` Class Reference

A small helper class representing a rectangle.

7.39 `seq64::Seq24PerfInput` Class Reference

Implements the default performance input characteristics of this application.

Inheritance diagram for seq64::Seq24PerfInput:



Public Member Functions

- bool `on_button_press_event` (GdkEventButton *a_ev, [perfdroll](#) &roll)
Handles the normal variety of button-press event.
- bool `on_button_release_event` (GdkEventButton *a_ev, [perfdroll](#) &roll)
Handles various button-release events.
- bool `on_motion_notify_event` (GdkEventMotion *a_ev, [perfdroll](#) &roll)
Handles the normal motion-notify event.

Private Member Functions

- void `set_adding` (bool a_adding, [perfdroll](#) &roll)
A popup menu (which one?) calls this.

7.39.1 Member Function Documentation

7.39.1.1 bool `seq64::Seq24PerfInput::on_button_press_event` (GdkEventButton * a_ev, [perfdroll](#) & roll) [virtual]

Is there any easy way to use ctrl-left-click as the middle button here?

Implements [seq64::AbstractPerfInput](#).

7.39.1.2 `bool seq64::Seq24PerfInput::on_button_release_event (GdkEventButton * a_ev, perfroll & roll) [virtual]`

Any use for the middle-button or ctrl-left-click we can add?

Implements [seq64::AbstractPerfInput](#).

7.39.1.3 `void seq64::Seq24PerfInput::set_adding (bool adding, perfroll & roll) [private]`

What does it mean?

7.40 seq64::Seq24SeqEventInput Struct Reference

This structure implement the normal interaction methods for Seq24.

Public Member Functions

- [Seq24SeqEventInput](#) ()
Default constructor.
- void [set_adding](#) (bool a_adding, [sequevent](#) &ths)
Changes the mouse cursor to a pencil or a left pointer in the given sequevent aobject, depending on the first parameter.
- bool [on_button_press_event](#) (GdkEventButton *a_ev, [sequevent](#) &ths)
Implements the on-button-press event callback.
- bool [on_button_release_event](#) (GdkEventButton *a_ev, [sequevent](#) &ths)
Implements the on-button-release callback.
- bool [on_motion_notify_event](#) (GdkEventMotion *a_ev, [sequevent](#) &ths)
Implements the on-motion-notify event.

7.40.1 Member Function Documentation

7.40.1.1 `void seq64::Seq24SeqEventInput::set_adding (bool adding, sequevent & segev)`

Modifies m_adding as well.

7.40.1.2 `bool seq64::Seq24SeqEventInput::on_button_press_event (GdkEventButton * a_ev, sequevent & segev)`

Set values for dragging, then reset box that holds dirty redraw spot. Needs update.

segev.m_seq.unselect(); ???????

7.41 seq64::Seq24SeqRollInput Struct Reference

Implements the Seq24 mouse interaction paradigm for the seqroll.

Public Member Functions

- [Seq24SeqRollInput](#) ()
Default constructor.
- void [set_adding](#) (bool a_adding, [seqroll](#) &ths)
Changes the mouse cursor pixmap according to whether a note is being added or not.

- bool [on_button_press_event](#) (GdkEventButton *a_ev, [seqroll](#) &ths)

Implements the on-button-press event handling for the Seq24 style of mouse interaction.

- bool [on_button_release_event](#) (GdkEventButton *a_ev, [seqroll](#) &ths)

Implements the on-button-release event handling for the Seq24 style of mouse interaction.

- bool [on_motion_notify_event](#) (GdkEventMotion *a_ev, [seqroll](#) &ths)

Implements the on-motion-notify event handling for the Seq24 style of mouse interaction.

7.41.1 Member Function Documentation

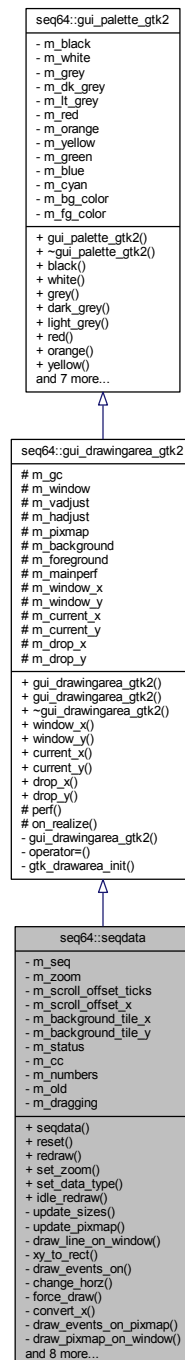
7.41.1.1 void seq64::Seq24SeqRollInput::set_adding (bool *a_adding*, [seqroll](#) & *sroll*)

(Which?) popup menu calls this. It is actually a right click, I think.

7.42 seq64::seqdata Class Reference

This class supports drawing piano-roll events on a window.

Inheritance diagram for seq64::seqdata:



Public Member Functions

- [seqdata](#) ([sequence](#) &seq, [perform](#) &p, int zoom, Gtk::Adjustment &hadjust)

Principal constructor.

- void [reset](#) ()

This function calls [update_size](#)().

- void [redraw](#) ()

- Updates the pixmap and queues up a redraw operation.*

 - void [set_zoom](#) (int a_zoom)

Sets the zoom to the given value and resets the view via the reset function.
- void [set_data_type](#) (unsigned char a_status, unsigned char a_control)

Sets the status to the given value, and the control to the optional given value, which defaults to 0, then calls [redraw\(\)](#).
- int [idle_redraw](#) ()

Draws events on this object's built-in window and pixmap.

Private Member Functions

- void [update_sizes](#) ()

Updates the sizes in the pixmap if the view is realized, and queues up a draw operation.
- void [update_pixmap](#) ()

Simply calls [draw_events_on_pixmap\(\)](#).
- void [draw_line_on_window](#) ()

Draws on vertical line on...
- void [xy_to_rect](#) (int a_x1, int a_y1, int a_x2, int a_y2, int &r_x, int &r_y, int &r_w, int &r_h)

This function takes two points, and returns an Xwin rectangle, returned via the last four parameters.
- void [draw_events_on](#) (Glib::RefPtr< Gdk::Drawable > a_draw)

Draws events on the given drawable object.
- void [change_horz](#) ()

Change the scrolling offset on the x-axis, and redraw.
- void [force_draw](#) ()

Force a redraw.
- void [convert_x](#) (int x, long &tick)

This function takes screen coordinates, and gives the horizontal tick value based on the current zoom, returned via the second parameter.
- void [draw_events_on_pixmap](#) ()

Simply calls [draw_events_on\(\)](#) for this object's built-in pixmap.
- void [draw_pixmap_on_window](#) ()

Simply queues up a draw operation.
- void [on_realize](#) ()

Implements the on-realization event, by calling the base-class version and then allocating the resources that could not be allocated in the constructor.
- bool [on_expose_event](#) (GdkEventExpose *a_ev)

Implements the on-expose event.
- bool [on_button_press_event](#) (GdkEventButton *a_ev)

Implement a button-press event.
- bool [on_button_release_event](#) (GdkEventButton *a_ev)

Implement a button-release event.
- bool [on_motion_notify_event](#) (GdkEventMotion *a_p0)

Handles a motion-notify event.
- bool [on_leave_notify_event](#) (GdkEventCrossing *p0)

Handles an on-leave notification event.
- bool [on_scroll_event](#) (GdkEventScroll *a_ev)

Implements the on-scroll event.
- void [on_size_allocate](#) (Gtk::Allocation &)

Handle a size-allocation event.

Private Attributes

- int [m_zoom](#)
one pixel == m_zoom ticks
- unsigned char [m_status](#)
What is the data window currently editing?

Additional Inherited Members

7.42.1 Constructor & Destructor Documentation

7.42.1.1 `seq64::seqdata::seqdata (sequence & seq, perform & p, int zoom, Gtk::Adjustment & hadjust)`

In the constructor you can only allocate colors, `get_window()` returns 0 because we have not been realized.

7.42.2 Member Function Documentation

7.42.2.1 `void seq64::seqdata::reset ()`

Then, regardless of whether the view is realized, updates the pixmap and queues up a draw operation.

Note

If it weren't for the `is_realized()` condition, we could just call [update_sizes\(\)](#), which does all this anyway.

7.42.2.2 `void seq64::seqdata::redraw () [inline]`

We need to make this an inline function and use it as common code.

7.42.2.3 `void seq64::seqdata::set_zoom (int zoom)`

This begs the question, do we have GUI access to the zoom setting?

7.42.2.4 `int seq64::seqdata::idle_redraw ()`

This drawing is done only if there is no dragging in progress, to guarantee no flicker.

7.42.2.5 `void seq64::seqdata::update_sizes () [private]`

It creates a pixmap with window dimensions given by `m_window_x` and `m_window_y`.

7.42.2.6 `void seq64::seqdata::xy_to_rect (int a_x1, int a_y1, int a_x2, int a_y2, int & r_x, int & r_y, int & r_w, int & r_h) [private]`

It checks the mins/maxes, then fills in x, y, and width, height.

7.42.2.7 `void seq64::seqdata::on_realize () [private]`

It also connects up the [change_horz\(\)](#) function.

7.42.2.8 `bool seq64::seqdata::on_motion_notify_event (GdkEventMotion * a_p0) [private]`

It converts the x,y of the mouse to ticks, then sets the events in the event-data-range, updates the pixmap, draws events in the window, and draws a line on the window.

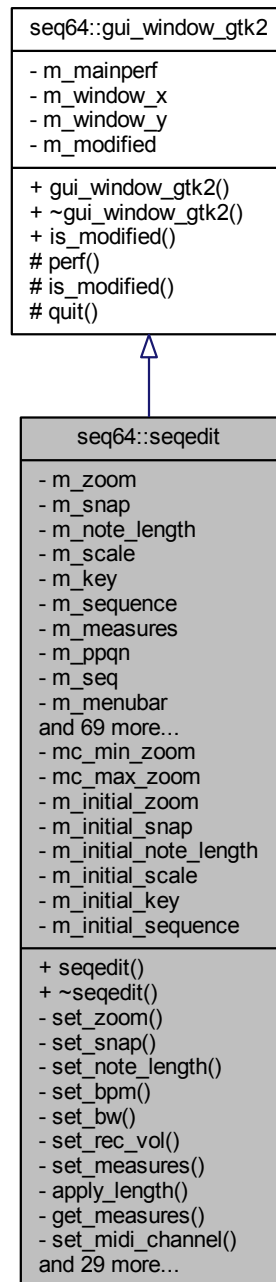
7.42.2.9 `bool seq64::seqdata::on_scroll_event (GdkEventScroll * a_ev) [private]`

This scroll event only handles basic scrolling, without any modifier keys such as GDK_CONTROL_MASK or GDK_SHIFT_MASK.

7.43 seq64::seqedit Class Reference

Implements the Pattern Editor, which has references to:

Inheritance diagram for seq64::seqedit:



Public Member Functions

- `seqedit` (`sequence` &`a_seq`, `perform` &`a_perf`, `int pos`, `int ppqn=c_ppqn`)
Connects to a menu item, tells the performance to launch the timer thread.
- `~seqedit` ()
A rote destructor.

Private Member Functions

- void [set_zoom](#) (int a_zoom)
Selects the given zoom value.
- void [set_snap](#) (int a_snap)
Selects the given snap value.
- void [set_note_length](#) (int a_note_length)
Selects the given note-length value.
- void [set_bpm](#) (int a_beats_per_measure)
Set the bpm (beats per measure) value, using the given parameter, and some internal values passed to [apply_length\(\)](#).
- void [set_bw](#) (int a_beat_width)
Set the bw (beat width) value, using the given parameter, and some internal values passed to [apply_length\(\)](#).
- void [set_rec_vol](#) (int a_rec_vol)
Passes the given parameter to [sequence::set_rec_vol\(\)](#).
- void [set_measures](#) (int a_length_measures)
Set the measures value, using the given parameter, and some internal values passed to [apply_length\(\)](#).
- void [apply_length](#) (int a_bpm, int a_bw, int a_measures)
Sets the length based on the three given parameters.
- long [get_measures](#) ()
Calculates the measures value based on the bpm (beats per measure), ppqn (parts per quarter note), and bw (beat width) values, and returns the resultant measures value.
- void [set_midi_channel](#) (int a_midichannel)
Selects the given MIDI channel parameter in the main sequence object, so that it will use that channel.
- void [set_midi_bus](#) (int a_midibus)
Selects the given MIDI buss parameter in the main sequence object, so that it will use that buss.
- void [set_scale](#) (int a_scale)
Selects the given scale value.
- void [set_key](#) (int a_note)
Selects the given key (signature) value.
- void [set_background_sequence](#) (int a_seq)
Draws the given background sequence on the Pattern editor so that the musician has something to see that can be played against.
- void [name_change_callback](#) ()
Set the name for the main sequence to this object's entry name.
- void [play_change_callback](#) ()
Passes the play status to the sequence object.
- void [record_change_callback](#) ()
Passes the recording status to the sequence object.
- void [q_rec_change_callback](#) ()
Passes the quantized-recording status to the sequence object.
- void [thru_change_callback](#) ()
Passes the MIDI Thru status to the sequence object.
- void [undo_callback](#) ()
Pops an undo operation from the sequence object, and then tell the segroll, seqtime, seqdata, and sequevent objects to redraw.
- void [redo_callback](#) ()
Pops a redo operation from the sequence object, and then tell the segroll, seqtime, seqdata, and sequevent objects to redraw.
- void [set_data_type](#) (unsigned char a_status, unsigned char a_control=0)
Sets the data type based on the given parameters.
- void [fill_top_bar](#) ()

This function inserts the user-interface items into the top bar or panel of the pattern editor; this bar has two rows of user interface elements.

- void `create_menus` ()
Creates the various menus by pushing menu elements into the menus.
- void `popup_menu` (Gtk::Menu *a_menu)
Pops up the given pop-up menu.
- void `popup_event_menu` ()
Populates the event-selection menu that drops from the "Event" button in the bottom row of the Pattern editor.
- void `popup_midibus_menu` ()
Populates the MIDI Output buss pop-up menu.
- void `popup_sequence_menu` ()
Populates the "set background sequence" menu (drops from the button that has some note-bars on it at the right of the second row of the top bar).
- void `popup_tool_menu` ()
Sets up the pop-up menus that are brought up by pressing the Tools button, which shows a hammer image.
- void `popup_midich_menu` ()
Populates the MIDI Channel pop-up menu.
- Gtk::Image * `create_menu_image` (bool a_state=false)
Sets the manu pixmap depending on the given state, where true is a full menu (black background), and empty menu (gray background).
- bool `timeout` ()
Update the window after a time out, based on dirtiness and on playback progress.
- void `do_action` (int a_action, int a_var)
Implements the actions brought forth from the Tools (hammer) button.
- void `on_realize` ()
On realization, calls the base-class version, and connects the redraw timeout signal, timed at c_redraw_ms.
- bool `on_delete_event` (GdkEventAny *a_event)
Handles an on-delete event.
- bool `on_scroll_event` (GdkEventScroll *a_ev)
Handles an on-scroll event.
- bool `on_key_press_event` (GdkEventKey *a_ev)
Handles a key-press event.

Private Attributes

- int `m_zoom`
Provides the zoom values: 0 1 2 3 4, and 1, 2, 4, 8, 16.
- int `m_snap`
Use in setting the snap-to in pulses, off = 1.
- int `m_scale`
Settings for the music scale and key.
- Gtk::Menu * `m_menu_length`
Provides the length in measures.
- Gtk::Menu * `m_menu_bpm`
These member provide the time signature, beats per measure, and beat width menus.
- unsigned char `m_editing_status`
Indicates what is the data window currently editing?

Static Private Attributes

- static const int `mc_min_zoom`
Static data members.

Additional Inherited Members

7.43.1 Detailed Description

- perform
- seqroll
- seqkeys
- seqdata
- seqtime
- seqevent
- sequence

This class has a metric ton of user-interface objects and other members.

7.43.2 Constructor & Destructor Documentation

7.43.2.1 `seq64::seqedit::seqedit (sequence & seq, perform & p, int pos, int ppqn = c_ppqn)`

But this is an unused, empty function.

`void seqedit::menu_action_quantise () { }` Principal constructor.

Todo Offload most of the work into an initialization function like options does; make the sequence and perform parameters references.

7.43.3 Member Function Documentation

7.43.3.1 `void seq64::seqedit::set_zoom (int a_zoom) [private]`

It is passed to the seqroll, seqtime, seqdata, and seqevent objects, as well.

7.43.3.2 `void seq64::seqedit::set_snap (int a_snap) [private]`

It is passed to the seqroll, seqevent, and sequence objects, as well.

7.43.3.3 `void seq64::seqedit::set_note_length (int a_note_length) [private]`

It is passed to the seqroll object, as well.

7.43.3.4 `void seq64::seqedit::apply_length (int a_bpm, int a_bw, int a_measures) [private]`

Then the seqroll, seqtime, seqdata, and seqevent objects are reset().

7.43.3.5 `long seq64::seqedit::get_measures () [private]`

Todo Create a `sequence::set_units()` function or a `sequence::get_measures()` function to forward to.

7.43.3.6 `void seq64::seqedit::set_scale (int a_scale) [private]`

It is passed to the seqroll and seqkeys objects, as well.

7.43.3.7 `void seq64::seqedit::set_key (int a_note) [private]`

It is passed to the seqroll and seqkeys objects, as well.

7.43.3.8 `void seq64::seqedit::set_background_sequence (int a_seq) [private]`

Todo Make the sequence pointer a reference.

7.43.3.9 `void seq64::seqedit::name_change_callback () [private]`

That name is the name the user has given to the sequence being edited.

7.43.3.10 `void seq64::seqedit::set_data_type (unsigned char a_status, unsigned char a_control = 0) [private]`

To be determined.

7.43.3.11 `void seq64::seqedit::popup_event_menu () [private]`

This menu has a large number of items. I think they are filled in in code, but can also be loaded from `~/seq24usr`. To be determined. Create the 8 sub-menus for the various ranges of controller changes, shown 16 per sub-menu.

7.43.3.12 `void seq64::seqedit::popup_midibus_menu () [private]`

The MIDI busses are obtained by getting the mastermidibus object, and iterating through the busses that it contains.

7.43.3.13 `void seq64::seqedit::popup_sequence_menu () [private]`

It is populated with an "Off" menu entry, and a second "[0]" menu entry that pulls up a drop-down menu of all of the patterns/sequences that are present in the MIDI file.

7.43.3.14 `void seq64::seqedit::popup_tool_menu () [private]`

This button shows three sub-menus that need to be filled in by this function. All the functions accessed here seem to be implemented by the `do_action()` function.

7.43.3.15 `void seq64::seqedit::do_action (int a_action, int a_var) [private]`

Note that the `push_undo()` calls push all of the current events (in `sequence::m_events`) onto the stack (as a single entry).

7.43.3.16 `bool seq64::seqedit::on_delete_event (GdkEventAny * a_event) [private]`

It tells the sequence to stop recording, tells the perform object's mastermidibus to stop processing input, and sets the sequence object's editing flag to false.

Warning

This function also calls "delete this"!

Returns

Always returns false.

7.43.4 Field Documentation

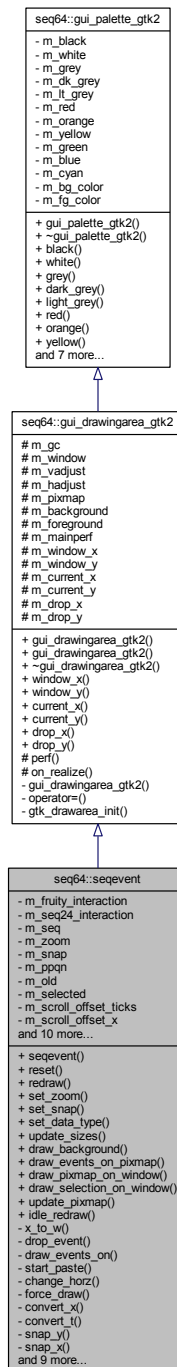
7.43.4.1 `const int seq64::segedit::mc_min_zoom` `[static], [private]`

These items apply to all of the instances of segedit.

7.44 seq64::sequevent Class Reference

Implements the piano event drawing area.

Inheritance diagram for seq64::sequevent:



Public Member Functions

- [sequevent](#) ([sequence](#) &seq, [perform](#) &p, int zoom, int snap, [seqdata](#) &seqdata_wid, Gtk::Adjustment &hadjust, int ppqn=c_ppqn)

Principal constructor.

- void [reset](#) ()

This function basically resets the whole widget as if it was realized again.

- void [redraw](#) ()
Adjusts the scrolling offset for ticks, updates the pixmap, and draws it on the window.
- void [set_zoom](#) (int a_zoom)
Sets zoom to the given value, and resets if the value ended up being changed.
- void [set_snap](#) (int a_snap)
'Setter' function for member m_snap
- void [set_data_type](#) (unsigned char a_status, unsigned char a_control)
Sets the status to the given parameter, and the CC value to the given optional control parameter, which defaults to 0.
- void [update_sizes](#) ()
If the window is realized, this function creates a pixmap with window dimensions, the updates the pixmap, and queues up a redraw.
- void [draw_background](#) ()
This function updates the background.
- void [draw_events_on_pixmap](#) ()
This function fills the main pixmap with events.
- void [draw_pixmap_on_window](#) ()
This function currently just queues up a draw operation for the pixmap.
- void [draw_selection_on_window](#) ()
Draw the selected events on the window.
- void [update_pixmap](#) ()
Redraws the background pixmap on the main pixmap, then puts the events on.
- int [idle_redraw](#) ()
Implements redraw while idling.

Private Member Functions

- void [x_to_w](#) (int a_x1, int a_x2, int &a_x, int &a_w)
This function checks the mins / maxes.
- void [drop_event](#) (long a_tick)
Drops (adds) an event at the given tick.
- void [draw_events_on](#) (Glib::RefPtr< Gdk::Drawable > a_draw)
Draws events on the given drawable object.
- void [start_paste](#) ()
Starts a paste operation.
- void [change_horz](#) ()
Changes the horizontal scrolling offset for ticks, then updates the pixmap and forces a redraw.
- void [force_draw](#) ()
Forces a draw on the current drawable area of the window.
- void [convert_x](#) (int x, long &tick)
Takes the screen x coordinate, multiplies it by the current zoom, and returns the tick value in the given parameter.
- void [convert_t](#) (long ticks, int &x)
Converts the given tick value to an x corrdinate, based on the zoom, and returns it via the second parameter.
- void [snap_y](#) (int &y)
This function performs a 'snap' on y.
- void [snap_x](#) (int &a_x)
This function performs a 'snap' on x.
- void [on_realize](#) ()
Implements the on-realize callback.
- bool [on_expose_event](#) (GdkEventExpose *a_ev)
Implements the on-expose event callback.
- bool [on_button_press_event](#) (GdkEventButton *a_ev)

- Implements the on-button-press event callback.*
- bool [on_button_release_event](#) (GdkEventButton *a_ev)
Implements the on-button-release event callback.
- bool [on_motion_notify_event](#) (GdkEventMotion *a_ev)
Implements the on-motion-notify event callback.
- bool [on_focus_in_event](#) (GdkEventFocus *)
Responds to a focus event by setting the HAS_FOCUS flag.
- bool [on_focus_out_event](#) (GdkEventFocus *)
Responds to a unfocus event by resetting the HAS_FOCUS flag.
- bool [on_key_press_event](#) (GdkEventKey *a_p0)
Implements the key-press event callback function.
- void [on_size_allocate](#) (Gtk::Allocation &)
Implements the on-size-allocate event callback.

Private Attributes

- FruitySeqEventInput [m_fruity_interaction](#)
Why should we need both at the same time? Just load the one that is specified in the configuration.
- int [m_zoom](#)
Zoom setting, means that one pixel == m_zoom ticks.
- bool [m_selecting](#)
Used when highlighting a bunch of events.
- unsigned char [m_status](#)
Indicates what is the data window currently editing?

Additional Inherited Members

7.44.1 Member Function Documentation

7.44.1.1 void seq64::seqevent::set_snap (int a_snap) [inline]

Simply sets the snap member.

7.44.1.2 void seq64::seqevent::set_data_type (unsigned char status, unsigned char control = 0)

Then redraws.

7.44.1.3 void seq64::seqevent::update_sizes ()

This ends up filling the background with dotted lines, etc.

7.44.1.4 void seq64::seqevent::draw_background ()

It sets the foreground to white, draws the rectangle.

7.44.1.5 void seq64::seqevent::draw_pixmap_on_window ()

Old comments:

```
It then tells event to do the same.
We changed something on this window, and chances are we need to
update the event widget as well and update our velocity window.
```

7.44.1.6 `int seq64::sequevent::idle_redraw ()`

Who calls this routine?

7.44.1.7 `void seq64::sequevent::x_to_w (int a_x1, int a_x2, int & a_x, int & a_w) [private]`

Then it fills in x and the width.

7.44.1.8 `void seq64::sequevent::drop_event (long a_tick) [private]`

It sets the first byte properly for after-touch, program-change, channel-pressure, and pitch-wheel. The type of event is determined by m_status.

7.44.1.9 `void seq64::sequevent::start_paste () [private]`

It gets the clipboard box that selected elements are in, makes a coordinate conversion, and then, sets the m_↔ selected rectangle to hold the (x,y,w,h) of the selected events.

7.44.1.10 `void seq64::sequevent::convert_x (int x, long & tick) [inline], [private]`

Why not just return it normally?

7.44.1.11 `void seq64::sequevent::convert_t (long ticks, int & x) [inline], [private]`

Why not just return it normally?

7.44.1.12 `void seq64::sequevent::snap_x (int & x) [private]`

- snap = number pulses to snap to
- m_zoom = number of pulses per pixel,

Therefore snap / m_zoom = number pixels to snap to.

7.44.1.13 `void seq64::sequevent::on_realize () [private]`

It calls the base-class version, and then allocates additional resource not allocated in the constructor. Finally, it connects up the change_horz function.

7.44.1.14 `bool seq64::sequevent::on_button_press_event (GdkEventButton * a_ev) [private]`

It distinguishes between the Seq24 and Fruity varieties of mouse interaction.

Odd. In the legacy code, each case fell through to the next case to the "default" case! We will assume for now that this is incorrect.

Note that returning "true" from a Gtkmm event-handler stops the propagation of the event to higher-level widgets. The Fruity and Seq24 event handlers return true, always. In the legacy code, though, the fall-through code caused false to be returned, always. Not sure what effect this had.

7.44.1.15 `bool seq64::segevent::on_button_release_event (GdkEventButton * a_ev) [private]`

It distinguishes between the Seq24 and Fruity varieties of mouse interaction.

Odd. The fruity case fell through to the Seq24 case. We will assume for now that this is correct.

7.44.1.16 `bool seq64::segevent::on_motion_notify_event (GdkEventMotion * a_ev) [private]`

It distinguishes between the Seq24 and Fruity varieties of mouse interaction.

Odd. The fruity case fell through to the Seq24 case. We will assume for now that this is correct.

7.44.1.17 `bool seq64::segevent::on_key_press_event (GdkEventKey * a_p0) [private]`

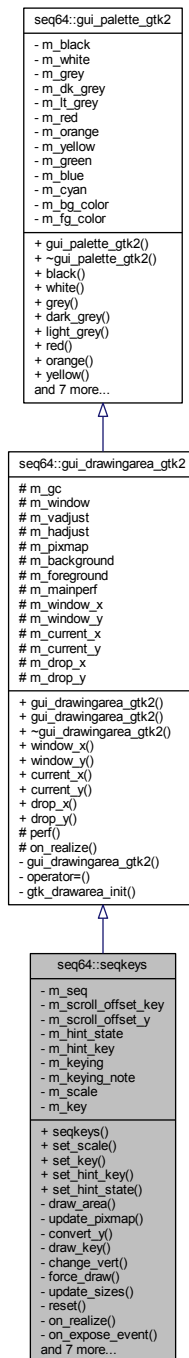
It handles deleted a selection via the Backspace or Delete keys, cut via Ctrl-X, copy via Ctrl-C, paste via Ctrl-V, and undo via Ctrl-Z.

Would be nice to provide redo functionality via Ctrl-Y. :-)

7.45 seq64::seqkeys Class Reference

This class implements the left side piano of the pattern/sequence editor.

Inheritance diagram for seq64::seqkeys:



Public Member Functions

- `seqkeys` (`sequence` &seq, `perform` &p, `Gtk::Adjustment` &vadjust)
Principal constructor.
- void `set_scale` (int a_scale)
Sets the musical scale, then resets.
- void `set_key` (int a_key)

- *Sets the musical key, then resets.*
- void [set_hint_key](#) (int a_key)
Sets a key to grey so that it can serve as a scale hint.
- void [set_hint_state](#) (bool a_state)
Sets the hint state to the given value.

Private Member Functions

- void [draw_area](#) ()
Draws the updated pixmap on the drawable area of the window where the keys' location is hardwired.
- void [update_pixmap](#) ()
Updates the pixmaps to prepare it for the next draw operation.
- void [convert_y](#) (int a_y, int &a_note)
Takes the screen y coordinate, and returns the note value in the second parameter.
- void [draw_key](#) (int a_key, bool a_state)
Draws the given key according to the given state.
- void [change_vert](#) ()
Changes the y offset of the scrolling, and the forces a draw.
- void [force_draw](#) ()
Forces a draw operation on the whole window.
- void [reset](#) ()
Resetting the keys view updates the pixmap and queues up a draw operation.
- void [on_realize](#) ()
Implements the on-realize event.
- bool [on_expose_event](#) (GdkEventExpose *a_ev)
Implements the on-expose event, by drawing on the window.
- bool [on_button_press_event](#) (GdkEventButton *a_ev)
Implements the on-button-press event callback.
- bool [on_button_release_event](#) (GdkEventButton *a_ev)
Implements the on-button-release event callback.
- bool [on_motion_notify_event](#) (GdkEventMotion *a_p0)
Implements the on-motion-notify event handler.
- bool [on_enter_notify_event](#) (GdkEventCrossing *p0)
Implements the on-enter notification event handler.
- bool [on_leave_notify_event](#) (GdkEventCrossing *p0)
Implements the on-leave notification event handler.
- bool [on_scroll_event](#) (GdkEventScroll *a_ev)
Implements the on-scroll-event notification event handler.
- void [on_size_allocate](#) (Gtk::Allocation &)
Implements the on-size-allocation notification event handler.

Private Attributes

- bool [m_keying](#)
What is this?

Additional Inherited Members

7.45.1 Member Function Documentation

7.45.1.1 void seq64::seqkeys::set_hint_state (bool state)

Parameters

<i>state</i>	Provides the value for hinting, where true == on, false == off.
--------------	---

7.45.1.2 `void seq64::seqkeys::draw_key (int a_key, bool a_state)` [private]

It accounts for the black keys and the white keys.

Parameters

<i>a_key</i>	The key to be drawn.
<i>a_state</i>	How the key is to be drawn, where false == normal, true == grayed.

7.45.1.3 `void seq64::seqkeys::on_realize ()` [private]

Call the base-class version and then allocates resources that could not be allocated in the constructor. It connects the [change_vert\(\)](#) function and then calls it.

7.45.1.4 `bool seq64::seqkeys::on_button_press_event (GdkEventButton * ev)` [private]

It currently handles only the left button. This button, pressed on the piano keyboard, causes m_keying to be set to true, and the given note to play.

7.45.1.5 `bool seq64::seqkeys::on_button_release_event (GdkEventButton * ev)` [private]

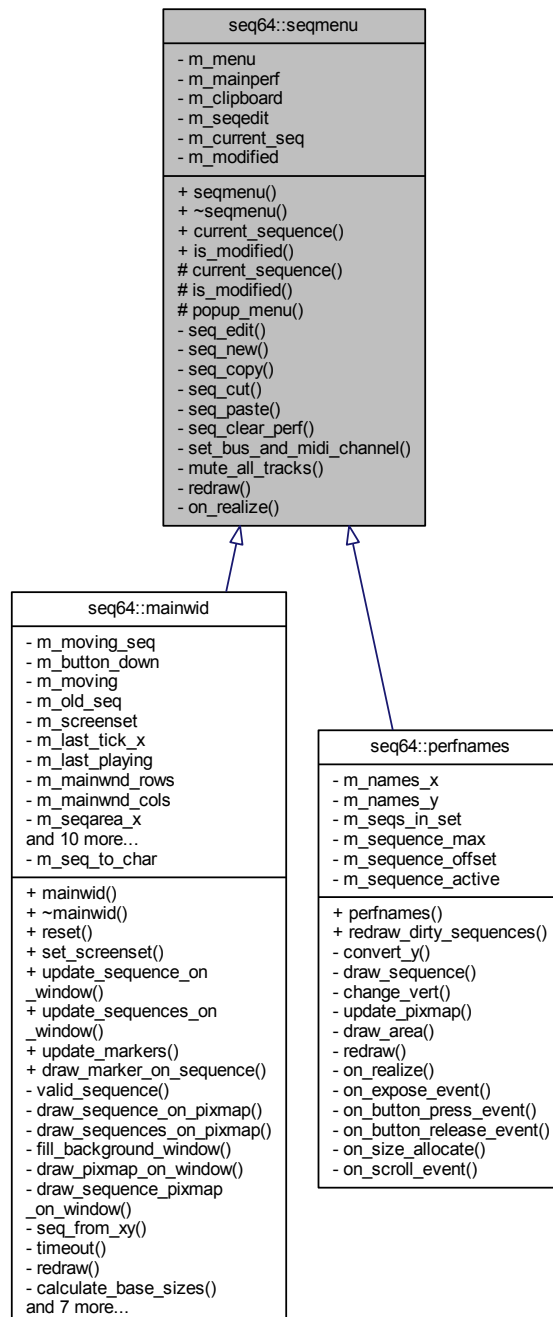
It currently handles only the left button, and only if m_keying is true.

This function is used after pressing on one of the keys on the left-side piano keyboard, to make it play, and turns off the playing of the note.

7.46 seq64::seqmenu Class Reference

This class handles the right-click menu of the sequence slots in the pattern window.

Inheritance diagram for seq64::seqmenu:



Public Member Functions

- [seqmenu](#) ([perform](#) &a_p)
Principal constructor.
- virtual [~seqmenu](#) ()
Provides a rote base-class destructor.
- int [current_sequence](#) () const

- *'Getter' function for member m_current_seq*
- bool [is_modified](#) () const
- *'Getter' function for member m_modified*

Protected Member Functions

- void [current_sequence](#) (int seq)
- *'Setter' function for member m_current_seq*
- void [is_modified](#) (bool flag)
- *'Setter' function for member m_modified*
- void [popup_menu](#) ()
- *This function sets up the File menu entries.*

Private Member Functions

- void [seq_edit](#) ()
- *This menu callback launches the sequence-editor (pattern editor) window.*
- void [seq_new](#) ()
- *This function sets the new sequence into the perform object, a bit prematurely, though.*
- void [seq_copy](#) ()
- *Copies the selected (current) sequence to the clipboard sequence.*
- void [seq_cut](#) ()
- *Deletes the selected (current) sequence and copies it to the clipboard sequence, if it is not in edit mode.*
- void [seq_paste](#) ()
- *Pastes the sequence clipboard into the current sequence, if the current sequence slot is not active.*
- void [seq_clear_perf](#) ()
- *If the current sequence is active, this function pushes a trigger undo in the main perform object, clears its sequence triggers for the current sequence, and sets the dirty flag of the sequence.*
- void [set_bus_and_midi_channel](#) (int a_bus, int a_ch)
- *Sets up the bus, MIDI channel, and dirtiness flag of the current sequence in the main perform object, as per the give parameters.*
- void [mute_all_tracks](#) ()
- *Mutes all tracks in the main perform object.*

Private Attributes

- [seqedit](#) * [m_seqedit](#)
- *Change Note Added by Chris on 2015-08-02 based on compiler warnings and a comment warning in the [seq_edit\(\)](#) function.*

7.46.1 Detailed Description

It is an abstract base class.

7.46.2 Constructor & Destructor Documentation

7.46.2.1 seq64::seqmenu::seqmenu (perform & a_p)

Apart from filling in some of the members, this function initializes the clipboard, so that we don't get a crash on a paste with no previous copy.

7.46.2.2 seq64::seqmenu::~~seqmenu () [virtual]

A rote destructor.

This is necessary in an abstraction base class.

If we determine that we need to delete the m_seqedit pointer, we can do it here. But that is not likely, because we can have many new seqedit objects in play, because we can edit many at once.

7.46.3 Member Function Documentation

7.46.3.1 void seq64::seqmenu::seq_edit () [private]

If it is already open for that sequence, this function just raises it.

Note that the m_seqedit member to which we save the new pointer is currently there just to avoid a compiler warning.

Also, if a new sequences is created, we set the m_modified flag to true, even though the sequence might later be deleted. Too much modification to keep track of!

7.46.3.2 void seq64::seqmenu::seq_copy () [private]

Todo Can be offloaded to a perform member function that accepts a sequence clipboard non-const reference parameter.

7.46.3.3 void seq64::seqmenu::seq_cut () [private]

Todo A lot of seq_cut() can be offloaded to a (new) perform member function that takes a sequence clipboard non-const reference parameter.

7.46.3.4 void seq64::seqmenu::seq_paste () [private]

Then it sets the dirty flag for the destination sequence.

Todo All of seq_paste() can be offloaded to a (new) perform member function with a const clipboard reference parameter.

7.46.3.5 void seq64::seqmenu::seq_clear_perf () [private]

Todo All of seq_paste() can be offloaded to a (new) perform member function.

7.46.4 Field Documentation

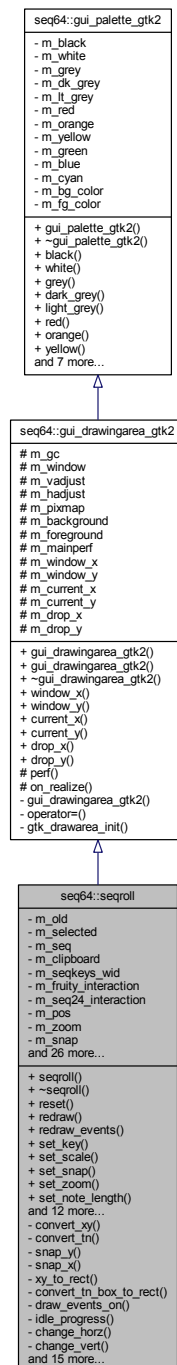
7.46.4.1 seqedit* seq64::seqmenu::m_seqedit [private]

We'll save the result of that function here, and will let valgrind tell us later if Gtkmm takes care of it.

7.47 seq64::seqroll Class Reference

Implements the piano roll section of the pattern editor.

Inheritance diagram for seq64::seqroll:



Public Member Functions

- `seqroll` (`perform` &`perf`, `sequence` &`seq`, `int` zoom, `int` snap, `seqkeys` &`seqkeys_wid`, `int` pos, `Gtk::Adjustment` &`hadjust`, `Gtk::Adjustment` &`vadjust`, `int` ppqn=`c_ppqn`)

Principal constructor.

- `~seqroll` ()

Provides a destructor to delete allocated objects.

- void `reset` ()
This function basically resets the whole widget as if it was realized again.
- void `redraw` ()
Redraws unless `m_ignore_redraw` is true.
- void `redraw_events` ()
Redraws events unless `m_ignore_redraw` is true.
- void `set_key` (int key)
Sets the music key to the given value, and then resets the view.
- void `set_scale` (int scale)
Sets the music scale to the given value, and then resets the view.
- void `set_snap` (int snap)
Sets the snap to the given value, and then resets the view.
- void `set_zoom` (int zoom)
Sets the zoom to the given value, and then resets the view.
- void `set_note_length` (int note_length)
'Setter' function for member `m_note_length`
- void `set_ignore_redraw` (bool ignore)
'Setter' function for member `m_ignore_redraw`
- void `set_data_type` (unsigned char status, unsigned char control)
Sets the status to the given parameter, and the CC value to the given optional control parameter, which defaults to 0.
- void `set_background_sequence` (bool state, int seq)
This function sets the given sequence onto the piano roll of the pattern editor, so that the musician can have another pattern to play against.
- void `update_pixmap` ()
This function draws the background pixmap on the main pixmap, and then draws the events on it.
- void `update_sizes` ()
Update the sizes of items based on zoom, PPQN, BPM, BW (beat width) and more.
- void `update_background` ()
Updates the background of this window.
- void `draw_background_on_pixmap` ()
Draws the main pixmap.
- void `draw_events_on_pixmap` ()
Fills the main pixmap with events.
- void `draw_selection_on_window` ()
Draws the current selection on the main window.
- void `draw_progress_on_window` ()
Draw a progress line on the window.
- int `idle_redraw` ()
Draw the events on the main window and on the pixmap.
- void `start_paste` ()
Starts a paste operation.

Private Member Functions

- void `convert_tn` (long ticks, int note, int &x, int &y)
This function takes the given note and tick, and returns the screen coordinates via the pointer parameters.
- void `snap_x` (int &x)
Performs a 'snap' operation on the x coordinate.
- void `xy_to_rect` (int x1, int y1, int x2, int y2, int &x, int &y, int &w, int &h)
This function checks the mins / maxes, and then fills in the x, y, width, and height values.
- void `convert_tn_box_to_rect` (long tick_s, long tick_f, int note_h, int note_l, int &x, int &y, int &w, int &h)

- Converts a tick/note box to an x/y rectangle.*
- void [draw_events_on](#) (Glib::RefPtr< Gdk::Drawable > draw)
 - Draws events on the given drawable area.*
- void [change_horz](#) ()
 - Change the horizontal scrolling offset and redraw.*
- void [change_vert](#) ()
 - Change the vertical scrolling offset and redraw.*
- void [force_draw](#) ()
 - Set the pixmap into the window and then draws the selection on it.*
- void [on_realize](#) ()
 - Implements the on-realize event handling.*
- bool [on_expose_event](#) (GdkEventExpose *ev)
 - Implements the on-expose event handling.*
- bool [on_button_press_event](#) (GdkEventButton *ev)
 - Implements the on-button-press event handling.*
- bool [on_button_release_event](#) (GdkEventButton *ev)
 - Implements the on-button-release event handling.*
- bool [on_motion_notify_event](#) (GdkEventMotion *ev)
 - Implements the on-motion-notify event handling.*
- bool [on_focus_in_event](#) (GdkEventFocus *)
 - Implements the on-focus event handling.*
- bool [on_focus_out_event](#) (GdkEventFocus *)
 - Implements the on-unfocus event handling.*
- bool [on_key_press_event](#) (GdkEventKey *ev)
 - Implements the on-key-press event handling.*
- bool [on_scroll_event](#) (GdkEventScroll *a_ev)
 - Implements the on-scroll event handling.*
- void [on_size_allocate](#) (Gtk::Allocation &)
 - Implements the on-size-allocate event handling.*
- bool [on_leave_notify_event](#) (GdkEventCrossing *p0)
 - Implements the on-leave-notify event handling.*
- bool [on_enter_notify_event](#) (GdkEventCrossing *p0)
 - Implements the on-enter-notify event handling.*

Private Attributes

- int [m_zoom](#)
 - one pixel == m_zoom ticks**
- unsigned char [m_status](#)
 - Indicates what is the data window currently editing.*
- bool [m_selecting](#)
 - When highlighting a bunch of events.*
- int [m_move_delta_x](#)
 - Tells where the dragging started.*

Additional Inherited Members

7.47.1 Member Function Documentation

7.47.1.1 void seq64::seqroll::reset ()

It's almost identical to the [change_horz\(\)](#) function!

7.47.1.2 `void seq64::seqroll::set_data_type (unsigned char status, unsigned char control)`

Unlike the same function in `sequevent`, this version does not redraw.

7.47.1.3 `void seq64::seqroll::set_background_sequence (bool state, int seq)`

The `a_state` parameter sets the boolean `m_drawing_background_seq`.

7.47.1.4 `void seq64::seqroll::draw_events_on_pixmap ()`

Just calls [draw_events_on\(\)](#).

7.47.1.5 `void seq64::seqroll::convert_tn (long a_ticks, int a_note, int & a_x, int & a_y)` [private]

This function is the "inverse" of `convert_xy()`.

7.47.1.6 `void seq64::seqroll::snap_x (int & x)` [private]

This function is similar to `snap_y()`, but it calculates a modulo value from the snap and zoom settings.

- `m_snap` = number pulses to snap to
- `m_zoom` = number of pulses per pixel

Therefore, `m_snap / m_zoom` = number pixels to snap to.

7.47.1.7 `bool seq64::seqroll::on_key_press_event (GdkEventKey * a_p0)` [private]

The start/end key may be the same key (i.e. SPACEBAR). Allow toggling when the same key is mapped to both triggers (i.e. SPACEBAR).

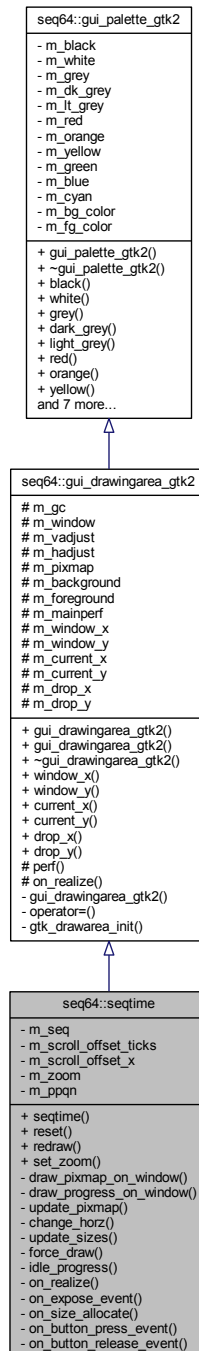
7.47.1.8 `bool seq64::seqroll::on_scroll_event (GdkEventScroll * a_ev)` [private]

This scroll event only handles basic scrolling without any modifier keys such as `GDK_CONTROL_MASK` or `GDK_SHIFT_MASK`.

7.48 seq64::seqtime Class Reference

This class implements the piano time, whatever that is.

Inheritance diagram for seq64::seqtime:



Public Member Functions

- void [set_zoom](#) (int zoom)

Sets the zoom to the given value and resets the window.

Private Member Functions

- bool `idle_progress` ()
Simply returns true.
- bool `on_button_press_event` (GdkEventButton *)
Implements the on-button-press event handler.
- bool `on_button_release_event` (GdkEventButton *)
Implements the on-button-release event handler.

Private Attributes

- int `m_zoom`
one pixel == m_zoom ticks

Additional Inherited Members

7.48.1 Member Function Documentation

7.48.1.1 bool `seq64::seqtime::on_button_press_event` (GdkEventButton *) [inline],[private]

Simply returns false.

7.48.1.2 bool `seq64::seqtime::on_button_release_event` (GdkEventButton *) [inline],[private]

Simply returns false.

7.49 seq64::sequence Class Reference

The sequence class is firstly a receptable for a single track of MIDI data read from a MIDI file or edited into a pattern.

Public Types

- enum `select_action_e` {
 `e_select` ,
 `e_deselect`,
 `e_toggle_selection`,
 `e_remove_one` }
- typedef std::list< `trigger` > `Triggers`
Exposes the triggers, currently needed for `midi_container` only.

Public Member Functions

- `sequence` (int ppqn=c_ppqn)
Principal constructor.
- `~sequence` ()
A rote destructor.
- `sequence & operator=` (const `sequence` &rhs)
Principal assignment operator.
- `event_list` & `events` ()
'Getter' function for member m_events

- [Triggers & triggers](#) ()
'Getter' function for member m_triggers
- int [event_count](#) () const
Returns the number of events stored in m_events.
- void [push_undo](#) ()
Pushes the list-event into the undo-list.
- void [pop_undo](#) ()
If there are items on the undo list, this function pushes the list-event into the redo-list, puts the top of the undo-list into the list-event, pops from the undo-list, calls [verify_and_link\(\)](#), and then calls unselect.
- void [pop_redo](#) ()
If there are items on the redo list, this function pushes the list-event into the undo-list, puts the top of the redo-list into the list-event, pops from the redo-list, calls [verify_and_link\(\)](#), and then calls unselect.
- void [push_trigger_undo](#) ()
Pushes the list-trigger into the trigger undo-list, then flags each item in the undo-list as unselected.
- void [pop_trigger_undo](#) ()
If the trigger undo-list has any items, the list-trigger is pushed 9nto the redo list, the top of the undo-list is copied into the list-trigger, and then pops from the undo-list.
- void [set_name](#) (const std::string &name)
Sets the sequence name member, m_name.
- void [set_name](#) (char *name)
Sets the sequence name member, m_name.
- void [set_bpm](#) (long beats_per_measure)
'Setter' function for member m_time_beats_per_measure
- long [get_bpm](#) () const
'Getter' function for member m_time_beats_per_measure
- void [set_bw](#) (long beat_width)
'Setter' function for member m_time_beat_width
- long [get_bw](#) () const
'Getter' function for member m_time_beat_width
- void [set_rec_vol](#) (long rec_vol)
'Setter' function for member m_rec_vol
- void [set_song_mute](#) (bool mute)
'Setter' function for member m_song_mute
- bool [get_song_mute](#) () const
'Getter' function for member m_song_mute
- const char * [get_name](#) () const
'Getter' function for member m_name pointer
- const std::string & [name](#) () const
'Getter' function for member m_name
- void [set_editing](#) (bool edit)
'Setter' function for member m_editing
- bool [get_editing](#) () const
'Getter' function for member m_editing
- void [set_raise](#) (bool edit)
'Setter' function for member m_raise
- bool [get_raise](#) (void) const
'Getter' function for member m_raise
- void [set_length](#) (long len, bool adjust_triggers=true)
Sets the length (m_length) and adjusts triggers for it if desired.
- long [get_length](#) () const
'Getter' function for member m_length

- long [get_last_tick](#) ()
Returns the last tick played, and is used by the editor's idle function.
- void [set_playing](#) (bool)
Sets the playing state of this sequence.
- bool [get_playing](#) () const
'Getter' function for member m_playing
- void [toggle_playing](#) ()
Toggles the playing status of this sequence.
- void [toggle_queued](#) ()
'Setter' function for member m_queued and m_queued_tick
- void [off_queued](#) ()
'Setter' function for member m_queued
- bool [get_queued](#) () const
'Getter' function for member m_queued
- long [get_queued_tick](#) () const
'Getter' function for member m_queued_tick
- void [set_recording](#) (bool)
'Setter' function for member m_recording and m_notes_on
- bool [get_recording](#) () const
'Getter' function for member m_recording
- void [set_snap_tick](#) (int st)
'Setter' function for member m_snap_tick
- void [set_quantized_rec](#) (bool qr)
'Setter' function for member m_quantized_rec
- bool [get_quantized_rec](#) () const
'Getter' function for member m_quantized_rec
- void [set_thru](#) (bool)
'Setter' function for member m_thru
- bool [get_thru](#) () const
'Getter' function for member m_thru
- bool [is_dirty_main](#) ()
Returns the value of the dirty main flag, and sets that flag to false (i.e.
- bool [is_dirty_edit](#) ()
Returns the value of the dirty edit flag, and sets that flag to false.
- bool [is_dirty_perf](#) ()
Returns the value of the dirty performance flag, and sets that flag to false.
- bool [is_dirty_names](#) ()
Returns the value of the dirty names (heh heh) flag, and sets that flag to false.
- void [set_dirty_mp](#) ()
Sets the dirty flags for names, main, and performance.
- void [set_dirty](#) ()
Call [set_dirty_mp\(\)](#) and then sets the dirty flag for editing.
- unsigned char [get_midi_channel](#) () const
'Getter' function for member m_midi_channel
- void [set_midi_channel](#) (unsigned char ch)
Sets the m_midi_channel number.
- void [print](#) ()
Prints a list of the currently-held events.
- void [print_triggers](#) ()
Prints a list of the currently-held triggers.
- void [play](#) (long tick, bool playback_mode)

- The `play()` function dumps notes starting from the given tick, and it pre-buffers ahead.
- void `set_orig_tick` (long tick)
'Setter' function for member m_last_tick
 - void `add_event` (const `event` *e)
Adds an event to the internal event list in a sorted manner.
 - void `add_trigger` (long tick, long length, long offset=0, bool `adjust_offset`=true)
Adds a trigger.
 - void `split_trigger` (long tick)
Splits a trigger.
 - void `grow_trigger` (long tick_from, long tick_to, long length)
Grows a trigger.
 - void `del_trigger` (long tick)
Deletes a trigger, that brackets the given tick, from the trigger-list.
 - bool `unselect_triggers` ()
Always returns false!
 - bool `intersectTriggers` (long position, long &start, long &end)
This function examines each trigger in the trigger list.
 - bool `intersectNotes` (long position, long position_note, long &start, long &end, long ¬e)
This function examines each note in the event list.
 - bool `intersectEvents` (long posstart, long posend, long status, long &start)
This function examines each non-note event in the event list.
 - void `move_selected_triggers_to` (long tick, bool `adjust_offset`, int which=2)
Moves selected triggers as per the given parameters.
 - long `get_selected_trigger_start_tick` ()
Gets the selected trigger's start tick.
 - long `get_selected_trigger_end_tick` ()
Gets the selected trigger's end tick.
 - long `get_max_trigger` ()
Get the ending value of the last trigger in the trigger-list.
 - void `move_triggers` (long start_tick, long distance, bool direction)
Moves triggers in the trigger-list.
 - void `copy_triggers` (long start_tick, long distance)
Not sure what these diagrams are for yet.
 - void `clear_triggers` ()
Clears the whole list of triggers.
 - long `get_trigger_offset` () const
'Getter' function for member m_trigger_offset
 - void `set_midi_bus` (char mb)
Sets the midibus number to dump to.
 - char `get_midi_bus` () const
'Getter' function for member m_bus
 - void `set_master_midi_bus` (mastermidibus *mmb)
'Setter' function for member m_masterbus
 - int `select_note_events` (long tick_s, int note_h, long tick_f, int note_l, `select_action_e` action)
This function selects events in range of tick start, note high, tick end, and note low.
 - int `select_events` (long tick_s, long tick_f, unsigned char status, unsigned char cc, `select_action_e` action)
Select all events in the given range, and returns the number selected.
 - int `select_events` (unsigned char status, unsigned char cc, bool inverse=false)
Select all events with the given status, and returns the number selected.
 - int `get_num_selected_notes` ()
Counts the selected notes in the event list.

- int [get_num_selected_events](#) (unsigned char status, unsigned char cc)
Counts the selected events, with the given status, in the event list.
- void [select_all](#) ()
Selects all events, unconditionally.
- void [copy_selected](#) ()
Copies the selected events.
- void [paste_selected](#) (long tick, int note)
Pastes the selected notes (and only note events) at the given tick and the given note value.
- void [get_selected_box](#) (long &tick_s, int ¬e_h, long &tick_f, int ¬e_l)
Returns the 'box' of the selected items.
- void [get_clipboard_box](#) (long &tick_s, int ¬e_h, long &tick_f, int ¬e_l)
Returns the 'box' of selected items.
- void [move_selected_notes](#) (long delta_tick, int delta_note)
Removes and adds reads selected in position.
- void [add_note](#) (long tick, long length, int note, bool paint=false)
Adds a note of a given length and note value, at a given tick location.
- void [add_event](#) (long tick, unsigned char status, unsigned char d0, unsigned char d1, bool paint=false)
Adds a event of a given status value and data values, at a given tick location.
- void [stream_event](#) (event *ev)
Streams the given event.
- void [change_event_data_range](#) (long tick_s, long tick_f, unsigned char status, unsigned char cc, int d_s, int d_f)
Changes the event data range.
- void [increment_selected](#) (unsigned char status, unsigned char control)
Increments events the match the given status and control values.
- void [decrement_selected](#) (unsigned char status, unsigned char control)
Decrements events the match the given status and control values.
- void [grow_selected](#) (long delta_tick)
Moves note off event.
- void [stretch_selected](#) (long delta_tick)
Performs a stretch operation on the selected events.
- void [remove_marked](#) ()
Removes marked events.
- void [mark_selected](#) ()
Marks the selected events.
- void [unpaint_all](#) ()
Unpaints all list-events.
- void [unselect](#) ()
Deselects all events, unconditionally.
- void [verify_and_link](#) ()
This function verifies state: all note-ons have an off, and it links note-offs with their note-ons.
- void [link_new](#) ()
Links a new event.
- void [zero_markers](#) ()
Resets everything to zero.
- void [play_note_on](#) (int note)
Plays a note from the piano roll on the main bus on the master MIDI buss.
- void [play_note_off](#) (int note)
Turns off a note from the piano roll on the main bus on the master MIDI buss.
- void [off_playing_notes](#) ()
Sends a note-off event for all active notes.

- void [reset_draw_marker](#) ()
This refreshes the play marker to the last tick.
- void [reset_draw_trigger_marker](#) ()
Threadsafe
- draw_type [get_next_note_event](#) (long *tick_s, long *tick_f, int *note, bool *selected, int *velocity)
Each call to seqdata() fills the passed references with a events elements, and returns true.
- int [get_lowest_note_event](#) ()
Threadsafe
- int [get_highest_note_event](#) ()
Threadsafe
- bool [get_next_event](#) (unsigned char status, unsigned char cc, long *tick, unsigned char *d0, unsigned char *d1, bool *selected)
Get the next event in the event list that matches the given status and control character.
- bool [get_next_event](#) (unsigned char *status, unsigned char *cc)
Get the next event in the event list.
- bool [get_next_trigger](#) (long *tick_on, long *tick_off, bool *selected, long *tick_offset)
Get the next trigger in the trigger list, and set the parameters based on that trigger.
- void [fill_container](#) (midi_container &c, int tracknumber)
This function fills the given character list with MIDI data from the current sequence, preparatory to writing it to a file.
- void [transpose_notes](#) (int steps, int scale)
Transposes notes by the given steps, in accordance with the given scale.

Private Member Functions

- void [put_event_on_bus](#) (event *ev)
Takes an event that this sequence is holding, and places it on the midibus.
- void [set_trigger_offset](#) (long trigger_offset)
Sets m_trigger_offset and wraps it to m_length.
- void [split_trigger](#) (trigger &trig, long split_tick)
Splits the trigger given by the parameter into two triggers.
- void [adjust_trigger_offsets_to_length](#) (long new_len)
Not sure what these diagrams are for yet.
- long [adjust_offset](#) (long offset)
Adjusts the given offset by mod'ing it with m_length and adding m_length if needed, and returning the result.
- void [remove](#) (event_list::iterator i)
A helper function, which does not lock/unlock, so it is unsafe to call without supplying an iterator from the list-event.
- void [remove](#) (event *e)
A helper function, which does not lock/unlock, so it is unsafe to call without supplying an iterator from the list-event.

Private Attributes

- [event_list m_events](#)
This list holds the current pattern/sequence events.
- mutex [m_mutex](#)
Provides locking for the sequence.

Static Private Attributes

- static [event_list m_events_clipboard](#)
A static clipboard for holding pattern/sequence events.

7.49.1 Detailed Description

More members than you can shake a stick at.

7.49.2 Member Enumeration Documentation

7.49.2.1 enum seq64::sequence::select_action_e

Enumerator

e_select This enumeration is used in selecting events and note. Se the [select_note_events\(\)](#) and [select_↔events\(\)](#) functions.

e_deselect To deselect the event under the cursor.

e_toggle_selection To toggle the selection of the event under the cursor.

e_remove_one To remove one note under the cursor.

7.49.3 Member Function Documentation

7.49.3.1 sequence & seq64::sequence::operator= (const sequence & rhs)

Follows the stock rules for such an operator, but does a little more then just assign member values.

Threadsafe

7.49.3.2 int seq64::sequence::event_count () const

Threadsafe

7.49.3.3 void seq64::sequence::push_undo ()

Threadsafe

7.49.3.4 void seq64::sequence::pop_undo ()

Threadsafe

7.49.3.5 void seq64::sequence::pop_redo ()

Threadsafe

7.49.3.6 void seq64::sequence::push_trigger_undo ()

Threadsafe

7.49.3.7 void seq64::sequence::set_bpm (long beats_per_measure)

Threadsafe

7.49.3.8 void seq64::sequence::set_bw (long beat_width)

Threadsafe

7.49.3.9 `long seq64::sequence::get_bw () const [inline]`

Threadsafe

7.49.3.10 `void seq64::sequence::set_rec_vol (long rec_vol)`

Threadsafe

7.49.3.11 `void seq64::sequence::set_length (long len, bool adjust_triggers = true)`

Threadsafe

7.49.3.12 `void seq64::sequence::set_playing (bool a_p)`

When playing, and the sequencer is running, notes get dumped to the ALSA buffers.

Parameters

<i>a_p</i>	Provides the playing status to set. True means to turn on the playing, false means to turn it off, and turn off any notes still playing.
------------	--

7.49.3.13 `void seq64::sequence::toggle_queued ()`

Toggles the queued flag and sets the dirty-mp flag. Also calculates the queued tick based on `m_last_tick`.

Threadsafe

7.49.3.14 `void seq64::sequence::off_queued ()`

Toggles the queued flag and sets the dirty-mp flag.

Threadsafe

7.49.3.15 `void seq64::sequence::set_recording (bool a_r)`

Threadsafe

7.49.3.16 `void seq64::sequence::set_snap_tick (int a_st)`

Threadsafe

7.49.3.17 `void seq64::sequence::set_quantized_rec (bool a_qr)`

Threadsafe

7.49.3.18 `void seq64::sequence::set_thru (bool a_r)`

Threadsafe

7.49.3.19 `bool seq64::sequence::is_dirty_main ()`

resets it). This flag signals that a redraw is needed from recording.

Threadsafe

7.49.3.20 `bool seq64::sequence::is_dirty_edit ()`

Threadsafe

7.49.3.21 `bool seq64::sequence::is_dirty_perf ()`

Threadsafe

7.49.3.22 `bool seq64::sequence::is_dirty_names ()`

Threadsafe

7.49.3.23 `void seq64::sequence::set_dirty_mp ()`

Not threadsafe

7.49.3.24 `void seq64::sequence::set_dirty ()`

Threadsafe

7.49.3.25 `void seq64::sequence::set_midi_channel (unsigned char a_ch)`

Threadsafe

7.49.3.26 `void seq64::sequence::print ()`

Not threadsafe

7.49.3.27 `void seq64::sequence::print_triggers ()`

Not threadsafe

7.49.3.28 `void seq64::sequence::play (long tick, bool playback_mode)`

This function is called by the sequencer thread, performance. The tick comes in as global tick.

It turns the sequence off after we play in this frame.

Threadsafe

7.49.3.29 `void seq64::sequence::set_orig_tick (long tick)`

Threadsafe

7.49.3.30 void seq64::sequence::add_event (const event * ep)

Then it reset the draw-marker and sets the dirty flag.

Currently, when reading a MIDI file [see the [midifile::parse\(\)](#) function], only the main events (notes, after-touch, pitch, program changes, etc.) are added with this function. So, we can rely on reading only playable events into a sequence.

This module (sequencer) adds all of those events as well, but it can surely add other events. We should assume that any events added by sequencer are playable.

Threadsafe

Warning

This pushing (and, in writing the MIDI file, the popping), causes events with identical timestamps to be written in reverse order. Doesn't affect functionality, but it's puzzling until one understands what is happening.

7.49.3.31 void seq64::sequence::add_trigger (long a_tick, long a_length, long a_offset = 0, bool a_adjust_offset = true)

If a_state = true, the range is on. If a_state = false, the range is off.

What is this?

```

is      ie
<      ><      ><      >
es      ee
<      >
XX

es ee
<      >
<>

es      ee
<      >
<      >

es      ee
<      >
<      >

```

7.49.3.32 void seq64::sequence::split_trigger (long a_tick)

This is the public overload of split_trigger.

Threadsafe

7.49.3.33 void seq64::sequence::grow_trigger (long a_tick_from, long a_tick_to, long a_length)

Threadsafe

7.49.3.34 void seq64::sequence::del_trigger (long a_tick)

Threadsafe

7.49.3.35 bool seq64::sequence::intersectTriggers (long position, long & start, long & end)

If the given position is between the current trigger's tick-start and tick-end values, the these values are copied to the start and end parameters, respectively, and then we exit.

Threadsafe

Parameters

<i>position</i>	The position to examine.
<i>start</i>	The destination for the starting tick (m_tick_start) of the matching trigger.
<i>end</i>	The destination for the ending tick (m_tick_end) of the matching trigger.

Returns

Returns true if a trigger was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

7.49.3.36 bool seq64::sequence::intersectNotes (long *position*, long *position_note*, long & *start*, long & *ender*, long & *note*)

If the given position is between the current notes on and off time values, values, the these values are copied to the start and end parameters, respectively, the note value is copied to the note parameter, and then we exit.

Threadsafe

Parameters

<i>position</i>	The position to examine.
<i>position_note</i>	I think this is the note value we might be looking for ???
<i>start</i>	The destination for the starting tick (m_tick_start) of the matching trigger.
<i>end</i>	The destination for the ending tick (m_tick_end) of the matching trigger.
<i>note</i>	The destination for the note of the matching event.

Returns

Returns true if a event was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

7.49.3.37 bool seq64::sequence::intersectEvents (long *posstart*, long *posend*, long *status*, long & *start*)

If the given position is between the current trigger's tick-start and tick-end values, the these values are copied to the start and end parameters, respectively, and then we exit.

Threadsafe

Parameters

<i>posstart</i>	The starting position to examine.
<i>posend</i>	The ending position to examine.
<i>status</i>	The desired status value.
<i>start</i>	The destination for the starting tick (m_tick_start) of the matching trigger.

Returns

Returns true if a event was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

7.49.3.38 void seq64::sequence::move_selected_triggers_to (long *a_tick*, bool *a_adjust_offset*, int *a_which* = 2)

```
min_tick][0          1][max_tick
                2
```

- If we are moving the 0, use first as offset.
- If we are moving the 1, use the last as the offset.
- If we are moving both (2), use first as offset.

Threadsafe

7.49.3.39 `long seq64::sequence::get_selected_trigger_start_tick ()`

Threadsafe

7.49.3.40 `long seq64::sequence::get_selected_trigger_end_tick ()`

Threadsafe

7.49.3.41 `long seq64::sequence::get_max_trigger ()`

Threadsafe

7.49.3.42 `void seq64::sequence::move_triggers (long a_start_tick, long a_distance, bool a_direction)`

Threadsafe

7.49.3.43 `void seq64::sequence::copy_triggers (long a_start_tick, long a_distance)`

```
... a
[      ][      ]
...
... a
...

5    7    play
3      offset
8    10    play

X...X...X...X...X...X...X...X...X...
L      R
[      ][      ][ ] orig
[      ][      ]

    <<
    [      ][ ][ ] split on the R marker, shift first
    [      ][      ]
    delete middle
    [      ][ ][ ] move ticks
    [      ][      ]

    L      R
    [      ][ ][ ] split on L
    [      ][      ]

    [      ][ ][ ] increase all after L
    [      ][      ]
```

Copies triggers to...

Threadsafe

7.49.3.44 `void seq64::sequence::clear_triggers ()`

Threadsafe

7.49.3.45 `void seq64::sequence::set_midi_bus (char mb)`

Threadsafe

7.49.3.46 void seq64::sequence::set_master_midi_bus (mastermidibus * mmb)

Threadsafe

7.49.3.47 int seq64::sequence::select_note_events (long a_tick_s, int a_note_h, long a_tick_f, int a_note_l, select_action_e a_action)

Returns the number selected.

Threadsafe

7.49.3.48 int seq64::sequence::select_events (long tick_s, long tick_f, unsigned char status, unsigned char cc, select_action_e action)

Note that there is also an overloaded version of this function.

Threadsafe

7.49.3.49 int seq64::sequence::select_events (unsigned char status, unsigned char cc, bool inverse = false)

Note that there is also an overloaded version of this function.

Threadsafe

Warning

This used to be a void function, so it just returns 0 for now.

7.49.3.50 int seq64::sequence::get_num_selected_notes ()

Threadsafe

7.49.3.51 int seq64::sequence::get_num_selected_events (unsigned char status, unsigned char cc)

If the event is a control change (CC), then it must also match the given CC value.

Threadsafe

7.49.3.52 void seq64::sequence::select_all ()

Threadsafe

7.49.3.53 void seq64::sequence::copy_selected ()

Threadsafe

7.49.3.54 void seq64::sequence::paste_selected (long tick, int note)

I wonder if we can get away with just getting a reference to m_events_clipboard, rather than copying the whole thing, for speed.

Threadsafe

7.49.3.55 `void seq64::sequence::add_note (long tick, long length, int note, bool paint = false)`

It adds a single note-on / note-off pair.

The `a_paint` parameter indicates if we care about the painted event, so then the function runs though the events and deletes the painted ones that overlap the ones we want to add.

Threadsafe

7.49.3.56 `void seq64::sequence::add_event (long a_tick, unsigned char a_status, unsigned char a_d0, unsigned char a_d1, bool a_paint = false)`

The `a_paint` parameter indicates if we care about the painted event, so then the function runs though the events and deletes the painted ones that overlap the ones we want to add.

Threadsafe

7.49.3.57 `void seq64::sequence::stream_event (event * ev)`

Threadsafe

7.49.3.58 `void seq64::sequence::change_event_data_range (long tick_s, long tick_f, unsigned char status, unsigned char cc, int data_s, int data_f)`

Changes only selected events, if any.

Threadsafe

Let `t` == the current tick value; `ts` == tick start value; `tf` == tick finish value; `ds` = data start value; `df` == data finish value; `d` = the new data value.

Then

$$d = \frac{df (t - ts) + ds (tf - t)}{tf - ts}$$

If this were an interpolation formula it would be:

$$d = ds + (df - ds) \frac{t - ts}{tf - ts}$$

Something is not quite right; to be investigated.

```
\param tick_s
    Provides the starting tick value.

\param tick_f
    Provides the ending tick value.

\param status
    Provides the event status that is to be changed.

\param cc
    Provides the event control value.

\param data_s
    Provides the starting data value.

\param data_f
    Provides the finishing data value.
```

7.49.3.59 void seq64::sequence::increment_selected (unsigned char *astat*, unsigned char *control*)

The supported statuses are:

- EVENT_NOTE_ON
- EVENT_NOTE_OFF
- EVENT_AFTERTOUCH
- EVENT_CONTROL_CHANGE
- EVENT_PITCH_WHEEL
- EVENT_PROGRAM_CHANGE
- EVENT_CHANNEL_PRESSURE

Threadsafe

7.49.3.60 void seq64::sequence::decrement_selected (unsigned char *astat*, unsigned char *control*)

The supported statuses are:

- EVENT_NOTE_ON
- EVENT_NOTE_OFF
- EVENT_AFTERTOUCH
- EVENT_CONTROL_CHANGE
- EVENT_PITCH_WHEEL
- EVENT_PROGRAM_CHANGE
- EVENT_CHANNEL_PRESSURE

Threadsafe

7.49.3.61 void seq64::sequence::grow_selected (long *delta_tick*)

Threadsafe

7.49.3.62 void seq64::sequence::stretch_selected (long *delta_tick*)

This should move a note off event, according to old comments, but it doesn't seem to do that. See the [grow_selected\(\)](#) function.

Threadsafe

7.49.3.63 void seq64::sequence::remove_marked ()

Note how this function handles removing a value to avoid incrementing a now-invalid iterator.

Threadsafe

7.49.3.64 void seq64::sequence::mark_selected ()

Threadsafe

7.49.3.65 void seq64::sequence::unpaint_all ()

Threadsafe

7.49.3.66 void seq64::sequence::unselect ()

Threadsafe

7.49.3.67 void seq64::sequence::verify_and_link ()

Threadsafe

7.49.3.68 void seq64::sequence::link_new ()

Threadsafe

7.49.3.69 void seq64::sequence::zero_markers ()

This function is used when the sequencer stops.

Threadsafe

7.49.3.70 void seq64::sequence::play_note_on (int *a_note*)

It flushes a note to the midibus to preview its sound, used by the virtual piano.

Threadsafe

7.49.3.71 void seq64::sequence::play_note_off (int *a_note*)

Threadsafe

7.49.3.72 void seq64::sequence::off_playing_notes ()

Threadsafe

7.49.3.73 void seq64::sequence::reset_draw_marker ()

It resets the draw marker so that calls to [get_next_note_event\(\)](#) will start from the first event.

Threadsafe

7.49.3.74 draw_type seq64::sequence::get_next_note_event (long * *a_tick_s*, long * *a_tick_f*, int * *a_note*, bool * *a_selected*, int * *a_velocity*)

When it has no more events, returns a false.

7.49.3.75 bool seq64::sequence::get_next_event (unsigned char *status*, unsigned char *cc*, long * *tick*, unsigned char * *d0*, unsigned char * *d1*, bool * *selected*)

Then set the rest of the parameters parameters using that event.

7.49.3.76 bool seq64::sequence::get_next_event (unsigned char * *a_status*, unsigned char * *a_cc*)

Then set the status and control character parameters using that event.

7.49.3.77 void seq64::sequence::fill_container (midi_container & *c*, int *tracknumber*)

Note that some of the events might not come out in the same order they were stored in (we see that with program-change events).

Parameters

<i>c</i>	Provides the std::list object to push events to the front, which thus inserts them in backwards order. (These events are then popped back, which restores the order, with some exceptions).
<i>tracknumber</i>	Provides the track number. This number is masked into the track information.

7.49.3.78 void seq64::sequence::transpose_notes (int *steps*, int *scale*)

If the scale value is 0, this is "no scale", which is the chromatic scale, where all 12 notes, including sharps and flats, are part of the scale.

7.49.3.79 void seq64::sequence::put_event_on_bus (event * *a_e*) [private]

Threadsafe

7.49.3.80 void seq64::sequence::set_trigger_offset (long *a_trigger_offset*) [private]

Threadsafe

7.49.3.81 void seq64::sequence::split_trigger (trigger & *trig*, long *a_split_tick*) [private]

The original trigger ends 1 tick before the *a_split_tick* parameter, and the new trigger starts at *a_split_tick* and ends where the original trigger ended.

This is the private overload of `split_trigger`.

Threadsafe

Parameters

<i>trig</i>	Provides the original trigger, and also holds the changes made to that trigger as it is shortened.
<i>a_split_tick</i>	The position just after where the original trigger will be truncated, and the new trigger begins.

7.49.3.82 void seq64::sequence::adjust_trigger_offsets_to_length (long *a_new_len*) [private]

```

|...|...|...|...|...|...|...
0123456789abcdef0123456789abcdef
[      ][      ][      ][      ][      ][
[  ][      ][  ][  ][  ][  ][  ][  ][  ][  ][
0  4      4  0 7 4 2 0      6  2
0  4      4  0 1 4 6 0      2  6 inverse offset

[      ][      ][      ][      ][
[  ][      ][  ][  ][  ][  ][  ][  ][  ][
0  c      4  0 f c a 8      e  a
0  4      c  0 1 4 6 8      2  6 inverse offset

[      ][      ][      ][      ][
[  ][      ][  ][  ][  ][  ][  ][  ][  ][
k   g f c a 8      [  ][  ][
0  4      c   g h k m n      inverse offset

0123456789abcdefghijklmonpq
ponmlkjihgfedcba9876543210
0fedcba9876543210fedcba9876543210fedcba9876543210fedcba9876543210

```

Adjusts trigger offsets to the length of ???, for all triggers, and undo triggers.

Threadsafe

7.49.3.83 `void seq64::sequence::remove (event_list::iterator i) [private]`

If it's a note off, and that note is currently playing, then send a note off.

Not threadsafe

7.49.3.84 `void seq64::sequence::remove (event * e) [private]`

Finds the given event in m_events, and removes the first iterator matching that.

Not threadsafe

Todo Use find instead in `sequence::remove()`!

7.49.4 Field Documentation

7.49.4.1 `mutex seq64::sequence::m_mutex [mutable],[private]`

Made mutable for use in certain locked getter functions.

7.50 seq64::trigger Class Reference

This class is used in playback.

Public Member Functions

- `trigger ()`
Initializes the trigger structure.
- `bool operator< (const trigger &rhs)`
This operator compares only the m_tick_start members.

7.50.1 Detailed Description

Making its members public makes it really "just" a structure.

7.51 user_instrument Class Reference

Provides data about the MIDI instruments, readable from the "user" configuration file.

Public Member Functions

- `user_instrument (const std::string &name="")`
Default constructor.
- `user_instrument (const user_instrument &rhs)`
Copy constructor.
- `user_instrument & operator= (const user_instrument &rhs)`
Principal assignment operator.

- bool `is_valid` () const
'Getter' function for member m_is_valid
- void `set_defaults` ()
Sets the default values.
- void `set_global` (int instrum) const
Copies the current values of the member variables into the selected legacy global variable.
- void `get_global` (int instrum)
Copies the current values of the selected legacy global variable into corresponding member variable.
- const std::string & `name` () const
'Getter' function for member m_instrument_def.instrument (name of instrument)
- int `controller_count` () const
'Getter' function for member m_controller_count This function returns the number of active controllers.
- int `controller_max` () const
'Getter' function for member MIDI_CONTROLLER_MAX This function returns the maximum number of controllers, active or inactive.
- const std::string & `controller_name` (int c) const
'Getter' function for member m_instrument_def.controllers[c]
- bool `controller_active` (int c) const
'Getter' function for member m_instrument_def.controllers_active[c]
- void `set_controller` (int c, const std::string &cname, bool isactive)
'Setter' function for member m_instrument_def.controllers[c] and .controllers_active[c] Only sets the controller values if the object is already valid.

Private Member Functions

- void `set_name` (const std::string &instname)
'Setter' function for member m_instrument_def.instrument
- void `copy_definitions` (const `user_instrument` &rhs)
Copies the array members from one instance of `user_instrument` to this one.

Private Attributes

- bool `m_is_valid`
Provides a validity flag, useful in returning a reference to a bogus object for internal error-check.
- int `m_controller_count`
Provides the actual number of non-default controllers actually set.
- `user_instrument_t` `m_instrument_def`
The instance of the structure that this class wraps.

7.51.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

7.51.2 Member Function Documentation

7.51.2.1 void user_instrument::set_defaults ()

Also invalidates the object.

7.51.2.2 void user_instrument::set_global (int *instrum*) const

Should be called at initialization, and after settings are read from the "user" configuration file.

This function fills in all of the MIDI_CONTROLLER_MAX (128) values of the controllers and controllers_active fields.

Note that this is done only if the object is valid.

Parameters

<i>instrum</i>	Provides the destination instrument number. In order to support the legacy code, this index value must be less than c_max_instruments (64).
----------------	---

7.51.2.3 void user_instrument::get_global (int *instrum*)

Should be called before settings are written to the "user" configuration file.

This function fills in all of the MIDI_CONTROLLER_MAX (128) values of the controllers and controllers_active fields.

This function also sets the validity flag to true if the instrument name is not empty; the rest of the values are not checked.

Parameters

<i>instrum</i>	Provides the source instrument number. In order to support the legacy code, this index value must be less than c_max_instruments (64).
----------------	--

7.51.2.4 int user_instrument::controller_max () const [inline]

Remember that the controller numbers for each MIDI instrument range from 0 to 127 (MIDI_CONTROLLER_MAX-1).

7.51.2.5 const std::string & user_instrument::controller_name (int *c*) const

Parameters

<i>c</i>	The index of the desired controller.
----------	--------------------------------------

Returns

The name of the desired controller has is returned. If the index *c* is out of range, or the object is not valid, then a reference to an internal, empty string is returned.

7.51.2.6 bool user_instrument::controller_active (int *c*) const

Parameters

<i>c</i>	The index of the desired controller.
----------	--------------------------------------

Returns

The status of the desired controller has is returned. If the index *c* is out of range, or the object is not valid, then false is returned.

7.51.2.7 void user_instrument::set_controller (int *c*, const std::string & *cname*, bool *isactive*)

Parameters

<code>c</code>	The index of the desired controller.
<code>cname</code>	The name of the controller to be set as the controller name.
<code>isactive</code>	A flag that indicates if the desired controller is active.

7.51.2.8 `void user_instrument::set_name (const std::string & instname) [private]`

If the name parameter is not empty, the validity flag is set to true, otherwise it is set to false. Too tricky?

7.51.2.9 `void user_instrument::copy_definitions (const user_instrument & rhs) [private]`

Does not include the validity flag.

7.51.3 Field Documentation

7.51.3.1 `bool user_instrument::m_is_valid [private]`

Callers should check this flag via the `is_valid()` accessor before using this object. This flag is set to true when any valid member assignment occurs via a public setter call. However, setting an empty name for the instrument member will render the object invalid.

7.51.3.2 `int user_instrument::m_controller_count [private]`

Often, the "user" configuration file has only a few out of the 128 assigned explicitly.

7.52 `user_instrument_t` Struct Reference

This structure corresponds to `[user-instrument-N]` definitions in the `~/ .seq24usr` or `~/ .config/sequencer64/src` file.

7.53 `user_midi_bus` Class Reference

Provides data about the MIDI busses, readable from the "user" configuration file.

Public Member Functions

- `user_midi_bus` (const std::string &name="")
Default constructor.
- `user_midi_bus` (const `user_midi_bus` &rhs)
Copy constructor.
- `user_midi_bus & operator=` (const `user_midi_bus` &rhs)
Principal assignment operator.
- `bool is_valid ()` const
'Getter' function for member m_is_valid
- `void set_defaults ()`
Sets the default values.
- `void set_global` (int buss) const
Copies the current values of the member variables into their corresponding global variables.

- void `get_global` (int buss)
Copies the current values of the global variables into their corresponding member variable.
- const std::string & `name` () const
'Getter' function for member `m_midi_bus_def.alias` (name of alias)
- int `channel_count` () const
'Getter' function for member `m_channel_count`
- int `channel_max` () const
'Getter' function for member `MIDI_BUS_CHANNEL_MAX`
- int `instrument` (int channel) const
'Getter' function for member `m_midi_bus_def.instrument[channel]`
- void `set_instrument` (int channel, int instrum)
'Getter' function for member `m_midi_bus_def.instrument[channel]`

Private Member Functions

- void `set_name` (const std::string &name)
'Setter' function for member `m_midi_bus_def.alias` (name of alias) Also sets the validity flag according to the emptiness of the name parameter.
- void `copy_definitions` (const `user_midi_bus` &rhs)
Copies the member fields from one instance of `user_midi_bus` to this one.

Private Attributes

- bool `m_is_valid`
Provides a validity flag, useful in returning a reference to a bogus object for internal error-check.
- int `m_channel_count`
Provides the actual number of non-default buss channels actually set.
- `user_midi_bus_t m_midi_bus_def`
The instance of the structure that this class wraps.

7.53.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

7.53.2 Member Function Documentation

7.53.2.1 void `user_midi_bus::set_defaults` ()

Also invalidates the object. All 16 of the channels are set to `GM_INSTRUMENT_FLAG` (-1).

7.53.2.2 void `user_midi_bus::set_global` (int buss) const

Should be called at initialization, and after settings are read from the "user" configuration file.

Note that this is done only if the object is valid.

Parameters

<i>buss</i>	Provides the destination buss number. In order to support the legacy code, this index value must be less than c_max_busses (32).
-------------	--

7.53.2.3 void user_midi_bus::get_global (int *buss*)

Should be called before settings are written to the "user" configuration file.

This function also sets the validity flag to true if the instrument name is not empty; the rest of the values are not checked.

Parameters

<i>buss</i>	Provides the destination buss number. In order to support the legacy code, this index value must be less than c_max_busses (32).
-------------	--

7.53.2.4 int user_midi_bus::channel_count () const [inline]

Returns

This function returns the number of channels. Basically this value is always the same as that returned by [channel_max\(\)](#), but this pair of functions is consistent with the count functions in the [user_instrument](#) class.

7.53.2.5 int user_midi_bus::channel_max () const [inline]

Returns

Returns the maximum number of MIDI buss channels. Remember that the instrument channels for each MIDI buss range from 0 to 15 (MIDI_BUS_CHANNEL_MAX-1).

7.53.2.6 int user_midi_bus::instrument (int *channel*) const

Parameters

<i>channel</i>	Provides the desired buss channel number.
----------------	---

Returns

The instrument number of the desired buss channel is returned. If the channel number is out of range, or the object is not valid, then GM_INSTRUMENT_FLAG (-1) is returned.

7.53.2.7 void user_midi_bus::set_instrument (int *channel*, int *instrum*)

Does not alter the validity flag, just checks it.

Parameters

<i>channel</i>	Provides the desired buss channel number.
<i>instrum</i>	Provides the instrument number to set that channel to.

7.53.2.8 void user_midi_bus::copy_definitions (const user_midi_bus & *rhs*) [private]

Does not include the validity flag.

7.53.3 Field Documentation

7.53.3.1 `bool user_midi_bus::m_is_valid` [private]

Callers should check this flag via the `is_valid()` accessor before using this object. This flag is set to true when any valid member assignment occurs via a public setter call.

7.53.3.2 `int user_midi_bus::m_channel_count` [private]

Often, the "user" configuration file has only a few out of the 16 assigned explicitly.

7.54 `user_midi_bus_t` Struct Reference

This structure corresponds to `[user-midi-bus-0]` definitions in the `~/ .seq24usr` ("user") file.

7.55 `user_settings` Class Reference

Holds the current values of sequence settings and settings that can modify the number of sequences and the configuration of the user-interface.

Public Member Functions

- `user_settings ()`
Default constructor.
- `user_settings (const user_settings &rhs)`
Copy constructor.
- `user_settings & operator= (const user_settings &rhs)`
Principal assignment operator.
- `void set_defaults ()`
Sets the default values.
- `void normalize ()`
Calculate the derived values from the already-set values.
- `void set_globals () const`
Copies the current values of the member variables into their corresponding global variables.
- `void get_globals ()`
Copies the current values of the global variables into their corresponding member variables.
- `bool add_bus (const std::string &alias)`
Adds a user bus to the container, but only does so if the name parameter is not empty.
- `bool add_instrument (const std::string &instname)`
Adds a user instrument to the container, but only does so if the name parameter is not empty.
- `const user_midi_bus & bus (int index)`
'Getter' function for member Unlike the non-const version this function is public.
- `const user_instrument & instrument (int index)`
'Getter' function for member Unlike the non-const version this function is public.
- `int bus_count () const`
'Getter' function for member `m_midi_buses.size()`
- `void set_bus_instrument (int index, int channel, int instrum)`
'Getter' function for member `m_midi_buses[index].instrument[channel]` Currently this function is used, in the `userfile::parse()` function.

- int [bus_instrument](#) (int buss, int channel)
'Getter' function for member m_midi_buses[buss].instrument[channel]
- const std::string & [bus_name](#) (int buss)
'Getter' function for member m_midi_buses[buss].name
- int [instrument_count](#) () const
'Getter' function for member m_instruments.size()
- void [set_instrument_controllers](#) (int index, int cc, const std::string &ccname, bool isactive)
'Setter' function for member m_midi_instrument_defs[index].controllers, controllers_active
- const std::string & [instrument_name](#) (int instrum)
'Getter' function for member m_instruments[instrument].instrument (name of instrument)
- bool [instrument_controller_active](#) (int instrum, int c)
'Getter' function for member m_instruments[instrument].controllers_active[controller]
- const std::string & [instrument_controller_name](#) (int instrum, int c)
'Getter' function for member m_instruments[instrument].controllers_active[controller]
- int [mainwnd_rows](#) () const
'Getter' function for member m_mainwnd_rows
- int [mainwnd_cols](#) () const
'Getter' function for member m_mainwnd_cols
- int [seqs_in_set](#) () const
'Getter' function for member m_seqs_in_set
- int [gmute_tracks](#) () const
'Getter' function for member m_gmute_tracks
- int [max_sets](#) () const
'Getter' function for member m_max_sets
- int [max_sequence](#) () const
'Getter' function for member m_max_sequence
- int [text_x](#) () const
'Getter' function for member m_text_x
- int [text_y](#) () const
'Getter' function for member m_text_y
- int [seqchars_x](#) () const
'Getter' function for member m_seqchars_x
- int [seqchars_y](#) () const
'Getter' function for member m_seqchars_y
- int [seqarea_x](#) () const
'Getter' function for member m_seqarea_x
- int [seqarea_y](#) () const
'Getter' function for member m_seqarea_y
- int [seqarea_seq_x](#) () const
'Getter' function for member m_seqarea_seq_x
- int [seqarea_seq_y](#) () const
'Getter' function for member m_seqarea_seq_y
- int [mainwid_border](#) () const
'Getter' function for member m_mainwid_border
- int [mainwid_spacing](#) () const
'Getter' function for member m_mainwid_spacing
- int [control_height](#) () const
'Getter' function for member m_control_height
- int [mainwid_x](#) () const
'Getter' function for member m_mainwid_x
- int [mainwid_y](#) () const

- *'Getter' function for member m_mainwid_y*
- void [mainwnd_rows](#) (int value)
 - *'Setter' function for member m_mainwnd_rows This value is not modified unless the value parameter is between 4 and 8, inclusive.*
- void [mainwnd_cols](#) (int value)
 - *'Setter' function for member m_mainwnd_cols This value is not modified unless the value parameter is between 8 and 10, inclusive.*
- void [max_sets](#) (int value)
 - *'Setter' function for member m_seqs_in_set*
- void [text_x](#) (int value)
 - *'Setter' function for member m_max_sequence*
- void [text_y](#) (int value)
 - *'Setter' function for member m_text_y This value is not modified unless the value parameter is between 12 and 12, inclusive.*
- void [seqchars_x](#) (int value)
 - *'Setter' function for member m_seqchars_x This affects the size or crampiness of a pattern slot, and for now we will hardwire it to 15.*
- void [seqchars_y](#) (int value)
 - *'Setter' function for member m_seqchars_y This affects the size or crampiness of a pattern slot, and for now we will hardwire it to 5.*
- void [seqarea_x](#) (int value)
 - *'Setter' function for member m_seqarea_x*
- void [seqarea_y](#) (int value)
 - *'Setter' function for member m_seqarea_y*
- void [seqarea_seq_x](#) (int value)
 - *'Setter' function for member m_seqarea_seq_x*
- void [seqarea_seq_y](#) (int value)
 - *'Setter' function for member m_seqarea_seq_y*
- void [mainwid_border](#) (int value)
 - *'Setter' function for member m_mainwid_border This value is not modified unless the value parameter is between 0 and 3, inclusive.*
- void [mainwid_spacing](#) (int value)
 - *'Setter' function for member m_mainwid_spacing This value is not modified unless the value parameter is between 2 and 6, inclusive.*
- void [control_height](#) (int value)
 - *'Setter' function for member m_control_height This value is not modified unless the value parameter is between 0 and 4, inclusive.*
- void [dump_summary](#) ()
 - *'Setter' function for member m_mainwid_y*

Private Types

- typedef std::vector< [user_midi_bus](#) > [Busses](#)
 - *Internal type for the container of [user_midi_bus](#) objects.*
- typedef std::vector< [user_instrument](#) > [Instruments](#)
 - *Internal type for the container of [user_instrument](#) objects.*

Private Member Functions

- [user_midi_bus](#) & [private_bus](#) (int buss)
 - *'Getter' function for member m_midi_buses[index] (internal function) If the index is out of range, then an invalid object is returned.*
- [user_instrument](#) & [private_instrument](#) (int instrum)
 - *'Getter' function for member m_instruments[index] If the index is out of range, then a invalid object is returned.*

Private Attributes

- [Busses m_midi_buses](#)
Provides data about the MIDI busses, readable from the "user" configuration file.
- [Instruments m_instruments](#)
Provides data about the MIDI instruments, readable from the "user" configuration file.
- [int m_mainwnd_rows](#)
Number of rows in the Patterns Panel.
- [int m_mainwnd_cols](#)
Number of columns in the Patterns Panel.
- [int m_seqs_in_set](#)
Number of patterns/sequences in the Patterns Panel, also known as a "set" or "screen set".
- [int m_gmute_tracks](#)
Number of group-mute tracks that can be support, which is m_seqs_in_set squared, or 1024.
- [int m_max_sets](#)
Maximum number of screen sets that can be supported.
- [int m_max_sequence](#)
The maximum number of patterns supported is given by the number of patterns supported in the panel (32) times the maximum number of sets (32), or 1024 patterns.
- [int m_text_x](#)
Constants for the mainwid class.
- [int m_seqchars_x](#)
Constants for the mainwid class.
- [int m_seqarea_x](#)
The m_seqarea_x and m_seqarea_y constants are derived from the width and heights of the default character set, and the number of characters in width, and the number of lines, in a pattern/sequence box.
- [int m_seqarea_seq_x](#)
Area of what? Doesn't look at all like it is based on the size of characters.
- [int m_mainwid_border](#)
These control sizes.
- [int m_control_height](#)
This constants seems to be created for a future purpose, perhaps to reserve space for a new bar on the mainwid pane.
- [int m_mainwid_x](#)
The width of the main pattern/sequence grid, in pixels.

7.55.1 Detailed Description

These settings will eventually be made part of the "user" settings file.

7.55.2 Member Typedef Documentation

7.55.2.1 `typedef std::vector<user_midi_bus> user_settings::Busses` `[private]`

Sorry about the "confusion" about "bus" versus "buss". See Google for arguments about it.

7.55.3 Member Function Documentation

7.55.3.1 `void user_settings::set_defaults ()`

For the m_midi_buses and m_instruments members, this function can only iterate over the current size of the vectors. But the default size is zero!

7.55.3.2 void user_settings::set_globals () const

Should be called at initialization, and after settings are read from the "user" configuration file.

7.55.3.3 void user_settings::get_globals ()

Should be called before settings are written to the "user" configuration file.

7.55.3.4 const user_midi_bus& user_settings::bus (int index) [inline]

Cannot append the const specifier.

7.55.3.5 const user_instrument& user_settings::instrument (int index) [inline]

Cannot append the const specifier.

7.55.3.6 int user_settings::bus_instrument (int buss, int channel) [inline]

Todo Do this for controllers values and for `user_instrument` members.

7.55.3.7 void user_settings::mainwnd_rows (int value)

The default value is 4. Dependent values are recalculated after the assignment.

7.55.3.8 void user_settings::mainwnd_cols (int value)

The default value is 8. Dependent values are recalculated after the assignment.

7.55.3.9 void user_settings::max_sets (int value)

Warning

This is a dependent value at present, and changing it is experimental.

void `user_settings::seqs_in_set` (int value) { m_seqs_in_set = value; } *'Setter' function for member m_gmute_tracks*

Warning

This is a dependent value at present, and changing it is experimental.

void `user_settings::gmute_tracks` (int value) { m_gmute_tracks = value; } *'Setter' function for member m_max_sets*
This value is not modified unless the value parameter is between 32 and 64, inclusive. The default value is 32. Dependent values are recalculated after the assignment.

7.55.3.10 void user_settings::text_x (int value)

Warning

This is a dependent value at present, and changing it is experimental.

void `user_settings::max_sequence` (int value) { m_max_sequence = value; } *'Setter' function for member m_text_x*
This value is not modified unless the value parameter is between 6 and 6, inclusive. The default value is 6. Dependent values are recalculated after the assignment. This value is currently restricted, until we can code up a bigger font.

7.55.3.11 `void user_settings::text_y (int value)`

The default value is 12. Dependent values are recalculated after the assignment. This value is currently restricted, until we can code up a bigger font.

7.55.3.12 `void user_settings::mainwid_border (int value)`

The default value is 0. Dependent values are recalculated after the assignment.

7.55.3.13 `void user_settings::mainwid_spacing (int value)`

The default value is 2. Dependent values are recalculated after the assignment.

7.55.3.14 `void user_settings::control_height (int value)`

The default value is 0. Dependent values are recalculated after the assignment.

7.55.3.15 `void user_settings::dump_summary ()`**Warning**

This is a dependent value at present, and changing it is experimental.

`void user_settings::mainwid_y (int value) { m_mainwid_y = value; }` Provides a debug dump of basic information to help debug a surprisingly intractable problem with all busses having the name and values of the last buss in the configuration. Does its work only if `PLATFORM_DEBUG` and `USE_DUMP_SUMMARY` are defined. Only enabled in emergencies :-D.

7.55.3.16 `user_midi_bus & user_settings::private_bus (int index)` [private]

This invalid object has an empty alias, and all the instrument numbers are -1.

7.55.3.17 `user_instrument & user_settings::private_instrument (int index)` [private]

This invalid object has an empty(), instrument name, false for all `controllers_active[]` values, and empty `controllers[]` string values.

7.55.4 Field Documentation7.55.4.1 **Busses** `user_settings::m_midi_buses` [private]

Since this object is a vector, its size is adjustable.

7.55.4.2 **Instruments** `user_settings::m_instruments` [private]

The size is adjustable, and grows as objects are added.

7.55.4.3 `int user_settings::m_mainwnd_rows` [private]

The current value is 4, and if changed, many other values depend on it. Together with `m_mainwnd_cols`, this value fixes the patterns grid into a 4 x 8 set of patterns known as a "screen set".

7.55.4.4 `int user_settings::m_mainwnd_cols` `[private]`

The current value is 4, and probably won't change, since other values depend on it. Together with `m_mainwnd_rows`, this value fixes the patterns grid into a 4 x 8 set of patterns known as a "screen set".

7.55.4.5 `int user_settings::m_seqs_in_set` `[private]`

This value is $4 \times 8 = 32$ by default.

Warning

Currently part of the "rc" file and `rc_settings!`

7.55.4.6 `int user_settings::m_max_sets` `[private]`

Basically, that the number of times the Patterns Panel can be filled. 32 sets can be created.

7.55.4.7 `int user_settings::m_text_x` `[private]`

The `m_text_x` and `m_text_y` constants help define the "seqarea" size. It looks like these two values are the character width (x) and height (y) in pixels. Thus, these values would be dependent on the font chosen. But that, currently, is hard-wired. See the `m_font_6_12[]` array for the default font specification.

However, please not that font files are not used. Instead, the fonts are provided by two pixmaps in the `src/pixmap` directory: `font_b.xpm` (black lettering on a white background) and `font_w.xpm` (white lettering on a black background).

7.55.4.8 `int user_settings::m_seqchars_x` `[private]`

The `m_seqchars_x` and `m_seqchars_y` constants help define the "seqarea" size. These look like the number of characters per line and the number of lines of characters, in a pattern/sequence box.

7.55.4.9 `int user_settings::m_seqarea_x` `[private]`

Compare these two constants to `m_seqarea_seq_x(y)`, which was in `mainwid.h`, but is now in this file.

7.55.4.10 `int user_settings::m_seqarea_seq_x` `[private]`

These are used only in the `mainwid` module.

7.55.4.11 `int user_settings::m_mainwid_border` `[private]`

We'll try changing them and see what happens. Increasing these value spreads out the pattern grids a little bit and makes the Patterns panel slightly bigger. Seems like it would be useful to make these values user-configurable.

7.55.4.12 `int user_settings::m_control_height` `[private]`

But it is used only in this header file, to define `m_mainwid_y`, but doesn't add anything to that value.

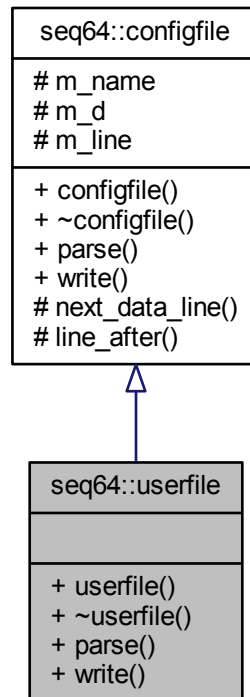
7.55.4.13 `int user_settings::m_mainwid_x` `[private]`

Affected by the `m_mainwid_border` and `m_mainwid_spacing` values.

7.56 seq64::userfile Class Reference

Supports the user's ~/.seq24usr configuration file.

Inheritance diagram for seq64::userfile:



Public Member Functions

- `userfile` (const std::string &a_name)
Principal constructor.
- `~userfile` ()
A rote destructor needed for a derived class.
- bool `parse` (perform &a_perf)
Parses a "usr" file, filling in the given perform object.
- bool `write` (const perform &a_perf)
This function just returns false, as there is no "perform" information in the user-file yet.

Additional Inherited Members

7.56.1 Member Function Documentation

7.56.1.1 bool seq64::userfile::parse (perform & a_perf) [virtual]

This function opens the file as a text file (line-oriented).

Parameters

<i>a_perf</i>	The performance object, currently unused.
---------------	---

Implements [seq64::configfile](#).

7.56.1.2 `bool seq64::userfile::write (const perform & a_perf) [virtual]`

Parameters

<i>a_perf</i>	The performance object, currently unused.
---------------	---

Implements [seq64::configfile](#).

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