Sequencer64 Developer Reference Manual

0.95.1

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Contents

Chapter 1

Sequencer64 Classes and Functions

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1.1 Introduction

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

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

Also read the ROADMAP, README, and contrib/bugs_to_investigate files to understand the genesis of this project and the things that still need to be done with Sequencer64.

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/seq24-doc.git`
- `https://github.com/ahlstromcj/sequencer64-doc.git`

These project also have prebuilt PDFs should one not want to bother building them.

In the present document, we've left out a some side-code to cut down on the size of the document. Still, the resulting PDF is over 1000 pages long.

Some useful references:

- `http://acad.carleton.edu/courses/musc108-00-f14/pages/04/04StandardMID←IFiles.html`
- `http://www.midimusicadventures.com/qs/midi-zips/soundtracks/kq6gm.zip`

Chapter 2

Licenses

Library This application and its libraries, sub-applications, and documents.

Author(s) Chris Ahlstrom 2015-09-10

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Chapter 3

Todo List

File calculations.cpp

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

File daemonize.cpp

There is a service wrapper available under Win32. It is called "srvhost.exe". At this time, we *still* don't know how to use it, but it is available, and Windows XP seems to use it quite a bit.

File perfnames.cpp

When bringing up this dialog, and starting play from it, some extra horizontal lines are drawn for some of the sequences. This happens even in seq24, so this is long standing behavior. Is it useful, and how? Where is it done? In perfroll?

File rc_settings.cpp

Kepler34 has two more settings values: [midi-clock-mod-ticks], [note-resume] and [key-height]. The latter sounds more like a "usr" setting.

File rc_settings.hpp

Consolidate the usr and rc settings classes, or at least have a base class for common elements like "[comments]".

Global seq64::editable_events::save_events ()

Consider what to do about the sequence::m_is_modified flag.

Global seq64::event::set_status_keep_channel (midibyte eventcode)

THIS function WILL set a BOGUS CHANNEL on events >= SYSEX !!!!!

Global seq64::eventedit::handle_save ()

Could also support writing the events to a new sequence, for added flexibility.

Global seq64::font::init (Glib::RefPtr< Gdk::Window > windo)

Can we scale these images via scale_simple(newwidth, newhight, Gtk::INTERP_BILINEAR)

Global seq64::gui_palette_gtk2::gui_palette_gtk2 ()

Use an array of colors instead of this switch.

Global seq64::jack_assistant::deinit ()

Note that we still need a way to call jack_release_timebase() when the user turns off the "JACK Master" status of Sequencer64.

Global seq64::jack_timebase_callback (jack_transport_state_t state, jack_nframes_t nframes, jack_↩ position_t ∗pos, int new_pos, void ∗arg)

Shouldn't we process the first clause ONLY if new_pos is true?

Global seq64::mainwnd::edit_field_has_focus () const

We may have to revisit this one to add the Adjustment objects and the extra objects created in multi-wid mode.

Global seq64::mainwnd::mainwnd (perform &p, bool allowperf2=true, int ppqn=SEQ64_USE_DEFAULT_↩ PPQN, int mainwid_rows=1, int mainwid_cols=1, bool mainwid_indep=false)

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

Global seq64::mainwnd::on_key_release_event (GdkEventKey ∗ev)

Test this functionality in old and new application.

Global seq64::mainwnd::tempo_log ()

Upgrade this so that a Ctrl-click calls toggle_tempo_record, so that we can eliminate a tempo button; there are too many buttons.

Global seq64::perfedit::perfedit (perform &p, bool second_perfedit=false, int ppqn=SEQ64_USE_DEFAU↩ LT_PPQN)

Offload most of the work into an initialization function like options does.

Global seq64::perform::add_sequence (sequence ∗seq, int perf)

Shouldn't we wrap around the sequence list if we can't find an empty sequence slot after prefnum?

This function needs some deeper analysis against the original, in my opinion.

Global seq64::perform::launch (int ppqn)

We probably need a bpm parameter for consistency at some point.

Global seq64::perform::lookup_keyevent_key (int seqnum)

In the context of pattern keys, we should replace c_seqs_in_set with a better-named value; if sets are actually larger than that, due to the "sets" option, then we simply repeat the pattern here using a modifier key ["shifted", see lookup_slot_key()]; in other words, we're stuck on using 32 pattern hot-keys.

Global seq64::perform::m_seqs [c_max_sequence]

First, make the sequence array a vector, and second, put all of these flags into a structure and access those members indirectly.

Global seq64::perform::pop_trigger_undo ()

Look at seq32/src/perform.cpp and the perform :: push_trigger_undo(track) function, which has a track parameter that has a -1 values the supports all tracks. It requires two new vectors (one for undo, one for redo), two new flags (likewise). We've put this code in place, no longer macroed out, now permanent.

Global seq64::perform::set_left_tick (midipulse tick, bool setstart=true)

The perform::m_one_measure member is currently hardwired to m_ppqn∗4.

Global seq64::perform::set_overwrite_recording (bool overwrite_active, int seq, bool toggle=false)

Might probably as well create(bool rec_active, bool thru_active, sequence ∗ s).

Global seq64::perform::set_tick (midipulse tick)

Do we really need m_current_tick???

Global seq64::perfroll::set_ppqn (int ppqn)

Resolve the issue of c_perf_scale_x versus m_perf_scale_x in perfroll.

Global seq64::perftime::set_ppqn (int ppqn)

We need make the 4 constant variable per the number of beats (quarter-notes) per bar, and also at least make 16 (4x4) a meaningful manifest constant.

Global seq64::pulses_to_string (midipulse p)

Still needs to be unit tested.

Global seq64::pulses_to_timestring (midipulse p, const midi_timing &timinginfo)

Still needs to be unit tested.

Global seq64::reroute_stdio (const std::string &logfile, bool closem)

Implement "daemonizing" for Windows, including redirection to the Windows Event Log.

Global seq64::seqdata::on_scroll_event (GdkEventScroll ∗ev)

DOCUMENT the seqdata scrolling behavior in the documentation projects.

Global seq64::seqedit::get_measures ()

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

Global seq64::seqedit::seqedit (perform &perf, sequence &seq, int pos, int ppqn=SEQ64_USE_DEFAULT↩_PPQN)

Offload most of the work into an initialization function like options does.

Global seq64::seqedit::set_beat_width (int bw)

Check if verification is needed at this point.

Global seq64::seqedit::set_beats_per_bar (int bpm)

Check if verification is needed at this point.

Global seq64::seqedit::set_measures (int lim)

Check if verification is needed at this point.

Global seq64::seqmenu::m_modified

We need to make sure that the perform object is in control of the modification flag.

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::seqroll::follow_progress () •

If playback is disabled (such as by a trigger), then do not update the page;

- When it comes back, make sure we're on the correct page;
- When it stops, put the window back to the beginning, even if the beginning is not defined as "0".

Global seq64::seqtime::update_pixmap ()

Sizing needs to be controlled by font parameters. Instead of 19 or 20, estimate the width of 3 letters. Instead of 9 pixels down, use the height of the seqtime and the height of a character.

Global seq64::sequence::add_chord (int chord, midipulse tick, midipulse len, int note)

Add the ability to preserve the incoming velocity.

Global seq64::sequence::get_minmax_note_events (int &lowest, int &highest)

For efficency, we should calculate this only when the event set changes, and save the results and return them if good.

Global seq64::sequence::stream_event (event &ev)

When we feel like debugging, we will replace the global is-playing call with the parent perform's is-running call.

If the last event was a Note Off, we should clear it here, and how?

Global seq64::triggers::next (midipulse &tick_on, midipulse &tick_off, bool &selected, midipulse &tick_↩offset)

It would be a bit simpler to simply return a trigger object, wouldn't it?

Chapter 4

Deprecated List

Global seq64::clock_tick_duration_bogus (midibpm bpm, int ppqn)

This is a somewhat bogus calculation used only for "statistical" output in the old perform module. Name changed to reflect this unfortunate fact. Use pulse_length_us() instead.

Chapter 5

Bug List

Global seq64::perform::get_group_mute_state (int gtrack)

We were not using the group track value if it was zero, but that is a legitimate value.

Global seq64::perform::set_group_mute_state (int gtrack, bool muted)

We were not using the group track value if it was zero, but that is a legitimate value.

Chapter 6

Namespace Index

6.1 Namespace List

Here is a list of all namespaces with brief descriptions:

Chapter 7

Hierarchical Index

7.1 Class Hierarchy

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

Chapter 8

Data Structure Index

8.1 Data Structures

Here are the data structures with brief descriptions:

Chapter 9

Namespace Documentation

9.1 Gtk Namespace Reference

9.2 seq64 Namespace Reference

Define this macro to use the new seq24 v.

Data Structures

- class automutex

    Provides a mutex that locks automatically when created, and unlocks when destroyed.
- class busarray

    Holds a number of businfo objects.
- class businfo

    A new class to consolidate a number of bus-related arrays into one array.
- class click

    Encapsulates any possible mouse click.
- class condition_var

    A mutex works best in conjunction with a condition variable.
- class configfile

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

    Provides for the management of MIDI editable events.
- class editable_events

    Provides for the management of an ordered collection MIDI editable events.
- class event

    Provides events for management of MIDI events.
- class event_list

    The event_list class is a receptable for MIDI events.
- class eventedit

    This class supports an Event Editor that is used to tweak the details of events and get a better idea of the mix of events in a sequence.
- class eventslots

    This class implements the left-side list of events in the pattern event-edit window.

- class font

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

    Implements the performance input of that certain fruity sequencer that people seem to like.
- class FruitySeqEventInput

    This class implements the interaction methods for the "fruity" mode of operation in the event panel of the seqroll.
- class FruitySeqRollInput

    Implements the fruity mouse interaction paradigm for the seqroll.
- class gui_assistant

    This class provides an interface for some of the GUI support needed in Sequencer64.
- class gui_assistant_gtk2

    This class provides an interface for some of the Gtk/Gdk/Glib support needed in Sequencer64.
- class gui_drawingarea_gtk2

    Implements the basic drawing areas of the application.
- class gui_palette_gtk2

    Implements a stock palette of Gdk::Color elements.
- class gui_window_gtk2

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

    This class provides the performance mode JACK support.
- class jack_scratchpad

    Provide a temporary structure for passing data and results between a perform and jack_assistant object.
- struct jack_status_pair_t

    Provides an internal type to make it easier to display a specific and accurate human-readable message when a JACK operation fails.
- class keybindentry

    Class for management of application key-bindings.
- class keys_perform

    This class supports the performance mode.
- class keys_perform_gtk2

    This class supports the performance mode.
- struct keys_perform_transfer

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

    Encapsulates any practical keystroke.
- class lash

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

    One LFO window class.
- class maintime

    This class provides the drawing of the progress bar at the top of the main window, along with two "pills" that move in time with the beat and measure.
- class mainwid

    This class implements the piano roll area of the application.
- class 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.
- class mastermidibase

    The class that "supervises" all of the midibus objects?
- class mastermidibus

    The class that "supervises" all of the midibus objects.

- class midi_alsa

  This class implements the ALSA version of the midi_api.
- class midi_alsa_info

  The class for handling ALSA MIDI input.
- class midi_api

  Subclasses of midi_in_api and midi_out_api contain all API- and OS-specific code necessary to fully implement the rtmidi API.
- class midi_container

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

  This class (formerly a struct) contains the control information for sequences that make up a live set.
- class midi_in_alsa

  This class implements the ALSA version of a MIDI input object.
- class midi_in_jack

  The class for handling JACK MIDI input.
- class midi_info

  The class for holding basic information on the MIDI input and output ports currently present in the system.
- class midi_jack

  This class implements with JACK version of the midi_alsa object.
- struct midi_jack_data

  Contains the JACK MIDI API data as a kind of scratchpad for this object.
- class midi_jack_info

  The class for handling JACK MIDI port enumeration.
- class midi_list

  This class is the std::list implementation of the midi_container.
- class midi_measures

  Provides a data structure to hold the numeric equivalent of the measures string "measures:beats:divisions" ("m:b:d").
- class midi_message

  Provides a handy capsule for a MIDI message, based on the std::vector<unsigned char> data type from the RtMidi project.
- class midi_out_alsa

  This class implements the ALSA version of a MIDI output object.
- class midi_out_jack

  The JACK MIDI output API class.
- class midi_port_info

  A class for holding port information.
- class midi_queue

  Provides a queue of midi_message structures.
- class midi_splitter

  This class handles the parsing and writing of MIDI files.
- class midi_timing

  We anticipate the need to have a small structure holding the parameters needed to calculate MIDI times within an arbitrary song.
- class midi_vector

  This class is the std::vector implementation of the midi_container.
- class midibase

  This class implements with ALSA version of the midibase object.
- class midibus

  This class implements with rtmidi version of the midibus object.
- class midifile

  This class handles the parsing and writing of MIDI files.

- class mutex

  The mutex class provides a simple wrapper for the pthread_mutex_t type used as a recursive mutex.
- class options

  This class supports a full tabbed options dialog.
- class optionsfile

  Provides a file for reading and writing the application' main configuration file.
- class perfedit

  This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel.
- class perfnames

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

  This class supports the performance mode.
- struct performcallback

  Provides for notification of events.
- class perfroll

  This class implements the performance roll user interface.
- class perftime

  This class implements drawing the piano time at the top of the "performance window" (the "song editor").
- class rc_settings

  This class contains the options formerly named "global_xxxxxx".
- class rect

  Supports a simple rectangle and some common manipulations needed by the user-interface.
- class rterror

  Exception handling class for rtexmidi.
- class rtmidi

  The main class of the rtmidi API.
- class rtmidi_in

  A realtime MIDI input class.
- class rtmidi_in_data

  The rtmidi_in_data structure is used to pass private class data to the MIDI input handling function or thread.
- class rtmidi_info

  A class for enumerating MIDI clients and ports.
- class rtmidi_out

  A realtime MIDI output class.
- class Seq24PerfInput

  Implements the default (Seq24) performance input characteristics of this application.
- class Seq24SeqEventInput

  This structure implement the normal interaction methods for Seq24.
- class seqdata

  This class supports drawing piano-roll eventis on a window.
- class seqedit

  Implements the Pattern Editor, which has references to:
- class seqevent

  Implements the piano event drawing area.
- class seqkeys

  This class implements the left side piano of the pattern/sequence editor.
- class seqmenu

  This class handles the right-click menu of the sequence slots in the pattern window.
- class seqroll

  Implements the piano roll section of the pattern editor.

- class seqtime

  This class implements the piano time, whatever that is.
- class sequence

  The sequence class is firstly a receptable for a single track of MIDI data read from a MIDI file or edited into a pattern.
- class trigger

  This class hold a single trigger for a sequence object.
- class triggers

  The triggers class is a receptable the triggers that can be used with a sequence object.
- class user_instrument

  Provides data about the MIDI instruments, readable from the "user" configuration file.
- struct user_instrument_t

  This structure corresponds to `[user-instrument-N]` definitions in the ∼`/.seq24usr` or ∼`/.config/sequencer64/seq` `usr` file.
- class user_midi_bus

  Provides data about the MIDI busses, readable from the "user" configuration file.
- struct user_midi_bus_t

  This structure corresponds to `[user-midi-bus-0]` definitions in the ∼`/.seq24usr` ("user") file (∼`/.config/sequencer64/sequencer64.usr` in the latest version of the application).
- class user_settings

  Holds the current values of sequence settings and settings that can modify the number of sequences and the configuration of the user-interface.
- class userfile

  Supports the user's ∼`/.config/sequencer64/sequencer64.usr` *and* ∼`/.seq24usr` *configuration file.*

Typedefs

- typedef unsigned char midibyte

  Provides a fairly common type definition for a byte value.
- typedef std::basic_string< midibyte > midistring

  Provides a string specialization to explicitly use unsigned characters.
- typedef unsigned char bussbyte

  Distinguishes a buss/bus number from other MIDI bytes.
- typedef unsigned short midishort

  Distinguishes a short value from the unsigned short values implicit in short-valued MIDI numbers.
- typedef unsigned long midilong

  Distinguishes a long value from the unsigned long values implicit in long-valued MIDI numbers.
- typedef char colorbyte

  Provides a way to save a sequence palette color in a single byte.
- typedef long midipulse

  Distinguishes a long value from the unsigned long values implicit in MIDI time measurements.
- typedef double midibpm

  Provides the data type for BPM (beats per minute) values.
- typedef void(∗ rterror_callback) (rterror::Type type, const std::string &errormsg, void ∗userdata)

  rtmidi error callback function prototype.
- typedef void(∗ rtmidi_callback_t) (midi_message &message, void ∗userdata)

  MIDI caller callback function type definition.

Enumerations

- enum wave_type_t {
  WAVE_NONE,
  WAVE_SINE,
  WAVE_SAWTOOTH,
  WAVE_REVERSE_SAWTOOTH,
  WAVE_TRIANGLE }

  Provides a clear enumation of wave types supported by the wave function.
- enum seq_modifier_t {
  SEQ64_NO_MASK,
  SEQ64_SHIFT_MASK,
  SEQ64_LOCK_MASK,
  SEQ64_CONTROL_MASK,
  SEQ64_MOD1_MASK,
  SEQ64_MOD2_MASK,
  SEQ64_MOD3_MASK,
  SEQ64_MOD4_MASK,
  SEQ64_MOD5_MASK,
  SEQ64_BUTTON1_MASK,
  SEQ64_BUTTON2_MASK,
  SEQ64_BUTTON3_MASK,
  SEQ64_BUTTON4_MASK,
  SEQ64_BUTTON5_MASK,
  SEQ64_SUPER_MASK,
  SEQ64_HYPER_MASK,
  SEQ64_META_MASK,
  SEQ64_RELEASE_MASK,
  SEQ64_MASK_MAX }

  Types of modifiers, essentially copied from gtk-2.0/gdk/gdktypes.h.
- enum seq_event_type_t {
  SEQ64_NOTHING,
  SEQ64_DELETE,
  SEQ64_DESTROY,
  SEQ64_EXPOSE,
  SEQ64_MOTION_NOTIFY,
  SEQ64_BUTTON_PRESS,
  SEQ64_2BUTTON_PRESS,
  SEQ64_3BUTTON_PRESS,
  SEQ64_BUTTON_RELEASE,
  SEQ64_KEY_PRESS,
  SEQ64_KEY_RELEASE,
  SEQ64_SCROLL,
  SEQ64_EVENT_LAST }

  Event types copped from gtk-2.0/gdk/gdkevents.h for use with this application.
- enum seq_scroll_direction_t {
  SEQ64_SCROLL_UP,
  SEQ64_SCROLL_DOWN,
  SEQ64_SCROLL_LEFT,
  SEQ64_SCROLL_RIGHT }

  Types of scroll events, essentially copied from gtk-2.0/gdk/gdkevents.h.
- enum clock_e {
  e_clock_disabled,
  e_clock_off,
  e_clock_pos,
  e_clock_mod }

  A clock enumeration, as used in the File / Options / MIDI Clock dialog.

- enum interaction_method_t {
  e_seq24_interaction,
  e_fruity_interaction,
  e_number_of_interactions }

  Provides mutually-exclusive codes for the mouse-handling used by the application.
- enum mute_group_handling_t {
  e_mute_group_stomp,
  e_mute_group_preserve,
  e_mute_group_max }

  Provides mutually-exclusive codes for handling the reading of mute-groups from the "rc" file versus the "MIDI" file.
- enum c_music_scales {
  c_scale_off,
  c_scale_major,
  c_scale_minor,
  c_scale_harmonic_minor,
  c_scale_melodic_minor,
  c_scale_c_whole_tone,
  c_scale_blues,
  c_scale_major_pentatonic,
  c_scale_minor_pentatonic,
  c_scale_size }

  Corresponds to the small number of musical scales that the application can handle.
- enum draw_type_t {
  DRAW_FIN,
  DRAW_NORMAL_LINKED,
  DRAW_NOTE_ON,
  DRAW_NOTE_OFF,
  DRAW_TEMPO }

  Provides a set of methods for drawing certain items.
- enum edit_mode_t {
  EDIT_MODE_NOTE,
  EDIT_MODE_DRUM }

  Provides two editing modes for a sequence.
- enum loop_record_t {
  LOOP_RECORD_LEGACY,
  LOOP_RECORD_OVERWRITE,
  LOOP_RECORD_EXPAND }

  Provides the supported looping recording modes.
- enum mouse_action_e {
  e_action_select,
  e_action_draw,
  e_action_grow }

  Mouse actions, for the Pattern Editor.
- enum edit_action_t {
  c_select_all_notes,
  c_select_all_events,
  c_select_inverse_notes,
  c_select_inverse_events,
  c_quantize_notes,
  c_quantize_events,
  c_tighten_events,
  c_tighten_notes,
  c_transpose_notes,
  c_reserved,
  c_transpose_h,
  c_expand_pattern,

c_compress_pattern,
c_select_even_notes,
c_select_odd_notes,
c_swing_notes }

Actions.

- enum rtmidi_api {
RTMIDI_API_UNSPECIFIED,
RTMIDI_API_LINUX_ALSA,
RTMIDI_API_UNIX_JACK,
RTMIDI_API_MAXIMUM }

  MIDI API specifier arguments.

Functions

- void swap (busarray &buses0, busarray &buses1)

  This free function swaps the contents of two busarray objects.
- std::string wave_type_name (wave_type_t wavetype)

  Converts a wave type value to a string.
- int extract_timing_numbers (const std::string &s, std::string &part_1, std::string &part_2, std::string &part_3, std::string &fraction)

  Extracts up to 4 numbers from a colon-delimited string.
- int tokenize_string (const std::string &source, std::vector< std::string > &tokens)

  Tokenizes a string using the colon, space, or period as delimiters.
- std::string pulses_to_string (midipulse p)

  Converts MIDI pulses (also known as ticks, clocks, or divisions) into a string.
- std::string pulses_to_measurestring (midipulse p, const midi_timing &seqparms)

  Converts a MIDI pulse/ticks/clock value into a string that represents "measures:beats:ticks" ("measures:beats↩ :division").
- bool pulses_to_midi_measures (midipulse p, const midi_timing &seqparms, midi_measures &measures)

  Converts a MIDI pulse/ticks/clock value into a string that represents "measures:beats:ticks" ("measures:beats↩ :division").
- std::string pulses_to_timestring (midipulse p, const midi_timing &timinginfo)

  Converts a MIDI pulse/ticks/clock value into a string that represents "hours:minutes:seconds.fraction".
- std::string pulses_to_timestring (midipulse p, midibpm bpm, int ppqn, bool showus)

  Converts a MIDI pulse/ticks/clock value into a string that represents "hours:minutes:seconds.fraction".
- midipulse measurestring_to_pulses (const std::string &measures, const midi_timing &seqparms)

  Converts a string that represents "measures:beats:division" to a MIDI pulse/ticks/clock value.
- midipulse midi_measures_to_pulses (const midi_measures &measures, const midi_timing &seqparms)

  Converts a string that represents "measures:beats:division" to a MIDI pulse/ticks/clock value.
- midipulse timestring_to_pulses (const std::string &timestring, int bpm, int ppqn)
- midipulse string_to_pulses (const std::string &s, const midi_timing &mt)

  Converts a time string to pulses.
- midibyte string_to_midibyte (const std::string &s)

  Converts a string to a MIDI byte.
- std::string shorten_file_spec (const std::string &fpath, int leng)

  Shortens a file-specification to make sure it is no longer than the provided length value.
- bool string_not_void (const std::string &s)

  Tests that a string is not empty and has non-space characters.
- bool string_is_void (const std::string &s)

  Tests that a string is empty or has only white-space characters.
- bool strings_match (const std::string &target, const std::string &x)

Compares two strings for a form of semantic equality, for the purposes of editable_event(), for example.
- int log2_time_sig_value (int tsd)

  Calculates the log-base-2 value of a number that is already a power of 2.
- int zoom_power_of_2 (int ppqn)

  Calculates a suitable starting zoom value for the given PPQN value.
- int beat_pow2 (int logbase2)

  Internal function for simple calculation of a power of 2 without a lot of math.
- midibyte beat_log2 (int value)

  Calculates the base-2 log of a number.
- double tempo_us_from_bytes (const midibyte tt[3])

  Calculates the tempo in microseconds from the bytes read from a Tempo event in the MIDI file.
- void tempo_us_to_bytes (midibyte t[3], int tempo_us)

  Provide a way to convert a tempo value (microseconds per quarter note) into the three bytes needed as value in a Tempo meta event.
- midibyte tempo_to_note_value (midibpm tempovalue)

  Converts a tempo value to a MIDI note value for the purpose of displaying a tempo value in the mainwid, seqdata section (hopefully!), and the perfroll.
- midibpm note_value_to_tempo (midibyte note)

  The inverse of tempo_to_note_value().
- bool ppqn_is_valid (int ppqn)

  Common code for handling PPQN settings.
- double tempo_us_from_bpm (midibpm bpm)

  Converts tempo (e.g.
- midibpm bpm_from_tempo_us (double tempous)

  This function calculates the effective beats-per-minute based on the value of a Tempo meta-event.
- midibpm bpm_from_bytes (midibyte t[3])

  Provides a direct conversion from a midibyte array to the beats/minute value.
- double pulse_length_us (midibpm bpm, int ppqn)

  Calculates pulse-length from the BPM (beats-per-minute) and PPQN (pulses-per-quarter-note) values.
- double delta_time_us_to_ticks (unsigned long us, midibpm bpm, int ppqn)

  Converts delta time in microseconds to ticks.
- double ticks_to_delta_time_us (midipulse delta_ticks, midibpm bpm, int ppqn)

  Converts the time in ticks ("clocks") to delta time in microseconds.
- double clock_tick_duration_bogus (midibpm bpm, int ppqn)

  Calculates the duration of a clock tick based on PPQN and BPM settings.
- int clock_ticks_from_ppqn (int ppqn)

  A simple calculation to convert PPQN to MIDI clock ticks.
- double double_ticks_from_ppqn (int ppqn)

  A simple calculation to convert PPQN to MIDI clock ticks.
- midipulse pulses_per_measure (int ppqn=SEQ64_DEFAULT_PPQN)

  Calculates the pulses per measure.
- midipulse measures_to_ticks (int bpb, int ppqn, int bw, int measures=1)

  Calculates the length of an integral number of measures, in ticks.
- int ticks_to_measures (int bpb, int ppqn, int bw, midipulse ticks=192)

  The inverse of measures_to_ticks.
- midipulse pulse_divide (midipulse numerator, midipulse denominator, midipulse &remainder)

  Calculates the quotient and remainder of a midipulse division, which is a common operation in Sequencer64.
- double wave_func (double angle, wave_type_t wavetype)

  Calculates a wave function for use as an LFO (low-frequency oscillator) for modifying data values in a sequence.
- bool extract_port_names (const std::string &fullname, std::string &clientname, std::string &portname)

  Extracts the two names from the ALSA/JACK client/port name format, "[0] 128:0 clientname:portname".

- std::string extract_bus_name (const std::string &fullname)

  Extracts the buss name from "bus:port".
- std::string extract_port_name (const std::string &fullname)

  Extracts the port name from "bus:port".
- std::string current_date_time ()

  Gets the current date/time.
- bool help_check (int argc, char ∗argv [ ])

  Checks to see if the first option is a help or version argument, just so we can skip the "Reading configuration ..." messages.
- bool parse_options_files (perform &p, std::string &errmessage, int argc, char ∗argv [ ])

  Provides the command-line option support, as well as some setup support, extracted from the main routine of Sequencer64.
- bool parse_mute_groups (perform &p, std::string &errmessage)

  Like parse_options_files(), but reads only the [mute-group] section.
- bool parse_o_options (int argc, char ∗argv [ ])

  Checks the putative command-line arguments for any of the new "options" options.
- bool parse_log_option (int argc, char ∗argv [ ])

  Checks the putative command-line arguments for the "log" option.
- int parse_command_line_options (perform &p, int argc, char ∗argv [ ])

  Parses the command-line options on behalf of the application.
- bool write_options_files (const perform &p)

  Saves all options to the "rc" and "user" configuration files.
- std::string build_details ()

  Generates a string describing the features of the build.
- bool check_daemonize (int argc, char ∗argv [ ])
- uint32_t daemonize (const std::string &appname, const std::string &cwd=".", int mask=0)
- void undaemonize (uint32_t previous_umask)
- bool reroute_stdio (const std::string &logfile, bool closem)

  Alters the standard terminal file descriptors so that they either route to to a log file, under Linux or Windows.
- bool is_note_off_velocity (midibyte status, midibyte data)

  This free function is used in the midifile module and in the event::is_note_off_recorded() member function.
- std::string to_string (const event &ev)

  A free function to convert an event into an informative string, just enough to save some debugging time.
- event create_tempo_event (midipulse tick, midibpm tempo)

  Creates and returns a tempo event.
- bool file_access (const std::string &targetfile, int mode)
- bool file_exists (const std::string &filename)

  Checks a file for existence.
- bool file_readable (const std::string &filename)

  Checks a file for readability.
- bool file_writable (const std::string &filename)

  Checks a file for writability.
- bool file_accessible (const std::string &filename)

  Checks a file for readability and writability.
- bool file_executable (const std::string &filename)

  Checks a file for the ability to be executed.
- bool file_is_directory (const std::string &filename)

  Checks a file to see if it is a directory.
- bool make_directory (const std::string &pathname)

  A function to ensure that the ∼/.config/sequencer64 directory exists.
- std::string get_current_directory ()

Provides the path name of the current working directory.

- std::string get_full_path (const std::string &path)

  Given a path, relative or not, this function returns the full path.
- std::string normalize_path (const std::string &path, bool to_unix)

  Makes sure that the path-name is a UNIX path, separated by forward slashes (the solidus).
- std::string strip_quotes (const std::string &item)

  Strips the double quotes from a string.
- std::string file_extension (const std::string &path)

  Gets a file extension, defined simply as the text after the last period in the path.
- bool strcasecompare (const std::string &a, const std::string &b)
- bool file_extension_match (const std::string &path, const std::string &target)

  Sees if file-extensions match, case-insensitively.
- void jack_shutdown_callback (void ∗arg)

  Global functions for JACK support and JACK sessions.
- void jack_timebase_callback (jack_transport_state_t state, jack_nframes_t nframes, jack_position_t ∗pos, int new_pos, void ∗arg)

  The JACK timebase function defined here sets the JACK position structure.
- int jack_transport_callback (jack_nframes_t nframes, void ∗arg)

  Implemented second patch for JACK Transport from freddix/seq24 GitHub project.
- jack_client_t ∗ create_jack_client (const std::string &clientname, const std::string &uuid)

  A more full-featured initialization for a JACK client, which is meant to be called by the init() function.
- void show_jack_statuses (unsigned bits)

  Loops through the full set of JACK bits, showing the information for any bits that are set in the given parameter.
- long get_current_jack_position (void ∗arg)

  This function gets the current JACK position.
- void jack_session_callback (jack_session_event_t ∗ev, void ∗arg)

  Set the m_jsession_ev (event) value of the perform object.
- bool invalid_key (unsigned key)

  Free functions for keyboard support.
- void keyval_normalize (keys_perform_transfer &k)

  For the case in which the "rc" file is missing or corrupt, this function makes sure that each control key has a reasonable value.
- bool create_lash_driver (perform &p, int argc, char ∗∗argv)

  Creates and starts a lash object.
- lash ∗ lash_driver ()

  Provides access to the lash object.
- void delete_lash_driver ()

  Deletes the last object.
- void millisleep (unsigned long ms)
- bool is_null_midipulse (midipulse p)

  Compares a midipulse value to SEQ64_NULL_MIDIPULSE.
- void ∗ output_thread_func (void ∗p)

  Global functions defined in perform.cpp.
- void ∗ input_thread_func (void ∗myperf)

  Set up the performance, and set the process to realtime privileges.
- rc_settings & rc ()

  Returns a reference to the global rc_settings object.
- user_settings & usr ()

  Returns a reference to the global user_settings object, for better encapsulation.
- int choose_ppqn (int ppqn)

  Common code for handling PPQN settings.

- midipulse timestring_to_pulses (const std::string &timestring, midibpm bpm, int ppqn)

  Converts a string that represents "hours:minutes:seconds.fraction" into a MIDI pulse/ticks/clock value.
- static std::string get_compound_option (const std::string &compound, std::string &optionname)

  Gets a compound option argument.
- bool set_current_directory (const std::string &path)

  Sets the current directory for the application.
- std::string message_concatenate (const char ∗m1, const char ∗m2)

  This function concatenates two C string pointers and returns them as a string message.
- bool info_message (const std::string &msg)

  Common-code for console messages.
- bool error_message (const std::string &msg)

  Common-code for error messages.
- static bool casecompare (char a, char b)
- int jack_dummy_callback (jack_nframes_t nframes, void ∗arg)

  Provides a dummy callback.
- const std::string & seq_app_name ()

  Returns the name of the application.
- const std::string & seq_client_name ()

  Returns the name of the client for the application.
- const std::string & seq_version ()

  Returns the version of the application.
- static std::string make_section_name (const std::string &label, int value)

  Provides a purely internal, ad hoc helper function to create numbered section names for the userfile class.
- font & font_render ()

  The p_font_renderer pointer was once created in the main module, sequencer64.cpp.
- Gtk::Adjustment & adjustment_dummy ()

  Provides a way to provide a dummy Gtk::Adjustment object, but not create one until it is actually needed, so that the Glib/Gtk infrastructure is ready for it.
- bool is_ctrl_key (GdkEventKey ∗ev)

  Encapsulates the safe test for the control key, as described here: `https://developer.gnome.org/gtk3/stable/checklist-modifiers.html`.
- bool is_shift_key (GdkEventKey ∗ev)

  Encapsulates the safe test for the shift key.
- bool is_no_modifier (GdkEventScroll ∗ev)

  Encapsulates the safe test for no modifier keys, for a scroll event.
- bool is_ctrl_key (GdkEventScroll ∗ev)

  Encapsulates the safe test for the control key for scrolling.
- bool is_shift_key (GdkEventScroll ∗ev)

  Encapsulates the safe test for the shift key.
- bool is_ctrl_key (GdkEventButton ∗ev)

  Encapsulates the safe test for the control key for buttons.
- bool is_shift_key (GdkEventButton ∗ev)

  Encapsulates the safe test for the shift key.
- bool is_ctrl_shift_key (GdkEventButton ∗ev)

  Encapsulates the safe test for the ctrl-shift key combination.
- bool is_super_key (GdkEventButton ∗ev)

  Encapsulates the test for the super (mod4, windows) key for buttons.
- void test_widget_click (GtkWidget ∗w)

  Not sure where I was going with this one!
- bool is_left_drag (GdkEventMotion ∗ev)

  Tests for a left-drag motion being in force.

- bool is_drag_motion (GdkEventMotion ∗ev)

  Tests for a left-, right-, and middle-drag motion being in force.
- std::string keyval_name (unsigned key)

  Free functions for keyboard support.
- void update_mainwid_sequences ()

  This global function in the seq64 namespace calls mainwid :: update_sequences_on_window(), if the global mainwid object exists.
- void update_perfedit_sequences ()

  This global function in the seq64 namespace calls perfedit :: draw_sequences(), if the global perfedit objects exist.
- int FF_RW_timeout (void ∗arg)

  This global function in the seq64 namespace is passed to the gtk_timeout_add callback.
- static long clamp (long val, long low, long hi)

  An internal function used by the FruitySeqRollInput class.
- void silence_jack_errors (bool silent=true)
- void silence_jack_info (bool silent=true)
- std::string midi_api_name (int i)
- int midi_probe ()
- bool midi_input_test (rtmidi_info &info, int portindex)

Variables

- std::string c_controller_names [SEQ64_MIDI_COUNT_MAX]

  Provides the default names of MIDI controllers.
- const midibyte EVENT_STATUS_BIT

  This highest bit of the status byte is always 1.
- const midibyte EVENT_ANY

  Channel Voice Messages.
- const midibyte EVENT_NOTE_OFF
- const midibyte EVENT_NOTE_ON
- const midibyte EVENT_AFTERTOUCH
- const midibyte EVENT_CONTROL_CHANGE
- const midibyte EVENT_PROGRAM_CHANGE
- const midibyte EVENT_CHANNEL_PRESSURE
- const midibyte EVENT_PITCH_WHEEL
- const midibyte EVENT_CTRL_VOLUME

  Control Change Messages.
- const midibyte EVENT_CTRL_BALANCE
- const midibyte EVENT_CTRL_PAN
- const midibyte EVENT_CTRL_EXPRESSION
- const midibyte EVENT_MIDI_REALTIME

  System Messages.
- const midibyte EVENT_MIDI_SYSEX
- const midibyte EVENT_MIDI_QUARTER_FRAME
- const midibyte EVENT_MIDI_SONG_POS
- const midibyte EVENT_MIDI_SONG_SELECT
- const midibyte EVENT_MIDI_SONG_F4
- const midibyte EVENT_MIDI_SONG_F5
- const midibyte EVENT_MIDI_TUNE_SELECT
- const midibyte EVENT_MIDI_SYSEX_END
- const midibyte EVENT_MIDI_SYSEX_CONTINUE
- const midibyte EVENT_MIDI_CLOCK
- const midibyte EVENT_MIDI_SONG_F9

- const midibyte EVENT_MIDI_START
- const midibyte EVENT_MIDI_CONTINUE
- const midibyte EVENT_MIDI_STOP
- const midibyte EVENT_MIDI_SONG_FD
- const midibyte EVENT_MIDI_ACTIVE_SENSE
- const midibyte EVENT_MIDI_RESET
- const midibyte EVENT_MIDI_META

    0xFF is a MIDI "escape code" used in MIDI files to introduce a MIDI meta event.
- const midibyte EVENT_META_SEQ_NUMBER

    Provides values for the currently-supported Meta events, and many others:
- const midibyte EVENT_META_TEXT_EVENT
- const midibyte EVENT_META_COPYRIGHT
- const midibyte EVENT_META_TRACK_NAME
- const midibyte EVENT_META_INSTRUMENT
- const midibyte EVENT_META_LYRIC
- const midibyte EVENT_META_MARKER
- const midibyte EVENT_META_CUE_POINT
- const midibyte EVENT_META_MIDI_CHANNEL
- const midibyte EVENT_META_MIDI_PORT
- const midibyte EVENT_META_END_OF_TRACK
- const midibyte EVENT_META_SET_TEMPO
- const midibyte EVENT_META_SMPTE_OFFSET
- const midibyte EVENT_META_TIME_SIGNATURE
- const midibyte EVENT_META_KEY_SIGNATURE
- const midibyte EVENT_META_SEQSPEC
- const midibyte EVENT_META_ILLEGAL

    As a "type" (overloaded on channel) value for a Meta event, 0xFF indicates an illegal meta type.
- const midibyte EVENT_NULL_CHANNEL

    This value of 0xFF is Sequencer64's channel value that indicates that the event's m_channel value is bogus.
- const midibyte EVENT_GET_CHAN_MASK

    These file masks are used to obtain or to mask off the channel data from a status byte.
- const midibyte EVENT_CLEAR_CHAN_MASK
- const int EVENTS_ALL

    Variable from the "stazed" extras.
- const int EVENTS_UNSELECTED
- const int c_midibus_output_size

    Manifest global constants.
- const int c_midibus_input_size

    The c_midibus_input_size value is passed, in mastermidibus, to snd_seq_set_input_buffer_size().
- const int c_midibus_sysex_chunk

    Controls the amount a SysEx data sent at one time, in the midibus module.
- const midilong c_midibus

    Provides tags used by the midifile class to control the reading and writing of the extra "proprietary" information stored in a Seq24 MIDI file.
- const midilong c_midich

    Track channel number.
- const midilong c_midiclocks

    Track clocking.
- const midilong c_triggers

    See c_triggers_new.
- const midilong c_notes

    Song data.

- const midilong c_timesig

  Track time signature.
- const midilong c_bpmtag

  Song beats/minute.
- const midilong c_triggers_new

  Track trigger data.
- const midilong c_mutegroups

  Song mute group data.
- const midilong c_gap_A

  Gap.
- const midilong c_gap_B

  Gap.
- const midilong c_gap_C

  Gap.
- const midilong c_gap_D

  Gap.
- const midilong c_gap_E

  Gap.
- const midilong c_gap_F

  Gap.
- const midilong c_midictrl

  Song MIDI control.
- const midilong c_musickey

  The track's key.
- const midilong c_musicscale

  The track's scale.
- const midilong c_backsequence

  Track background sequence.
- const midilong c_transpose

  Track transpose value.
- const midilong c_perf_bp_mes

  Perfedit beats/measure.
- const midilong c_perf_bw

  Perfedit beat-width.
- const midilong c_tempo_map

  Reserve seq32 tempo map.
- const midilong c_reserved_1

  Reserved for expansion.
- const midilong c_reserved_2

  Reserved for expansion.
- const midilong c_tempo_track

  Alternate tempo track no.
- const midilong c_seq_color

  Future feature Kepler34.
- const midilong c_seq_edit_mode

  Future feature Kepler34.
- const int c_midi_track_ctrl

  Pseudo control values for associating MIDI events (I think) with automation of some of the controls in seq24.
- const int c_midi_control_bpm_up
- const int c_midi_control_bpm_dn
- const int c_midi_control_ss_up

- const int c_midi_control_ss_dn
- const int c_midi_control_mod_replace
- const int c_midi_control_mod_snapshot
- const int c_midi_control_mod_queue
- const int c_midi_control_mod_gmute
- const int c_midi_control_mod_glearn
- const int c_midi_control_play_ss
- const int c_midi_controls
- const int c_midi_control_playback
- const int c_midi_control_song_record
- const int c_midi_control_solo
- const int c_midi_control_thru
- const int c_midi_control_bpm_page_up
- const int c_midi_control_bpm_page_dn
- const int c_midi_control_ss_set
- const int c_midi_control_record
- const int c_midi_control_quan_record
- const int c_midi_control_reset_seq
- const int c_midi_controls_extended
- int g_midi_control_limit
- const int c_status_replace

  These were purely internal constants used with the functions that implement MIDI control (and also some keystroke control) for the application.
- const int c_status_snapshot

  This value signals the "snapshot" functionality.
- const int c_status_queue

  This value signals the "queue" functionality.
- const int c_status_oneshot

  This value signals the Kepler34 "one-shot" functionality.
- const bool c_scales_policy [c_scale_size][SEQ64_OCTAVE_SIZE]

  Each value in the kind of scale is denoted by a true value in these arrays.
- const int c_scales_transpose_up [c_scale_size][SEQ64_OCTAVE_SIZE]

  Increment values needed to transpose each scale up so that it remains in the same key.
- const int c_scales_transpose_dn [c_scale_size][SEQ64_OCTAVE_SIZE]

  Making these positive makes it easier to read, but the actual array contains negative values.
- const char c_scales_text [c_scale_size][20]

  The names of the currently-supported scales.
- const char c_key_text [SEQ64_OCTAVE_SIZE][4]

  Provides the entries for the Key dropdown menu in the Pattern Editor window.
- const char c_interval_text [16][4]

  Provides the entries for the Interval dropdown menu in the Pattern Editor window.
- const char c_chord_text [8][6]

  Provides the entries for the Chord dropdown menu in the Pattern Editor window.
- const int c_chord_number

  Additional support data for the chord-generation feature from Stazed's seq32 project.
- const char c_chord_table_text [c_chord_number][12]

  Additional support data for the chord-generation feature from Stazed's seq32 project.
- const int c_chord_size

  Provides the number of chord values in each chord's specification array.
- const int c_chord_table [c_chord_number][c_chord_size]

  Additional support data for the chord-generation feature from Stazed's seq32 project.
- const int c_max_instruments

Provides the maximum number of instruments that can be defined in the `~/.seq24usr` *or* `~/.config/sequencer64/sequenc` `rc` *file.*

- const int c_max_busses

  Provides the maximum number of MIDI buss definitions supported in the "user" file.
- static const std::string versiontext

  Sets up the "hardwired" version text for Sequencer64.
- static struct option long_options [ ]

  A structure for command parsing that provides the long forms of command-line arguments, and associates them with their respective short form.
- static const std::string s_arg_list

  Provides a complete list of the short options, and is passed to getopt_long().
- static const char ∗const s_help_1a

  Provides help text.
- static const char ∗const s_help_1b

  More help text.
- static const char ∗const s_help_2

  Still more help text.
- static const char ∗const s_help_3

  Still still more help text.
- static const char ∗const s_help_4

  Still still more more help text.
- static const char ∗const s_help_5

  Still still still more more more help text.
- static const std::string s_bitness

  This section of variables provide static information about the options enabled or disabled during the build.
- jack_status_pair_t s_status_pairs [ ]

  Provides a list of JACK status bits, and a brief string to explain the status bit.
- struct charpair_t s_character_mapping [ ]

  The array of mappings of the non-alphabetic characters.
- static lash ∗ s_global_lash_driver

  The global pointer to the LASH driver instance.
- static rc_settings g_rc_settings

  Provides the replacement for all of the other "global_xxx" variables.
- static user_settings g_user_settings

  Provides the replacement for all of the other settings in the "user" configuration file, plus some of the "constants" in the globals module.
- static const int s_jitter_amount

  An internal variable for user-jitter control.
- static mainwid ∗ gs_mainwid_pointer

  Holds a pointer to the single instance of mainwnd for the entire application, once it is created.
- static perfedit ∗ gs_perfedit_pointer_0

  Holds a pointer to the first instance of perfedit for the entire application, once it is created.
- static perfedit ∗ gs_perfedit_pointer_1

  Holds a pointer to the second instance of perfedit for the entire application, once it is created.
- static const long s_handlesize

  An internal variable for handle size.

9.2.1 Detailed Description

Do not document a namespace; it breaks Doxygen.

0.9.3 delta-tick calculation code. This code doesn't quite work for generating the proper rate of MIDI clocks, and so have disabled that code until we can figure out what it is we're doing wrong. Do not enable it unless you are willing to test it.

9.2.2 Typedef Documentation

9.2.2.1 midibyte

```
typedef unsigned char seq64::midibyte
```

This can be used for a MIDI buss/port number or for a MIDI channel number. See the SEQ64_INVALID_MIDIBYTE macro.

9.2.2.2 midistring

```
typedef std::basic_string<midibyte> seq64::midistring
```

9.2.2.3 bussbyte

```
typedef unsigned char seq64::bussbyte
```

9.2.2.4 midishort

```
typedef unsigned short seq64::midishort
```

9.2.2.5 midilong

```
typedef unsigned long seq64::midilong
```

9.2.2.6 colorbyte

```
typedef char seq64::colorbyte
```

This value is signed since we need a value of -1 to indicate no color, and 0 to 127 to indicate the index that "points" to a palette color.

9.2.2.7 midipulse

```
typedef long seq64::midipulse
```

HOWEVER, CURRENTLY, if you make this value unsigned, then perfroll won't show any notes in the sequence bars!!! Also, a number of manipulations of this type currently depend upon it being a signed value.

9.2.2.8 midibpm

```
typedef double seq64::midibpm
```

This value used to be an integer, but we need to provide more precision in order to support better tempo matching.

9.2.2.9 rterror_callback

```
typedef void(* seq64::rterror_callback) (rterror::Type type, const std::string &errormsg, void
*userdata)
```

Note that class behaviour is undefined after a critical error (not a warning) is reported.

Parameters

type	Type of error.
errorText	Error description.

9.2.2.10 rtmidi_callback_t

```
typedef void(* seq64::rtmidi_callback_t) (midi_message &message, void *userdata)
```

Used to be nested in the rtmidi_in class. The timestamp parameter has been folded into the midi_message class (a wrapper for std::vector<unsigned char>), and the pointer has been replaced by a reference.

9.2.3 Enumeration Type Documentation

9.2.3.1 wave_type_t

```
enum seq64::wave_type_t
```

We still have to clarify these type values, though.

Enumerator

WAVE_NONE	No waveform, never used.
WAVE_SINE	Sine wave modulation.
WAVE_SAWTOOTH	Saw-tooth (ramp) modulation.
WAVE_REVERSE_SAWTOOTH	Reverse saw-tooth (decay).
WAVE_TRIANGLE	No waveform, never used.

9.2.3.2 seq_modifier_t

```
enum seq64::seq_modifier_t
```

We have to tweak the names to avoid redeclaration errors and to "personalize" the values. We change "GDK" to "SEQ64".

Since we're getting events from, say Gtk-2.4, but using our (matching) values for comparison, use the CAST_EQ↩UIVALENT() macro to compare them. Note that we might still end up having to a remapping (e.g. if trying to get the code to work with the Qt framework).

Enumerator

SEQ64_NO_MASK	
SEQ64_SHIFT_MASK	
SEQ64_LOCK_MASK	
SEQ64_CONTROL_MASK	
SEQ64_MOD1_MASK	
SEQ64_MOD2_MASK	
SEQ64_MOD3_MASK	
SEQ64_MOD4_MASK	
SEQ64_MOD5_MASK	
SEQ64_BUTTON1_MASK	
SEQ64_BUTTON2_MASK	
SEQ64_BUTTON3_MASK	
SEQ64_BUTTON4_MASK	
SEQ64_BUTTON5_MASK	
SEQ64_SUPER_MASK	Bits 13 and 14 are used by XKB, bits 15 to 25 are unused. Bit 29 is used internally.
SEQ64_HYPER_MASK	
SEQ64_META_MASK	
SEQ64_RELEASE_MASK	
SEQ64_MASK_MAX	

9.2.3.3 seq_event_type_t

```
enum seq64::seq_event_type_t
```

Only the values we need have been grabbed. We have to tweak the names to avoid redeclaration errors and to "personalize" the values. We change "GDK" to "SEQ64", but, for convenience (to hide errors? :-D), we keep the number the same.

Since we're getting events from, say Gtk-2.4, but using our (matching) values for comparison, use the CAST_EQ↩UIVALENT() macro to compare them. Note that we might still end up having to do a remapping (e.g. if trying to get the code to work with the Qt framework).

Enumerator

SEQ64_NOTHING	
SEQ64_DELETE	
SEQ64_DESTROY	
SEQ64_EXPOSE	
SEQ64_MOTION_NOTIFY	
SEQ64_BUTTON_PRESS	
SEQ64_2BUTTON_PRESS	
SEQ64_3BUTTON_PRESS	
SEQ64_BUTTON_RELEASE	
SEQ64_KEY_PRESS	
SEQ64_KEY_RELEASE	
SEQ64_SCROLL	
SEQ64_EVENT_LAST	

9.2.3.4 seq_scroll_direction_t

`enum seq64::seq_scroll_direction_t`

We have to tweak the names to avoid redeclaration errors and to "personalize" the values. We change "SEQ64" to "SEQ64".

Since we're getting events from, say Gtk-2.4, but using our (matching) values for comparison, use the CAST_EQ←UIVALENT() macro to compare them. Note that we might still end up having to a remapping (e.g. if trying to get the code to work with the Qt framework).

Enumerator

SEQ64_SCROLL_UP	
SEQ64_SCROLL_DOWN	
SEQ64_SCROLL_LEFT	
SEQ64_SCROLL_RIGHT	

9.2.3.5 clock_e

`enum seq64::clock_e`

This enumeration was also defined in midibus_portmidi.h, but we put it into this common module to avoid duplication.

Enumerator

e_clock_disabled	A new, currently-hidden value to indicate to ignore/disable an output port. If a port always fails to open, we want to just ignore it.

Enumerator

e_clock_off	Corresponds to the "Off" selection in the MIDI Clock tab. With this setting, the MIDI Clock is disabled for the buss using this setting. Notes will still be sent that buss, of course. Some software synthesizers might require this setting in order to make a sound.
e_clock_pos	Corresponds to the "Pos" selection in the MIDI Clock tab. With this setting, MIDI Clock will be sent to this buss, and, if playback is starting beyond tick 0, then MIDI Song Position and MIDI Continue will also be sent on this buss.
e_clock_mod	Corresponds to the "Mod" selection in the MIDI Clock tab. With this setting, MIDI Clock and MIDI Start will be sent. But clocking won't begin until the Song Position has reached the start modulo (in 1/16th notes) that is specified.

9.2.3.6 interaction_method_t

```
enum seq64::interaction_method_t
```

Moved here from the globals.h module.

Enumerator

e_seq24_interaction	Use the normal mouse interactions.
e_fruity_interaction	The "fruity" mouse interactions.
e_number_of_interactions	Keep this last... a size value.

9.2.3.7 mute_group_handling_t

```
enum seq64::mute_group_handling_t
```

There's no GUI way to set this item yet.

e_mute_group_stomp: This is the legacy (seq24) option, which reads the mute-groups from the MIDI file, and saves them back to the "rc" file and to the MIDI file. However, for Sequencer64 MIDI files such as b4uacuse-stress.midi, seq24 never reads the mute-groups in that MIDI file! In any case, this can be considered a corruption of the "rc" file.

e_mute_group_preserve: In this option, the mute groups are only written to the "rc" file if the MIDI file did not contain non-zero mute groups. This option prevents the contamination of the "rc" mute-groups by the MIDI file's mute-groups. We're going to make this the default option.

Enumerator

e_mute_group_stomp	Save main group to "rc"/MIDI files.
e_mute_group_preserve	Write new groups only to MIDI file.
e_mute_group_max	Keep this last... a size value.

9.2.3.8 c_music_scales

```
enum seq64::c_music_scales
```

Scales can be shown in the piano roll as gray bars for reference purposes.

We've added three more scales; there are still a number of them that could be fruitfully added to the list of scales.

It would be good to offload this stuff into a new "scale" class.

Enumerator

c_scale_off	
c_scale_major	
c_scale_minor	
c_scale_harmonic_minor	
c_scale_melodic_minor	
c_scale_c_whole_tone	
c_scale_blues	
c_scale_major_pentatonic	
c_scale_minor_pentatonic	
c_scale_size	

9.2.3.9 draw_type_t

```
enum seq64::draw_type_t
```

These values are used in the sequence, seqroll, perfroll, and mainwid classes.

Enumerator

DRAW_FIN	Indicates that drawing is finished.
DRAW_NORMAL_LINKED	Used for drawing linked notes.
DRAW_NOTE_ON	For starting the drawing of a note.
DRAW_NOTE_OFF	For finishing the drawing of a note.
DRAW_TEMPO	For drawing tempo meta events.

9.2.3.10 edit_mode_t

```
enum seq64::edit_mode_t
```

A feature adapted from Kepler34. Not yet ready for prime time.

Enumerator

EDIT_MODE_NOTE	Edit as Note input, the normal edit mode.
EDIT_MODE_DRUM	Edit as Drum input, using short notes.

9.2.3.11 loop_record_t

```
enum seq64::loop_record_t
```

These values are used by the seqedit class, which provides a button with a popup menu to select one of these recording modes.

Enumerator

LOOP_RECORD_LEGACY	Incoming events are merged into the loop.
LOOP_RECORD_OVERWRITE	Incoming events overwrite the loop.
LOOP_RECORD_EXPAND	Incoming events increase size of loop.

9.2.3.12 mouse_action_e

```
enum seq64::mouse_action_e
```

Enumerator

e_action_select	
e_action_draw	
e_action_grow	

9.2.3.13 edit_action_t

```
enum seq64::edit_action_t
```

These variables represent actions that can be applied to a selection of notes. One idea would be to add a swing-quantize action. We will reserve the value here, for notes only; not yet used or part of the action menu.

Enumerator

c_select_all_notes	
c_select_all_events	
c_select_inverse_notes	
c_select_inverse_events	

Enumerator

c_quantize_notes	
c_quantize_events	
c_tighten_events	
c_tighten_notes	
c_transpose_notes	
c_reserved	
c_transpose_h	
c_expand_pattern	
c_compress_pattern	
c_select_even_notes	
c_select_odd_notes	
c_swing_notes	

9.2.3.14 rtmidi_api

```
enum seq64::rtmidi_api
```

These items used to be nested in the rtmidi class, but that only worked when RtMidi.cpp/h were large monolithic modules.

Enumerator

RTMIDI_API_UNSPECIFIED	Search for a working compiled API.
RTMIDI_API_LINUX_ALSA	Advanced Linux Sound Architecture API.
RTMIDI_API_UNIX_JACK	JACK Low-Latency MIDI Server API.
RTMIDI_API_MAXIMUM	A count of APIs; an erroneous value.

9.2.4 Function Documentation

9.2.4.1 swap()

```
void seq64::swap (
            busarray & buses0,
            busarray & buses1 )
```

Parameters

buses0	Provides the first buss in the swap.
buses1	Provides the second buss in the swap.

9.2.4.2 wave_type_name()

```
std::string seq64::wave_type_name (
             wave_type_t wavetype )
```

These names are short because I cannot figure out how to get the window pad out to show the longer names.

Parameters

wavetype	The wave-type value to be displayed.

Returns

Returns a short description of the wave type.

9.2.4.3 extract_timing_numbers()

```
int seq64::extract_timing_numbers (
             const std::string & s,
             std::string & part_1,
             std::string & part_2,
             std::string & part_3,
             std::string & fraction )
```

- measures : beats : divisions
  - "8" represents solely the number of pulses. That is, if the user enters a single number, it is treated as the number of pulses.
  - "8:1" represents a measure and a beat.
  - "213:4:920" represents a measure, a beat, and pulses.
- hours : minutes : seconds . fraction. We really don't support this concept at present. Beware!
  - "2:04:12.14"
  - "0:1:2"

Warning

This is not the most efficient implementation you'll ever see. At some point we will tighten it up. This function is tested in the seq64-tests project, in the "calculations_unit_test" module. At present this test is surely BROKEN!

Parameters

	s	Provides the input time string, in measures or time format, to be processed.
out	*part↩_1*	The destination reference for the first part of the time. In some contexts, this number alone is a pulse (ticks) value; in other contexts, it is a measures value.
out	*part↩_2*	The destination reference for the second part of the time.
out	*part↩_3*	The destination reference for the third part of the time.
out	*fraction*	The destination reference for the fractional part of the time.

Returns

Returns the number of parts provided, ranging from 0 to 4.

9.2.4.4 tokenize_string()

```
int seq64::tokenize_string (
            const std::string & source,
            std::vector< std::string > & tokens )
```

They are treated equally, and the caller must determine what to do with the parts. Here are the steps:

```
-#  Skip any delimiters found at the beginning.  The position will
    either exist, or there will be nothing to parse.
-#  Get to the next delimiter.  This will exist, or not.  Get all
    non-delimiters until the next delimiter or the end of the string.
-#  Repeat until no more delimiters exist.
```

Parameters

source	The string to be parsed and tokenized.
tokens	Provides a vector into which to push the tokens.

Returns

Returns the number of tokens pushed (i.e. the final size of the tokens vector.

9.2.4.5 pulses_to_string()

```
std::string seq64::pulses_to_string (
            midipulse p )
```

Todo Still needs to be unit tested.

Parameters

p	The MIDI pulse/tick value to be converted.

Returns

Returns the string as an unsigned ASCII integer number.

9.2.4.6 pulses_to_measurestring()

```
std::string seq64::pulses_to_measurestring (
            midipulse p,
            const midi_timing & seqparms )
```

Parameters

p	The number of MIDI pulses (clocks, divisions, ticks, you name it) to be converted. If the value is SEQ64_NULL_MIDIPULSE, it is converted to 0, because callers don't generally worry about such niceties, and the least we can do is convert illegal measure-strings (like "000:0:000") to a legal value.
seqparms	This small structure provides the beats/measure, beat-width, and PPQN that hold for the sequence involved in this calculation. These values are needed in the calculations.

Returns

Returns the string, in measures notation, for the absolute pulses that mark this duration.

9.2.4.7 pulses_to_midi_measures()

```
bool seq64::pulses_to_midi_measures (
            midipulse p,
            const midi_timing & seqparms,
            midi_measures & measures )
```

```
m = p * W / (4 * P * B)
```

Parameters

	p	Provides the MIDI pulses (as in "pulses per quarter note") that are to be converted to MIDI measures format.
	seqparms	This small structure provides the beats/measure (B), beat-width (W), and PPQN (P) that hold for the sequence involved in this calculation. The beats/minute (T for tempo) value is not needed.
out	*measures*	Provides the current MIDI song time structure to hold the results, which are the measures, beats, and divisions values for the time of interest. Note that the measures and beats are corrected to be re 1, not 0.

Returns

Returns true if the calculations were able to be made. The P, B, and W values all need to be greater than 0.

9.2.4.8 pulses_to_timestring() [1/2]

```
std::string seq64::pulses_to_timestring (
             midipulse p,
             const midi_timing & timinginfo )
```

See the other pulses_to_timestring() overload.

Todo Still needs to be unit tested.

Parameters

p	Provides the number of ticks, pulses, or divisions in the MIDI event time.
timinginfo	Provides the tempo of the song, in beats/minute, and the pulse-per-quarter-note of the song.

Returns

Returns the return-value of the other pulses_to_timestring() function.

9.2.4.9 pulses_to_timestring() [2/2]

```
std::string seq64::pulses_to_timestring (
             midipulse p,
             midibpm bpm,
             int ppqn,
             bool showus )
```

If the fraction part is 0, then it is not shown. Examples:

```
-    "0:0:0"
-    "0:0:0.102333"
-    "12:3:1"
-    "12:3:1.000001"
```

Parameters

p	Provides the number of ticks, pulses, or divisions in the MIDI event time.
bpm	Provides the tempo of the song, in beats/minute.
ppqn	Provides the pulses-per-quarter-note of the song.
showus	If true (the default), shows the microseconds as well.

Returns

Returns the time-string representation of the pulse (ticks) value.

9.2.4.10 measurestring_to_pulses()

```
midipulse seq64::measurestring_to_pulses (
            const std::string & measures,
            const midi_timing & seqparms )
```

If the third value (the MIDI pulses or ticks value) is set to the dollar sign ("$"), then the pulses are set to PPQN-1, as a handy shortcut to indicate the end of the beat.

Warning

If only one number is provided, it is treated in this function like a measures value, not a pulses value.

Parameters

measures	Provides the current MIDI song time in "measures:beats:divisions" format, where divisions are the MIDI pulses in "pulses-per-quarter-note".
seqparms	This small structure provides the beats/measure, beat-width, and PPQN that hold for the sequence involved in this calculation.

Returns

Returns the absolute pulses that mark this duration. If the input string is empty, then 0 is returned.

9.2.4.11 midi_measures_to_pulses()

```
midipulse seq64::midi_measures_to_pulses (
            const midi_measures & measures,
            const midi_timing & seqparms )
```

p = 4 ∗ P ∗ m ∗ B / W p == pulse count (ticks or pulses) m == number of measures B == beats per measure (constant) P == pulses per quarter-note (constant) W == beat width in beats per measure (constant)

Note that the 0-pulse MIDI measure is "1:1:0", which means "at the beginning of the first beat of the first measure, no pulses'. It is not "0:0:0" as one might expect. If we get a 0 for measures or for beats, we treat them as if they were 1. It is too easy for the user to mess up.

We should consider clamping the beats to the beat-width value as well.

Parameters

measures	Provides the current MIDI song time structure holding the measures, beats, and divisions values for the time of interest.
seqparms	This small structure provides the beats/measure, beat-width, and PPQN that hold for the sequence involved in this calculation.

Returns

Returns the absolute pulses that mark this duration. If the pulse-value cannot be calculated, then SEQ64_↩ NULL_MIDIPULSE is returned.

9.2.4.12 timestring_to_pulses() [1/2]

```
midipulse seq64::timestring_to_pulses (
            const std::string & timestring,
            int bpm,
            int ppqn )
```

9.2.4.13 string_to_pulses()

```
midipulse seq64::string_to_pulses (
            const std::string & s,
            const midi_timing & mt )
```

First, the type of string is deduced by the characters in the string. If the string contains two colons and a decimal point, it is assumed to be a time-string ("hh:mm:ss.frac"); in addition ss will have to be less than 60. ??? Actually, now we only care if four numbers are provided.

If the string just contains two colons, then it is assumed to be a measure-string ("measures:beats:divisions").

If it has none of the above, it is assumed to be pulses. Testing is not rigorous.

Parameters

s	Provides the string to convert to pulses.
mt	Provides the structure needed to provide BPM and other values needed for some of the conversions done by this function.

Returns

Returns the string as converted to MIDI pulses (or divisions, clocks, ticks, whatever you call it).

9.2.4.14 string_to_midibyte()

```
midibyte seq64::string_to_midibyte (
            const std::string & s )
```

This function bypasses characters until it finds a digit (whether part of the number or a "0x" construct), and then converts it.

Parameters

s	Provides the string to convert to a MIDI byte.

Returns

Returns the MIDI byte value represented by the string.

9.2.4.15 shorten_file_spec()

```
std::string seq64::shorten_file_spec (
            const std::string & fpath,
            int leng )
```

This is done by removing character in the middle, if necessary, and replacing them with an ellipse.

This function operates by first trying to find the `/home` directory. If found, it strips off `/home/username` and replace it with the Linux ~ replacement for the `$HOME` environment variable. This function assumes that the "username" portion *must* exist, and that there's no goofy stuff like double-slashes in the path.

Parameters

fpath	The file specification, including the full path to the file, and the name of the file.
leng	Provides the length to which to limit the string.

Returns

Returns the fpath parameter, possibly shortened to fit within the desired length.

9.2.4.16 string_not_void()

```
bool seq64::string_not_void (
            const std::string & s )
```

Provides essentially the opposite test that string_is_void() provides. The definition of white-space is provided by the std::isspace() function/macro.

Parameters

s	The string pointer to check for emptiness.

Returns

Returns true if the pointer is valid, the string has a non-zero length, and is not just white-space.

9.2.4.17 string_is_void()

```
bool seq64::string_is_void (
             const std::string & s )
```

Meant to have essentially the opposite result of string_not_void(). The meaning of empty is special here, as it refers to a string being useless as a token:

```
-  The string is of zero length.
-  The string has only white-space characters in it, where the
   isspace() macro provides the definition of white-space.
```

Parameters

s	The string pointer to check for emptiness.

Returns

Returns true if the string has a zero length, or is only white-space.

9.2.4.18 strings_match()

```
bool seq64::strings_match (
             const std::string & target,
             const std::string & x )
```

The strings_match() function returns true if the comparison items are identical, without case-sensitivity in character content up to the length of the secondary string. This allows abbreviations to match. (And, in scanning routines, the first match is immediately accepted.)

Parameters

target	The primary string in the comparison. This is the target string, the one we hope to match. It is *assumed* to be non-empty, and the result is false if it is empty..
x	The secondary string in the comparison. It must be no longer than the target string, or the match is false.

Returns

Returns true if both strings are are identical in characters, up to the length of the secondary string, with the case of the characters being insignificant. Otherwise, false is returned.

9.2.4.19 log2_time_sig_value()

```
int seq64::log2_time_sig_value (
            int tsd )
```

Useful in converting a time signature's denominator to a Time Signature meta event's "dd" value.

Parameters

tsd	The time signature denominator, which must be a power of 2: 2, 4, 8, 16, or 32.

Returns

Returns the power of 2 that achieves the *tsd* parameter value.

9.2.4.20 zoom_power_of_2()

```
int seq64::zoom_power_of_2 (
            int ppqn )
```

The default starting zoom is 2, but this value is suitable only for PPQN of 192 and below. Also, zoom currently works consistently only if it is a power of 2. For starters, we scale the zoom to the selected ppqn, and then shift it each way to get a suitable power of two.

Parameters

ppqn	The ppqn of interest.

Returns

Returns the power of 2 appropriate for the given PPQN value.

9.2.4.21 beat_pow2()

```
int seq64::beat_pow2 (
            int logbase2 )
```

Use for calculating the denominator of a time signature.

Parameters

logbase2	Provides the power to which 2 is to be raised. This integer is probably only rarely greater than 4 (which represents a denominator of 16).

Returns

Returns 2 raised to the logbase2 power.

9.2.4.22 beat_log2()

```
midibyte seq64::beat_log2 (
             int value )
```

This number is truncated to an integer byte value, as it is used in calculating values to be written to a MIDI file.

Parameters

value	The integer value for which log2(value) is needed.

Returns

Returns log2(value).

9.2.4.23 tempo_us_from_bytes()

```
double seq64::tempo_us_from_bytes (
             const midibyte tt[3] )
```

Is it correct to simply cast the bytes to a double value?

Parameters

tt	Provides the 3-byte array of values making up the raw tempo data.

Returns

Returns the result of converting the bytes to a double value.

9.2.4.24 tempo_us_to_bytes()

```
void seq64::tempo_us_to_bytes (
             midibyte t[3],
             int tempo_us )
```

Recall the format of a Tempo event:

0 FF 51 03 t2 t1 t0 (tempo as number of microseconds per quarter note)

This code is the inverse of the lines of code around line 768 in midifile.cpp, which is basically `((t2 * 256) + t1) * 256 + t0`.

As a test case, note that the default tempo is 120 beats/minute, which is equivalent to tttttt=500000 (0x07A120). The output of this function will be t[] = { 0x07, 0xa1, 0x20 } [the indices go 0, 1, 2].

Parameters

t	Provides a small array of 3 elements to hold each tempo byte.
tempo_us	Provides the temp value in microseconds per quarter note. This is always an integer, not a double, so do not get confused here.

9.2.4.25 tempo_to_note_value()

```
midibyte seq64::tempo_to_note_value (
            midibpm tempovalue )
```

It implements the following linear equation, with clamping just in case.

```
                       N1 - N0
        N = N0 + (B - B0) ---------     where (N1 - N0) is always 127
                       B1 - B0


                    127
        N = (B - B0) ---------
                    B1 - B0


where N0 = 0 (MIDI note 0 is the minimum), N1 = 127 (the maximum MIDI
note), B0 is the value of usr().midi_bpm_minimum(),
B1 is the value of usr().midi_bpm_maximum(), B is the input beats/minute,
and N is the resulting note value.  As a precaution due to rounding error,
we clamp the values between 0 and 127.
```

Parameters

tempovalue	The tempo in beats/minute.

Returns

Returns the tempo value scaled to the range 0 to 127, based on the configured BPM minimum and maximum values.

9.2.4.26 note_value_to_tempo()

```
midibpm seq64::note_value_to_tempo (
            midibyte note )
```

```
              (N - N0) (B1 - B0)
    B = B0 + --------------------
                    N1 - N0


                (B1 - B0)
    B = B0 + N -----------
                   127
```

Parameters

note	The note value used for displaying the tempo in the seqdata pane, the perfroll, and in a mainwid slot.

Returns

Returns the tempo in beats/minute.

9.2.4.27 ppqn_is_valid()

```
bool seq64::ppqn_is_valid (
             int ppqn )  [inline]
```

Validates a PPQN value.

Parameters

ppqn	Provides the PPQN value to be used.

Returns

Returns true if the ppqn parameter is between MINIMUM_PPQN and MAXIMUM_PPQN, or is set to SE↩Q64_USE_DEFAULT_PPQN (-1).

9.2.4.28 tempo_us_from_bpm()

```
double seq64::tempo_us_from_bpm (
             midibpm bpm )  [inline]
```

120 beats/minute) to microseconds. This function is the inverse of bpm_from_tempo_us().

Parameters

bpm	The value of beats-per-minute. If this value is 0, we'll get an arithmetic exception.

Returns

Returns the tempo in qn/us. If the bpm value is 0, then 0 is returned.

9.2.4.29 bpm_from_tempo_us()

```
midibpm seq64::bpm_from_tempo_us (
            double tempous )  [inline]
```

The tempo event's numeric value is given in 3 bytes, and is in units of microseconds-per-quarter-note (us/qn).

Parameters

tempous	The value of the Tempo meta-event, in units of us/qn. If this value is 0, we'll get an arithmetic exception.

Returns

Returns the beats per minute. If the tempo value is 0, then 0 is returned.

9.2.4.30 bpm_from_bytes()

```
midibpm seq64::bpm_from_bytes (
            midibyte t[3] )  [inline]
```

It might be worthwhile to provide an std::vector version at some point.

Parameters

t	The 3 tempo midibytes that were read directly from a MIDI file.

9.2.4.31 pulse_length_us()

```
double seq64::pulse_length_us (
            midibpm bpm,
            int ppqn )  [inline]
```

The formula for the pulse-length in seconds is:

```
                60
        P = ------------
             BPM * PPQN
```

Parameters

bpm	Provides the beats-per-minute value. No sanity check is made. If this value is 0, we'll get an arithmetic exception.
ppqn	Provides the pulses-per-quarter-note value. No sanity check is made. If this value is 0, we'll get an arithmetic exception.

Returns

Returns the pulse length in microseconds. If either parameter is invalid, then this function will crash. :-D

9.2.4.32 delta_time_us_to_ticks()

```
double seq64::delta_time_us_to_ticks (
            unsigned long us,
            midibpm bpm,
            int ppqn )  [inline]
```

This function is the inverse of ticks_to_delta_time_us().

Please note that terms "ticks" and "pulses" are equivalent, and refer to the "pulses" in "pulses per quarter note".

```
             beats       pulses           1 minute       1 sec
    P = 120 ------ * 192 ------ * T us *  ---------   * ---------
            minute       beats            60 sec        1,000,000 us
```

```
Note that this formula assumes that a beat is a quarter note.  If a beat
is an eighth note, then the P value would be halved, because there would
be only 96 pulses per beat.  We will implement an additional function to
account for the beat; the current function merely blesses some
calculations made in the application.
```

Parameters

us	The number of microseconds in the delta time.
bpm	Provides the beats-per-minute value, otherwise known as the "tempo".
ppqn	Provides the pulses-per-quarter-note value, otherwise known as the "division".

Returns

Returns the tick value.

9.2.4.33 ticks_to_delta_time_us()

```
double seq64::ticks_to_delta_time_us (
            midipulse delta_ticks,
            midibpm bpm,
            int ppqn )  [inline]
```

The inverse of delta_time_us_to_ticks().

Please note that terms "ticks" and "pulses" are equivalent, and refer to the "pulses" in "pulses per quarter note".

Old: 60000000.0 ∗ double(delta_ticks) / (double(bpm) ∗ double(ppqn));

Parameters

delta_ticks	The number of ticks or "clocks".
bpm	Provides the beats-per-minute value, otherwise known as the "tempo".
ppqn	Provides the pulses-per-quarter-note value, otherwise known as the "division".

Returns

Returns the time value in microseconds.

9.2.4.34 clock_tick_duration_bogus()

```
double seq64::clock_tick_duration_bogus (
            midibpm bpm,
            int ppqn )  [inline]
```

Deprecated This is a somewhat bogus calculation used only for "statistical" output in the old perform module. Name changed to reflect this unfortunate fact. Use pulse_length_us() instead.

```
                  60000000 ppqn
        us = ---------------------------------
               MIDI_CLOCK_IN_PPQN * bpm * ppqn
```

```
MIDI_CLOCK_IN_PPQN is 24.
```

Parameters

bpm	Provides the beats-per-minute value. No sanity check is made. If this value is 0, we'll get an arithmetic exception.
ppqn	Provides the pulses-per-quarter-note value. No sanity check is made. If this value is 0, we'll get an arithmetic exception.

Returns

Returns the clock tick duration in microseconds. If either parameter is invalid, this will crash. Who wants to waste time on value checks here? :-D

9.2.4.35 clock_ticks_from_ppqn()

```
int seq64::clock_ticks_from_ppqn (
             int ppqn )  [inline]
```

Parameters

ppqn	The number of pulses per quarter note. For example, the default value for Seq24 is 192.

Returns

The integer value of ppqn / 24 [MIDI_CLOCK_IN_PPQN] is returned.

9.2.4.36 double_ticks_from_ppqn()

```
double seq64::double_ticks_from_ppqn (
             int ppqn )  [inline]
```

The same as clock_ticks_from_ppqn(), but returned as a double float.

Parameters

ppqn	The number of pulses per quarter note.

Returns

The double value of ppqn / 24 [SEQ64_MIDI_CLOCK_IN_PPQN]_is returned.

9.2.4.37 pulses_per_measure()

```
midipulse seq64::pulses_per_measure (
             int ppqn = SEQ64_DEFAULT_PPQN )  [inline]
```

This calculation is extremely simple, and it provides an important constraint to pulse (ticks) calculations: the number of pulses in a measure is always 4 times the PPQN value, regardless of the time signature. The number pulses in a 7/8 measure is the the same as in a 4/4 measure.

9.2.4.38 measures_to_ticks()

```
midipulse seq64::measures_to_ticks (
             int bpb,
             int ppqn,
             int bw,
             int measures = 1 )  [inline]
```

This function is called in seqedit::apply_length(), when the user selects a sequence length in measures. That function calculates the length in ticks. The number of pulses is given by the number of quarter notes times the pulses per quarter note. The number of quarter notes is given by the measures times the quarter notes per measure. The quarter notes per measure is given by the beats per measure times 4 divided by beat_width beats. So:

```
    p = 4 * P * m * B / W
        p == pulse count (ticks or pulses)
        m == number of measures
        B == beats per measure (constant)
        P == pulses per quarter-note (constant)
        W == beat width in beats per measure (constant)


For our "b4uacuse" MIDI file, M can be about 100 measures, B is 4,
P can be 192 (but we want to support higher values), and W is 4.
So p = 100 * 4 * 4 * 192 / 4 = 76800 ticks.

Note that 4 * P is a constraint encapsulated by the inline function
pulses_per_measure().
```

Parameters

bpb	The B value in the equation, beats/measure or beats/bar.
ppqn	The P value in the equation, pulses/qn.
bw	The W value in the equation, the denominator of the time signature. If this value is 0, we'll get an arithmetic exception (crash), so we just return 0 in this case.
measures	The M value in the equation. It defaults to 1, in case one desires a simple "ticks per measure" number.

Returns

Returns the L value (ticks or pulses) as calculated via the given equation. If bw is 0, then 0 is returned.

9.2.4.39 ticks_to_measures()

```
int seq64::ticks_to_measures (
             int bpb,
             int ppqn,
             int bw,
             midipulse ticks = 192 )  [inline]
```

Parameters

bpb	The B value in the equation, beats/measure or beats/bar.
ppqn	The P value in the equation, pulses/qn.
bw	The W value in the equation, the denominator of the time signature. If this value is 0, we'll get an arithmetic exception (crash), so we just return 0 in this case.
ticks	The p (pulses) value in the equation. It defaults to 192, in case one desires a default "ticks per measure" number.

Returns

Returns the M value (measures or bars) as calculated via the inverse equation. If ppqn or bpb are 0, then 0 is returned.

9.2.4.40 pulse_divide()

```
midipulse seq64::pulse_divide (
             midipulse numerator,
             midipulse denominator,
             midipulse & remainder )
```

This function also avoids division by zero (and currently ignores negative denominators, which are still possible with the current definition of the midipulse typedef.

Parameters

	numerator	Provides the numerator in the division operation.
	denominator	Provides the denominator in the division operation.
out	*remainder*	The remainder is written here. If the division cannot be done, it is set to 0.

Returns

Returns the result of the division.

9.2.4.41 wave_func()

```
double seq64::wave_func (
             double angle,
             wave_type_t wavetype )
```

We extracted this function from mattias's lfownd module, as it is more generally useful. The angle parameter is provided by the lfownd object. It is calculated by

```
        speed * tick * BW
angle = -------------------- + phase
            seqlength
```

```
The speed ranges from 0 to 16; the ratio of tick/seqlength ranges from 0
to 1; BW (beat width) is generally 4; the phase ranges from 0 to 1.
```

Parameters

angle	Provides the radial angle to be applied. Units of radians, apparently.
wavetype	Provides the wave_type_t value to select the type of wave data-point to be generated.

9.2.4.42 extract_port_names()

```
bool seq64::extract_port_names (
            const std::string & fullname,
            std::string & clientname,
            std::string & portname )
```

It's a bit krufty to have to rely on that strict format; changes in the bus/port code could break this function.

And when a2jmidid is running, indeed this function breaks. The name of a port changes to

```
a2j:Midi Through [14] (playback): Midi Through Port-0
```

with "a2j" as the client name and the rest, including the second colon, as the port name.

TODO: FIX ME!!!!!!!

Parameters

	fullname	The full port specification to be split.
out	*clientname*	The destination for the client name portion, "clientname".
out	*portname*	The destination for the port name portion, "portname".

Returns

Returns true if all items are non-empty after the process.

9.2.4.43 extract_bus_name()

```
std::string seq64::extract_bus_name (
            const std::string & fullname )
```

Sometimes we don't need both parts at once.

However, when a2jmidid is active. the port name will have a colon in it.

Parameters

fullname	The "bus:port" name.

Returns

Returns the "bus" portion of the string. If there is no colon, then it is assumed there is no buss name, so an empty string is returned.

9.2.4.44 extract_port_name()

```
std::string seq64::extract_port_name (
            const std::string & fullname )
```

Sometimes we don't need both parts at once.

However, when a2jmidid is active. the port name will have a colon in it.

Parameters

fullname	The "bus:port" name.

Returns

Returns the "port" portion of the string. If there is no colon, then it is assumed that the name is a port name, and so *fullname* is returned.

9.2.4.45 current_date_time()

```
std::string seq64::current_date_time ( )
```

Returns

Returns

9.2.4.46 help_check()

```
bool seq64::help_check (
            int argc,
            char * argv[] )
```

Also check for the –legacy option. Finally, it also checks for the "?" option that people sometimes use as a guess to get help.

Parameters

argc	The number of command-line arguments.
argv	The array of command-line argument pointers.

Returns

Returns true only if -v, -V, –version, -#, -h, –help, or "?" were encountered. If the legacy options occurred, then rc().legacy_format(true) is called, as a side effect, because it will be needed before we parse the options.

9.2.4.47 parse_options_files()

```
bool seq64::parse_options_files (
            perform & p,
            std::string & errmessage,
            int argc,
            char * argv[] )
```

It probably requires this call preceding: Gtk::Main kit(argc, argv), to strip any GTK+-specific parameters the knowledgeable user may have added. Usage:

```
Gtk::Main kit(argc, argv);
seq64::gui_assistant_gtk2 gui;
seq64::perform p(gui);
```

It also requires the caller to call rc().set_defaults() and usr().set_defaults() at the appropriate time, which is before any parsing of the command-line options. The caller can then use the command-line to make any modifications to the setting that will be used here. The biggest example is the -r/–reveal-alsa-ports option, which determines if the MIDI buss definition strings are read from the 'user' configuration file.

Instead of the legacy Seq24 names, we use the new configuration file-names, located in the ~/.config/sequencer64 directory. However, if they are not found, we no longer fall back to the legacy configuration file-names. If the –legacy option is in force, use only the legacy configuration file-name. The code also ensures the directory exists. CURRENTLY LINUX-SPECIFIC. See the rc_settings class for how this works.

```
        std::string cfg_dir = seq64::rc().home_config_directory();
        if (cfg_dir.empty())
            return EXIT_FAILURE;
```

Change Note ca 2016-04-03 We were parsing the user-file first, but we now need to parse the rc-file first, to get the manual-alsa-ports option, so that we can avoid overriding the port names that the ALSA system provides, if the manual-alsa-option is false.

Parameters

	p	Provides the perform object that will be affected by the new parameters.
out	*errmessage*	Provides a string into which to dump any error-message that might occur. Still not thoroughly supported in the "rc" and "user" configuration files.
	argc	The number of command-line arguments.
	argv	The array of command-line argument pointers.

Returns

Returns true if the reading of both configuration files succeeded, or if they did not exist. In the latter case, they will be saved as new files upon exit.

9.2.4.48 parse_mute_groups()

```
bool seq64::parse_mute_groups (
            perform & p,
            std::string & errmessage )
```

Parameters

p	The perform object to alter by reading the mute-groups.
errmessage	A return parameter for any error message that might occur.

Returns

Returns true if no errors occurred in reading the mute-groups. If not true, the caller should output the error message.

9.2.4.49 parse_o_options()

```
bool seq64::parse_o_options (
             int argc,
             char * argv[ ] )
```

These are flagged by "-o" or "--option". These options are then passed to the user_settings module. Multiple options can be supplied; the whole command-line is processed.

Parameters

argc	The number of command-line parameters, including the name of the application as parameter 0.
argv	The array of pointers to the command-line parameters.

Returns

Returns true if any "options" option was found, and false otherwise. If the options flags ("-o" or "--option") were found, but were not valid options, then we break out of processing and return false.

9.2.4.50 parse_log_option()

```
bool seq64::parse_log_option (
             int argc,
             char * argv[ ] )
```

Generally, this function needs to be called near the beginning of main(). See the rtmidi version of the main() function, for example.

Parameters

argc	The number of command-line parameters, including the name of the application as parameter 0.
argv	The array of pointers to the command-line parameters.

Returns

Returns true if stdio was rerouted to the "usr"-specified log-file.

9.2.4.51 parse_command_line_options()

```
int seq64::parse_command_line_options (
            perform & p,
            int argc,
            char * argv[ ] )
```

Note that, since we call this function twice (once before the configuration files are parsed, and once after), we have to make sure that the global value optind is reset to 0 before calling this function. Note that the traditional reset value for optind is 1, but 0 is used in GNU code to trigger the internal initialization routine of get_opt().

Parameters

p	The performance object that implements some of the command-line options.
argc	The number of command-line arguments.
argv	The array of command-line argument pointers.

Returns

Returns the value of optind if no help-related options were provided.

9.2.4.52 write_options_files()

```
bool seq64::write_options_files (
            const perform & p )
```

This function gets any legacy global variables, on the theory that they might have been changed.

Parameters

p	Provides the perform object that may provide new values for the parameters.

Returns

Returns true if both files were saved successfully. Otherwise returns false. But even if one write failed, the other might have succeeded.

9.2.4.53 build_details()

```
std::string seq64::build_details ( )
```

Returns

Returns an ordered, human-readable string enumerating the built-in features of this application.

9.2.4.54 check_daemonize()

```
bool seq64::check_daemonize (
            int argc,
            char * argv[] )
```

9.2.4.55 daemonize()

```
uint32_t seq64::daemonize (
            const std::string & appname,
            const std::string & cwd = ".",
            int mask = 0 )
```

9.2.4.56 undaemonize()

```
void seq64::undaemonize (
            uint32_t previous_umask )
```

9.2.4.57 reroute_stdio()

```
bool seq64::reroute_stdio (
            const std::string & logfile,
            bool closem )
```

Todo Implement "daemonizing" for Windows, including redirection to the Windows Event Log.

Still need to figure out a way to do this very simply, a la' Microsoft's 'svchost' executable.

Parameters

logfile	The optional name of the file to which to log messages. Defaults to an empty string.
closem	Just closes the standard file descriptors, rather than rerouting them to /dev/null. Defaults to false. This is the value needed if the *logfile* parameter is not empty.

Returns

Returns true if the log-file functionality has been enabled. I think :-D.

9.2.4.58 is_note_off_velocity()

```
bool seq64::is_note_off_velocity (
            midibyte status,
            midibyte data )  [inline]
```

Parameters

status	The type of event, which might be EVENT_NOTE_ON.
data	The data byte to check. It should be zero for a note-on is note-off event.

9.2.4.59 to_string()

```
std::string seq64::to_string (
            const event & ev )
```

Nothing fancy. If you want that, use the midicvt project.

Parameters

ev	The event to put on show.

Returns

Returns the string representation of the event parameter.

9.2.4.60 create_tempo_event()

```
event seq64::create_tempo_event (
            midipulse tick,
            midibpm tempo )
```

9.2.4.61 file_access()

```
bool seq64::file_access (
            const std::string & targetfile,
            int mode )
```

9.2.4.62 file_exists()

```
bool seq64::file_exists (
            const std::string & filename )
```

Parameters

filename	Provides the name of the file to be checked.

Returns

Returns 'true' if the file exists.

9.2.4.63 file_readable()

```
bool seq64::file_readable (
            const std::string & filename )
```

Parameters

filename	Provides the name of the file to be checked.

Returns

Returns 'true' if the file is readable.

9.2.4.64 file_writable()

```
bool seq64::file_writable (
            const std::string & filename )
```

Parameters

filename	Provides the name of the file to be checked.

Returns

Returns 'true' if the file is writable.

9.2.4.65 file_accessible()

```
bool seq64::file_accessible (
            const std::string & filename )
```

An even stronger test than file_exists. At present, we see no need to distinguish read and write permissions. We assume the file is accessible only if the file has both permissions.

Parameters

filename	Provides the name of the file to be checked.

Returns

Returns 'true' if the file is readable and writable.

9.2.4.66 file_executable()

```
bool seq64::file_executable (
             const std::string & filename )
```

Parameters

filename	Provides the name of the file to be checked.

Returns

Returns 'true' if the file exists.

9.2.4.67 file_is_directory()

```
bool seq64::file_is_directory (
             const std::string & filename )
```

This function is also used in the function of the same name in fileutilities.cpp.

Parameters

filename	Provides the name of the directory to be checked.

Returns

Returns 'true' if the file is a directory.

9.2.4.68 make_directory()

```
bool seq64::make_directory (
             const std::string & pathname )
```

This function is actually a little more general than that, but it is not sufficiently general, in general, General.

Parameters

pathname	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.

9.2.4.69 get_current_directory()

```
std::string seq64::get_current_directory ( )
```

This function is a wrapper for getcwd() and other such functions. It obtains the current working directory in the application.

Returns

The pointer to the string containg the name of the current directory. This name is the full path name for the directory. If an error occurs, then an empty string is returned.

9.2.4.70 get_full_path()

```
std::string seq64::get_full_path (
            const std::string & path )
```

It uses the Linux function realpath(3), which returns the canonicalized absolute path-name. For Windows, the function _fullpath() is used.

Parameters

path	Provides the path, which may be relative.

Returns

Returns the full path. If a problem occurs, the result is empty.

9.2.4.71 normalize_path()

```
std::string seq64::normalize_path (
            const std::string & path,
            bool to_unix )
```

Parameters

path	Provides the path, which should be a full path-name.
to_unix	Defaults to true, which converts "\" to "/". False converts in the opposite direction.

Returns

The possibly modified path is returned.

9.2.4.72 strip_quotes()

```
std::string seq64::strip_quotes (
             const std::string & item )
```

Meant mainly for removing quotes around a file-name, so it works only if the first character is a quote, and the last character is a quote.

Parameters

item	The string to be massaged.

Returns

The string without double quotes. If it didn't have any, the string should be unchanged.

9.2.4.73 file_extension()

```
std::string seq64::file_extension (
             const std::string & path )
```

We could use libmagic to determine the actual file type, but that is probably overkill for our purposes.

Parameters

path	Provides the file name or the full path to the file.

Returns

Returns the file extension. If there is no period, then an empty string is returned.

9.2.4.74 strcasecompare()

```
bool seq64::strcasecompare (
            const std::string & a,
            const std::string & b )
```

9.2.4.75 file_extension_match()

```
bool seq64::file_extension_match (
            const std::string & path,
            const std::string & target )
```

Parameters

path	Provides the file name or the full path to the file.
target	Provides the file extension to match against, without the period.

Returns

Returns true if the file extensions match.

9.2.4.76 jack_shutdown_callback()

```
void seq64::jack_shutdown_callback (
            void * arg )
```

This callback is to shut down JACK by clearing the jack_assistant :: m_jack_running flag.

Parameters

arg	Points to the jack_assistant in charge of JACK support for the perform object.

9.2.4.77 jack_timebase_callback()

```
void seq64::jack_timebase_callback (
            jack_transport_state_t state,
            jack_nframes_t nframes,
            jack_position_t * pos,
            int new_pos,
            void * arg )
```

The original version of the function worked properly with Hydrogen, but not with Klick. The new code seems to work with both. More testing and clarification is needed. This new code was "discovered" in the source-code for the "SooperLooper" project:

```
    http://essej.net/sooperlooper/
```

The first difference with the new code is that it handles the case where the JACK position is moved (new_pos == true). If this is true, and the JackPositionBBT bit is off in pos->valid, then the new BBT value is set.

The second set of differences are in the "else" clause. In the new code, it is very simple: calculate the new tick value, back it off by the number of ticks in a beat, and perhaps go to the first beat of the next bar.

In the old code (complex!), the simple BBT adjustment is always made. This changes (perhaps) the beats_per_bar, beat_type, etc. We need to make these settings use the actual global values for beats set for Sequencer64. Then, if transitioning from JackTransportStarting to JackTransportRolling (instead of checking new_pos!), the BBT values (bar, beat, and tick) are finally adjusted. Here are the steps, with old and new steps noted:

```
-#  Calculate the "delta" ticks based on the current frame, the
    ticks_per_beat, the beats_per_minute, and the frame_rate.  The old
    code saves this in a local, the new code assigns it to pos->tick.
-#  Old code: save this delta as a positive value.
-#  Figure out the settings and modify bar, beat, tick, and
    bar_start_tick.  The old and new code seem to have the same intent,
    but it seems like the new code is faster and also correct.
    -   Old code:  Calculations are made by division and mod
        operations.
    -   New code:  Calculations are made by increments and decrements
        in a while loop.
```

Stazed:

The call to jack_timebase_callback() to supply JACK with BBT, etc. would occasionally fail when the pos information had zero or some garbage in the pos.frame_rate variable. This would occur when there was a rapid change of frame position by another client... i.e. qjackctl. From the JACK API:

```
pos address of the position structure for the next cycle; pos->frame
will be its frame number. If new_pos is FALSE, this structure contains
extended position information from the current cycle.  If TRUE, it
contains whatever was set by the requester.  The timebase_callback's
task is to update the extended information here."
```

The "If TRUE" line seems to be the issue. It seems that qjackctl does not always set pos.frame_rate so we get garbage and some strange BBT calculations that display in qjackctl. So we need to set it here and just use m_↩
jack_frame_rate for calculations instead of pos.frame_rate.

Parameters

state	Indicates the current state of JACK transport.
nframes	The number of JACK frames in the current time period.
pos	Provides the position structure to be filled in, the address of the position structure for the next cycle; pos->frame will be its frame number. If new_pos is FALSE, this structure contains extended position information from the current cycle. If TRUE, it contains whatever was set by the requester. The timebase_callback's task is to update the extended information here.
new_pos	TRUE (non-zero) for a newly requested pos, or for the first cycle after the timebase_callback is defined. This is usually 0 in Sequencer64 at present, and 1 if one, say, presses "rewind" in qjackctl.
arg	Provides the jack_assistant pointer, currently unchecked for nullity.

Todo Shouldn't we process the first clause ONLY if new_pos is true?

Todo Shouldn't we process the first clause ONLY if new_pos is true?

9.2.4.78 jack_transport_callback()

```
int seq64::jack_transport_callback (
             jack_nframes_t nframes,
             void * arg )
```

Added the following function. This function is supposed to allow seq24/sequencer64 to follow JACK transport.

For more advanced ideas, see the MetronomeJack::process_callback() function in the klick project. It plays a metronome tick after calculating if it needs to or not. (Maybe we could use it to provide our own tick for recording patterns.)

If debugging is enabled in the build, then this function outputs the current JACK position information every couple of seconds, which can be useful to examine the interactions with other JACK clients.

The code enabled via USE_JACK_BBT_OFFSET sets the JACK position fieldl bbt_offset to 0. It doesn't seem to have any effect, though it can be seen when calling show_position() in the jack_transport_callback() function.

Stazed:

```
This process callback is called by JACK whether stopped or rolling.
Assuming every JACK cycle...  "...client supplied function that is
called by the engine anytime there is work to be done".  There seems to
be no definition of '...work to be done'.  nframes = buffer_size -- is
not used.
```

Parameters

nframes	Unused.
arg	Used for debug output now. Note that this function will be called very often, and this pointer will currently not be used unless debugging is turned on.

Returns

Returns 0 on success, non-zero on error.

9.2.4.79 create_jack_client()

```
jack_client_t * seq64::create_jack_client (
             const std::string & clientname,
             const std::string & uuid )
```

Do not call this function if the JACK client handle is already open.

Status bits for jack_status_t return pointer:

```
JackNameNotUnique means that the client name was not unique. With
JackUseExactName, this is fatal. Otherwise, the name was modified by
appending a dash and a two-digit number in the range "-01" to "-99".
The jack_get_client_name() function returns the exact string used. If
the specified client_name plus these extra characters would be too
long, the open fails instead.

JackServerStarted means that the JACK server was started as a result
of this operation. Otherwise, it was running already. In either case
the caller is now connected to jackd, so there is no race condition.
When the server shuts down, the client will find out.
```

JackOpenOptions:

```
JackSessionID | JackServerName | JackNoStartServer | JackUseExactName
```

helgrind:

```
Valgrind's helgrind tool shows

         Possible data race during read of size 4 at 0xF854E58 by thread #1
            by 0x267602: seq64::create_jack_client(...)
         This conflicts with a previous write of size 4 by thread #2
            by 0x267602: seq64::create_jack_client(...)

    So we add a static mutex to use with our automutex.  Does not prevent
    that message..... WHY?
```

We've never disabled the SEQ64_JACK_SESSION macro, and we like the error-reporting we get by that method. So we've commented out the following code in favor of using the session-uuid code:

ifdef SEQ64_JACK_SESSION

else

jack_status_t ∗ ps = NULL; result = jack_client_open(name, JackNullOption, ps);

endif

Parameters

clientname	Provides the name of the client, used in the call to jack_client_open(). By default, this name is the macro SEQ64_PACKAGE (i.e. "sequencer64"). The name scope is local to each server. Unless forbidden by the JackUseExactName option, the server will modify this name to create a unique variant, if needed.
uuid	The optional UUID to assign to the new client. If empty, there is no UUID.

Returns

Returns a pointer to the JACK client if JACK has opened the client connection successfully. Otherwise, a null pointer is returned.

9.2.4.80 show_jack_statuses()

```
void seq64::show_jack_statuses (
            unsigned bits )
```

For reference, here are the enumeration values from /usr/include/jack/types.h:

```
        JackFailure          = 0x01
        JackInvalidOption    = 0x02
        JackNameNotUnique    = 0x04
        JackServerStarted    = 0x08
        JackServerFailed     = 0x10
        JackServerError      = 0x20
        JackNoSuchClient     = 0x40
        JackLoadFailure      = 0x80
        JackInitFailure      = 0x100
        JackShmFailure       = 0x200
        JackVersionError     = 0x400
        JackBackendError     = 0x800
        JackClientZombie     = 0x1000
```

Parameters

bits	The mask of the bits to be shown in the output.

9.2.4.81 get_current_jack_position()

```
long seq64::get_current_jack_position (
             void * arg )
```

The Seq32 version also uses its tempo map to adjust this, but Sequencer64 currently does not.

Warning

Currently valgrind flags j->client() as uninitialized.

Parameters

arg	Provides the putative jack_assistant pointer, assumed to be not null.

Returns

Returns the calculated tick position if no errors occur. Otherwise, returns 0.

9.2.4.82 jack_session_callback()

```
void seq64::jack_session_callback (
             jack_session_event_t * ev,
             void * arg )
```

Glib is then used to connect in perform::jack_session_event(). However, the perform object's GUI-support interface is used instead of the following, so that the libseq64 library can be independent of a specific GUI framework:

```
Glib::signal_idle().
    connect(sigc::mem_fun(*jack, &jack_assistant::session_event));
```

Parameters

ev	The JACK event to be set.
arg	The pointer to the jack_assistant object. Currently not checked for nullity.

9.2.4.83 invalid_key()

```
bool seq64::invalid_key (
            unsigned key )  [inline]
```

The implementation of this function will ultimately depend on the GUI environment; currently it is GTK 2.x, so the implementation is in seq_gtkmm2/src/keys_perform_gtk2.cpp.

9.2.4.84 keyval_normalize()

```
void seq64::keyval_normalize (
            keys_perform_transfer & k )
```

Otherwise, random values, unchecked, can cause the application to crash.

Any field that is 0 or greater than 65536 is fixed. Not perfect, but better than allowing random values to be used.

Parameters

k	The structure to be validated and normalized.

9.2.4.85 create_lash_driver()

```
bool seq64::create_lash_driver (
            perform & p,
            int argc,
            char ** argv )
```

Initializes the lash driver (strips lash-specific command line arguments), then connects to the LASH daemon and polls events.

This function will always be called from the main routine, and called only once. Note that we don't need that darn SEQ64_LASH_SUPPORT macro in client code anymore.

Parameters

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

Returns

This function returns true if a lash object was created. This function will not create one if not configured to, if the command-line options did not specify the creation of the LASH driver, or if the LASH driver was already created.

9.2.4.86 lash_driver()

```
lash * seq64::lash_driver ( )
```

Returns

Returns the pointer to the LASH driver if it exists. Otherwise a null pointer is returned. The caller *must always check* the return value.

9.2.4.87 delete_lash_driver()

```
void seq64::delete_lash_driver ( )
```

This function will always be called from the main routine, once. The other lash-pointer functions will know if the pointer has been deleted.

9.2.4.88 millisleep()

```
void seq64::millisleep (
             unsigned long ms )
```

9.2.4.89 is_null_midipulse()

```
bool seq64::is_null_midipulse (
             midipulse p )  [inline]
```

By "null" in this case, we mean "unusable", not 0. Sigh, it's always something.

9.2.4.90 output_thread_func()

```
void * seq64::output_thread_func (
             void * myperf )
```

Set up the performance, set the process to realtime privileges, and then start the output function.

Parameters

myperf	Provides the perform object instance that is to be used. Its output_func() is called. Currently, this parameter is not validated, for speed.

Returns

Always returns nullptr.

9.2.4.91 input_thread_func()

```
void * seq64::input_thread_func (
             void * myperf )
```

Parameters

myperf	Provides the perform object instance that is to be used. Its output_func() is called. Currently, this parameter is not validated, for speed.

Returns

Always returns nullptr.

9.2.4.92 rc()

```
rc_settings & seq64::rc ( )
```

Why a function instead of direct variable access? Encapsulation. We are then free to change the way "global" settings are accessed, without changing client code.

Returns

Returns the global object g_rc_settings.

9.2.4.93 usr()

```
user_settings & seq64::usr ( )
```

Returns

Returns the global object g_user_settings.

9.2.4.94 choose_ppqn()

```
int seq64::choose_ppqn (
            int ppqn )
```

Putting it here means we can reduce the reliance on the global ppqn.

However, this function works completely only if the "user" configuration file has already been read. In some cases we may need to retrofit the desired PPQN value!

Parameters

ppqn	Provides the PPQN value to be used.

Returns

Returns the ppqn parameter, unless that parameter is SEQ64_USE_DEFAULT_PPQN (-1), then usr().midi↩ _ppqn is returned. If that value is also -1, then we return SEQ64_DEFAULT_PPQN (192).

9.2.4.95 timestring_to_pulses() [2/2]

```
midipulse seq64::timestring_to_pulses (
            const std::string & timestring,
            midibpm bpm,
            int ppqn )
```

Parameters

timestring	The time value to be converted, which must be of the form "hh:mm:ss" or "hh:mm:ss.fraction". That is, all four parts must be found.
bpm	The beats-per-minute tempo (e.g. 120) of the current MIDI song.
ppqn	The parts-per-quarter note precision (e.g. 192) of the current MIDI song.

Returns

Returns 0 if an error occurred or if the number actually translated to 0.

This conversion assumes that the fractional parts of the seconds is padded with zeroes on the left or right to 6 digits.

9.2.4.96 get_compound_option()

```
static std::string seq64::get_compound_option (
            const std::string & compound,
            std::string & optionname ) [static]
```

An option argument is a value flagged on the command line by the -o/–option options. Each option has a value associated with it, as the next argument on the command-line. A compound option is of the form name=value, of which one example is:

```
log=filename
```

This function extracts both the name and the value. If the name is empty, then the option is unsupported and should be ignored. If the value is empty, then there may be a default value to use.

Parameters

	compound	The putative compound option.
`out`	*optionname*	This value is filled in with the name of the option-value, if there is an equals sign in the *compound* parameter.

Returns

Returns the value part of the compound option, or just the compound parameter is there is no '=' sign. That is, it returns the option-value.

Side-effect(s) The name portion is returned in the optionname parameter.

9.2.4.97 set_current_directory()

```
bool seq64::set_current_directory (
            const std::string & path )
```

A wrapper replacement for chdir() or _chdir(). It sets the current working directory in the application. This function is necessary in order to make sure the current working directory is a safe place to work.

Returns

Returns true if the path name is good, and the chdir() call succeeded. Otherwise, false is returned.

Parameters

path	The full or relative name of the directory.

9.2.4.98 message_concatenate()

```
std::string seq64::message_concatenate (
            const char * m1,
            const char * m2 )
```

Note that we don't bother with error-checking the pointers. You're on your own, Hoss.

Parameters

m1	The first message, often a **func** macro.
m2	The second message.

Returns

Returns "m1: m2" as a standard C++ string.

9.2.4.99 info_message()

```
bool seq64::info_message (
             const std::string & msg )
```

Adds markers and a newline.

Parameters

msg	The message to print, sans the newline.

Returns

Returns true.

9.2.4.100 error_message()

```
bool seq64::error_message (
             const std::string & msg )
```

Adds markers, and returns false.

Parameters

msg	The message to print, sans the newline.

Returns

Returns false for convenience/brevity in setting function return values.

9.2.4.101 casecompare()

```
static bool seq64::casecompare (
             char a,
             char b )  [inline], [static]
```

9.2.4.102 jack_dummy_callback()

```
int seq64::jack_dummy_callback (
             jack_nframes_t nframes,
             void * arg )
```

Parameters

nframes	An unused parameter.
arg	Provides the jack_assistant pointer.

Returns

Does nothing, but returns nframes. If the arg parameter is null, then 0 is returned.

9.2.4.103 seq_app_name()

```
const std::string& seq64::seq_app_name ( )
```

We could continue to use the macro SEQ64_APP_NAME, but we might eventually want to make this name configurable. Not too likely, but possible.

Returns

Returns SEQ64_APP_NAME.

9.2.4.104 seq_client_name()

```
const std::string& seq64::seq_client_name ( )
```

We could continue to use the macro SEQ64_CLIENT_NAME, but we might eventually want to make this name configurable. More likely to be a configuration option in the future.

Returns

Returns SEQ64_CLIENT_NAME.

9.2.4.105 seq_version()

```
const std::string& seq64::seq_version ( )
```

We could continue to use the macro SEQ64_VERSION, but ... let's be consistent. :-D

Returns

Returns SEQ64_VERSION.

9.2.4.106 make_section_name()

```
static std::string seq64::make_section_name (
             const std::string & label,
             int value )  [static]
```

Parameters

label	The base-name of the section.
value	The numeric value to append to the section name.

Returns

Returns a string of the form "[basename-1]".

9.2.4.107 font_render()

```
font& seq64::font_render ( )  [inline]
```

We've going to render this pointer obsolete, though, and use a smart factory function to ensure the existence of this pointer, and return a reference to the font object.

We wanted to make the font a const object, but mainwid::on_realize() calls the font::init() function with its window object, and using const is impractical. We don't want to force every caller to deal with the overhead of passing even a null window pointer, either.

However, at some point we need some quarantee that the init() function is called before rendering a string. Right now, we guarantee it only by build order.

Returns

Returns a reference to the object pointed to by sp_font_renderer.

9.2.4.108 adjustment_dummy()

```
Gtk::Adjustment & seq64::adjustment_dummy ( )
```

This static object is used so we have an Adjustment to assign to the Adjustment members for classes that don't use them. Clumsy? We shall see.

Anyway, the parameters for this constructor are value, lower, upper, step-increment, and two more values.

9.2.4.109 is_ctrl_key() [1/3]

```
bool seq64::is_ctrl_key (
             GdkEventKey * ev )
```

It's a shame that GdkEventAny doesn't also encapsulate the keyboard state, since that is also available for other events, such as scroll events.

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_CONTROL_MASK.

9.2.4.110 is_shift_key() [1/3]

```
bool seq64::is_shift_key (
            GdkEventKey * ev )
```

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_SHIFT_MASK.

9.2.4.111 is_no_modifier()

```
bool seq64::is_no_modifier (
            GdkEventScroll * ev )
```

Parameters

ev	The scroll event to be tested.

Returns

Returns true if there are no modifiers in force.

9.2.4.112 is_ctrl_key() [2/3]

```
bool seq64::is_ctrl_key (
            GdkEventScroll * ev )
```

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_CONTROL_MASK.

9.2.4.113 is_shift_key() [2/3]

```
bool seq64::is_shift_key (
            GdkEventScroll * ev )
```

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_SHIFT_MASK.

9.2.4.114 is_ctrl_key() [3/3]

```
bool seq64::is_ctrl_key (
            GdkEventButton * ev )
```

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_CONTROL_MASK.

9.2.4.115 is_shift_key() [3/3]

```
bool seq64::is_shift_key (
            GdkEventButton * ev )
```

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_SHIFT_MASK.

9.2.4.116 is_ctrl_shift_key()

```
bool seq64::is_ctrl_shift_key (
            GdkEventButton * ev )
```

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_SHIFT_MASK and SEQ64_CONTROL_MASK.

9.2.4.117 is_super_key()

```
bool seq64::is_super_key (
            GdkEventButton * ev )
```

Basically just masks off the MOD4 bit; the "safe" method does not work for this key.

Parameters

ev	The keystroke event to be tested.

Returns

Returns true if the event state includes SEQ64_MOD4_MASK.

9.2.4.118 test_widget_click()

```
void seq64::test_widget_click (
            GtkWidget * w )
```

Parameters

w	Points to the widget being clicked.

9.2.4.119 is_left_drag()

```
bool seq64::is_left_drag (
            GdkEventMotion * ev )
```

Parameters

ev	Points to the event-motion structure.

Returns

Returns true if the SEQ64_BUTTON1_MASK bit is active.

9.2.4.120 is_drag_motion()

```
bool seq64::is_drag_motion (
            GdkEventMotion * ev )
```

Parameters

ev	Points to the event-motion structure.

Returns

Returns true if one of the SEQ64_BUTTON1_MASK, SEQ64_BUTTON2_MASK, or SEQ64_BUTTON3_M↩ ASK bits are active.

9.2.4.121 keyval_name()

```
std::string seq64::keyval_name (
            unsigned key )
```

Obtains the name of the key.

The implementation of this function will ultimately depend on the GUI environment; currently it is GTK 2.x, so the implementation is in seq_gtkmm2/src/keys_perform_gtk2.cpp.

In gtkmm, this is done via the gdk_keyval_name() function. Here, in the base class, we just provide an easy-to-create string. Note that this is a free function, not a class member.

Parameters

key	Provides the key-number to be converted to a key name.

Returns

Returns the key name as looked up by the GDK infrastructure. If the key is not found, then an empty string is returned.

9.2.4.122 update_mainwid_sequences()

```
void seq64::update_mainwid_sequences ( )
```

It is used by other objects that can modify the currently-edited sequence shown in the mainwid (main window).

9.2.4.123 update_perfedit_sequences()

```
void seq64::update_perfedit_sequences ( )
```

It is used by other objects (seqedit and eventedit) that can modify the currently-edited sequence shown in the perfedit (song window).

9.2.4.124 FF_RW_timeout()

```
int seq64::FF_RW_timeout (
             void * arg )  [inline]
```

Parameters

arg	Provides a putative pointer to the perform object that actually implements the timeout functionality.

Returns

Returns the value of the perform::FF_RW_timeout() call if seq32 transport support is enabled and the arg parameter is good, otherwise false is returned.

9.2.4.125 clamp()

```
static long seq64::clamp (
             long val,
             long low,
             long hi )  [inline], [static]
```

9.2.4.126 silence_jack_errors()

```
void seq64::silence_jack_errors (
             bool silent = true )
```

9.2.4.127 silence_jack_info()

```
void seq64::silence_jack_info (
             bool silent = true )
```

9.2.4.128 midi_api_name()

```
std::string seq64::midi_api_name (
             int i )
```

9.2.4.129 midi_probe()

```
int seq64::midi_probe ( )
```

9.2.4.130 midi_input_test()

```
bool seq64::midi_input_test (
             rtmidi_info & info,
             int portindex )
```

9.2.5 Variable Documentation

9.2.5.1 c_controller_names

```
std::string seq64::c_controller_names
```

This array is used only by the seqedit class.

9.2.5.2 EVENT_STATUS_BIT

```
const midibyte seq64::EVENT_STATUS_BIT
```

9.2.5.3 EVENT_ANY

```
const midibyte seq64::EVENT_ANY
```

The following MIDI events are channel messages. The comments represent the one or two data-bytes of the message.

Note that Channel Mode Messages use the same code as the Control Change, but uses reserved controller numbers ranging from 122 to 127.

The EVENT_ANY (0x00) value may prove to be useful in allowing any event to be dealt with. Not sure yet, but the cost is minimal.

9.2.5.4 EVENT_NOTE_OFF

```
const midibyte seq64::EVENT_NOTE_OFF
```

9.2.5.5 EVENT_NOTE_ON

```
const midibyte seq64::EVENT_NOTE_ON
```

9.2.5.6 EVENT_AFTERTOUCH

```
const midibyte seq64::EVENT_AFTERTOUCH
```

9.2.5.7 EVENT_CONTROL_CHANGE

```
const midibyte seq64::EVENT_CONTROL_CHANGE
```

9.2.5.8 EVENT_PROGRAM_CHANGE

```
const midibyte seq64::EVENT_PROGRAM_CHANGE
```

9.2.5.9 EVENT_CHANNEL_PRESSURE

```
const midibyte seq64::EVENT_CHANNEL_PRESSURE
```

9.2.5.10 EVENT_PITCH_WHEEL

```
const midibyte seq64::EVENT_PITCH_WHEEL
```

9.2.5.11 EVENT_CTRL_VOLUME

```
const midibyte seq64::EVENT_CTRL_VOLUME
```

9.2.5.12 EVENT_CTRL_BALANCE

```
const midibyte seq64::EVENT_CTRL_BALANCE
```

9.2.5.13 EVENT_CTRL_PAN

```
const midibyte seq64::EVENT_CTRL_PAN
```

9.2.5.14 EVENT_CTRL_EXPRESSION

```
const midibyte seq64::EVENT_CTRL_EXPRESSION
```

9.2.5.15 EVENT_MIDI_REALTIME

```
const midibyte seq64::EVENT_MIDI_REALTIME
```

The following MIDI events have no channel. We have included redundant constant variables for the SysEx Start and End bytes just to make it clear that they are part of this sequence of values, though usually treated separately.

Only the following constants are followed by some data bytes:

```
-   EVENT_MIDI_SYSEX            = 0xF0
-   EVENT_MIDI_QUARTER_FRAME    = 0xF1      // undefined?
-   EVENT_MIDI_SONG_POS         = 0xF2
-   EVENT_MIDI_SONG_SELECT      = 0xF3
```

A MIDI System Exclusive (SYSEX) message starts with F0, followed by the manufacturer ID (how many? bytes), a number of data bytes, and ended by an F7.

MIDI System Real-Time Messages:

```
 -   https://en.wikipedia.org/wiki/MIDI_beat_clock
 -   http://www.midi.org/techspecs/midimessages.php
```

9.2.5.16 EVENT_MIDI_SYSEX

```
const midibyte seq64::EVENT_MIDI_SYSEX
```

9.2.5.17 EVENT_MIDI_QUARTER_FRAME

```
const midibyte seq64::EVENT_MIDI_QUARTER_FRAME
```

9.2.5.18 EVENT_MIDI_SONG_POS

```
const midibyte seq64::EVENT_MIDI_SONG_POS
```

9.2.5.19 EVENT_MIDI_SONG_SELECT

```
const midibyte seq64::EVENT_MIDI_SONG_SELECT
```

9.2.5.20 EVENT_MIDI_SONG_F4

```
const midibyte seq64::EVENT_MIDI_SONG_F4
```

9.2.5.21 EVENT_MIDI_SONG_F5

```
const midibyte seq64::EVENT_MIDI_SONG_F5
```

9.2.5.22 EVENT_MIDI_TUNE_SELECT

```
const midibyte seq64::EVENT_MIDI_TUNE_SELECT
```

9.2.5.23 EVENT_MIDI_SYSEX_END

```
const midibyte seq64::EVENT_MIDI_SYSEX_END
```

9.2.5.24 EVENT_MIDI_SYSEX_CONTINUE

```
const midibyte seq64::EVENT_MIDI_SYSEX_CONTINUE
```

9.2.5.25 EVENT_MIDI_CLOCK

```
const midibyte seq64::EVENT_MIDI_CLOCK
```

9.2.5.26 EVENT_MIDI_SONG_F9

```
const midibyte seq64::EVENT_MIDI_SONG_F9
```

9.2.5.27 EVENT_MIDI_START

```
const midibyte seq64::EVENT_MIDI_START
```

9.2.5.28 EVENT_MIDI_CONTINUE

```
const midibyte seq64::EVENT_MIDI_CONTINUE
```

9.2.5.29 EVENT_MIDI_STOP

```
const midibyte seq64::EVENT_MIDI_STOP
```

9.2.5.30 EVENT_MIDI_SONG_FD

```
const midibyte seq64::EVENT_MIDI_SONG_FD
```

9.2.5.31 EVENT_MIDI_ACTIVE_SENSE

```
const midibyte seq64::EVENT_MIDI_ACTIVE_SENSE
```

9.2.5.32 EVENT_MIDI_RESET

```
const midibyte seq64::EVENT_MIDI_RESET
```

9.2.5.33 EVENT_MIDI_META

```
const midibyte seq64::EVENT_MIDI_META
```

Note that it has the same code (0xFF) as the Reset message, but the Meta message is read from a MIDI file, while the Reset message is sent to the sequencer by other MIDI participants.

9.2.5.34 EVENT_META_SEQ_NUMBER

```
const midibyte seq64::EVENT_META_SEQ_NUMBER
```

- Set Tempo (0x51)
- Time Signature (0x58)

9.2.5.35 EVENT_META_TEXT_EVENT

```
const midibyte seq64::EVENT_META_TEXT_EVENT
```

9.2.5.36 EVENT_META_COPYRIGHT

```
const midibyte seq64::EVENT_META_COPYRIGHT
```

9.2.5.37 EVENT_META_TRACK_NAME

```
const midibyte seq64::EVENT_META_TRACK_NAME
```

9.2.5.38 EVENT_META_INSTRUMENT

```
const midibyte seq64::EVENT_META_INSTRUMENT
```

9.2.5.39 EVENT_META_LYRIC

```
const midibyte seq64::EVENT_META_LYRIC
```

9.2.5.40 EVENT_META_MARKER

```
const midibyte seq64::EVENT_META_MARKER
```

9.2.5.41 EVENT_META_CUE_POINT

```
const midibyte seq64::EVENT_META_CUE_POINT
```

9.2.5.42 EVENT_META_MIDI_CHANNEL

```
const midibyte seq64::EVENT_META_MIDI_CHANNEL
```

9.2.5.43 EVENT_META_MIDI_PORT

```
const midibyte seq64::EVENT_META_MIDI_PORT
```

9.2.5.44 EVENT_META_END_OF_TRACK

```
const midibyte seq64::EVENT_META_END_OF_TRACK
```

9.2.5.45 EVENT_META_SET_TEMPO

```
const midibyte seq64::EVENT_META_SET_TEMPO
```

9.2.5.46 EVENT_META_SMPTE_OFFSET

```
const midibyte seq64::EVENT_META_SMPTE_OFFSET
```

9.2.5.47 EVENT_META_TIME_SIGNATURE

```
const midibyte seq64::EVENT_META_TIME_SIGNATURE
```

9.2.5.48 EVENT_META_KEY_SIGNATURE

```
const midibyte seq64::EVENT_META_KEY_SIGNATURE
```

9.2.5.49 EVENT_META_SEQSPEC

```
const midibyte seq64::EVENT_META_SEQSPEC
```

9.2.5.50 EVENT_META_ILLEGAL

```
const midibyte seq64::EVENT_META_ILLEGAL
```

9.2.5.51 EVENT_NULL_CHANNEL

```
const midibyte seq64::EVENT_NULL_CHANNEL
```

However, it also means that the channel, if applicable to the event, is encoded in the m_status byte itself. This is our work around to be able to hold a multi-channel SMF 0 track in a sequence. In a Sequencer64 SMF 0 track, every event has a channel. In a Sequencer64 SMF 1 track, the events do not have a channel. Instead, the channel is a global value of the sequence, and is stuffed into each event when the event is played or is written to a MIDI file.

9.2.5.52 EVENT_GET_CHAN_MASK

```
const midibyte seq64::EVENT_GET_CHAN_MASK
```

9.2.5.53 EVENT_CLEAR_CHAN_MASK

```
const midibyte seq64::EVENT_CLEAR_CHAN_MASK
```

9.2.5.54 EVENTS_ALL

```
const int seq64::EVENTS_ALL
```

We reversed the parts of each token for consistency with the macros defined above.

9.2.5.55 EVENTS_UNSELECTED

```
const int seq64::EVENTS_UNSELECTED
```

9.2.5.56 c_midibus_output_size

```
const int seq64::c_midibus_output_size
```

These constants were also defined in midibus_portmidi.h, but we made them common to both implementations here.

The c_midibus_output_size value is passed, in mastermidibus, to snd_seq_set_output_buffer_size(). Not sure if the value needs to be so large.

9.2.5.57 c_midibus_input_size

```
const int seq64::c_midibus_input_size
```

Not sure if the value needs to be so large.

9.2.5.58 c_midibus_sysex_chunk

```
const int seq64::c_midibus_sysex_chunk
```

9.2.5.59 c_midibus

```
const midilong seq64::c_midibus
```

Some of the information is stored with each track (and in the midi_container-derived classes), and some is stored in the proprietary header.

Track (sequencer-specific) data:

```
            c_midibus
            c_midich
            c_timesig
            c_triggers (deprecated)
            c_triggers_new
            c_musickey (can be in footer, as well)
            c_musicscale (ditto)
            c_backsequence (ditto)
            c_transpose
            c_seq_color (performance colors for a sequence)
```

```
Note that c_seq_color in Sequencer64 is stored per sequence, and only if
not PaletteColor::NONE.  In Kepler34, all 1024 sequence colors are stored
in a "proprietrary", whole-song section, whether used or not.  There are
also numeric differences in many of these "c_feature" constants.
```

Footer ("proprietary", whole-song) data:

```
            c_midictrl
            c_midiclocks
            c_notes
            c_bpmtag (beats per minute)
            c_mutegroups
            c_perf_bp_mes (perfedit's beats-per-measure setting)
            c_perf_bw     (perfedit's beat-width setting)
            c_tempo_map   (seq32's tempo map)
            c_reserved_1 and c_reserved_2
            c_tempo_track (holds the song's particular tempo track)
            c_seq_edit_mode (a potential future feature from Kepler34).
```

```
Also see the PDF file in the following project for more information about
the "proprietary" data:

    https://github.com/ahlstromcj/sequencer64-doc.git

Note that the track data is read from the MIDI file, but not written
directly to the MIDI file.  Instead, it is stored in the MIDI container as
sequences are edited to used these "sequencer-specific" features.
Also note that c_triggers has been replaced by c_triggers_new as the code
that marks the triggers stored with a sequence.

As an extension, we can also grab the key, scale, and background sequence
value selected in a sequence and write these values as track data, where
they can be read in and applied to a specific sequence, when the seqedit
object is created.  These values would not be stored in the legacy format.

Something like this could be done in the "user" configuration file, but
then the key and scale would apply to all songs.  We don't want that.

We could also add snap and note-length to the per-song defaults, but
the "user" configuration file seems like a better place to store these
preferences.
```

Note

- The value c_transpose value is from Stazed's seq32 project. The code to support this option is turned on via the build-configurable SEQ64_STAZED_TRANSPOSE macro, but here we reserved the value even if that option is not enabled by the user. There are additional values from Stazed/seq32, not yet used.
- The values below are compatible with Seq32, but they are not compatible with Kepler34. It uses 0x24240011 and 0x24240012 for difference purposes. See the asterisks below.
- Note the new "gap" values. We just noticed this gap, which has existed between 0x24240009 and 0x24240010 since Seq24!Track buss number.

9.2.5.60 c_midich

```
const midilong seq64::c_midich
```

9.2.5.61 c_midiclocks

```
const midilong seq64::c_midiclocks
```

9.2.5.62 c_triggers

```
const midilong seq64::c_triggers
```

9.2.5.63 c_notes

```
const midilong seq64::c_notes
```

9.2.5.64 c_timesig

```
const midilong seq64::c_timesig
```

9.2.5.65 c_bpmtag

```
const midilong seq64::c_bpmtag
```

9.2.5.66 c_triggers_new

```
const midilong seq64::c_triggers_new
```

9.2.5.67 c_mutegroups

```
const midilong seq64::c_mutegroups
```

9.2.5.68 c_gap_A

```
const midilong seq64::c_gap_A
```

A.

9.2.5.69 c_gap_B

```
const midilong seq64::c_gap_B
```

B.

9.2.5.70 c_gap_C

```
const midilong seq64::c_gap_C
```

C.

9.2.5.71 c_gap_D

```
const midilong seq64::c_gap_D
```

D.

9.2.5.72 c_gap_E

```
const midilong seq64::c_gap_E
```

E.

9.2.5.73 c_gap_F

```
const midilong seq64::c_gap_F
```

F.

9.2.5.74 c_midictrl

```
const midilong seq64::c_midictrl
```

9.2.5.75 c_musickey

```
const midilong seq64::c_musickey
```

-

9.2.5.76 c_musicscale

```
const midilong seq64::c_musicscale
```

-

9.2.5.77 c_backsequence

```
const midilong seq64::c_backsequence
```

9.2.5.78 c_transpose

```
const midilong seq64::c_transpose
```

9.2.5.79 c_perf_bp_mes

```
const midilong seq64::c_perf_bp_mes
```

9.2.5.80 c_perf_bw

```
const midilong seq64::c_perf_bw
```

9.2.5.81 c_tempo_map

```
const midilong seq64::c_tempo_map
```

9.2.5.82 c_reserved_1

```
const midilong seq64::c_reserved_1
```

9.2.5.83 c_reserved_2

```
const midilong seq64::c_reserved_2
```

9.2.5.84 c_tempo_track

```
const midilong seq64::c_tempo_track
```

9.2.5.85 c_seq_color

```
const midilong seq64::c_seq_color
```

-

9.2.5.86 c_seq_edit_mode

```
const midilong seq64::c_seq_edit_mode
```

-

9.2.5.87 c_midi_track_ctrl

```
const int seq64::c_midi_track_ctrl
```

The lowest value is c_seqs_in_set ∗ 2 = 64.

I think the reason for that value is to perhaps handle two sets or something like that. Will figure it out later.

The controls are read in from the "rc" configuration files, and are written to the c_midictrl section of the "proprietary" final track in a Seq24/Sequencer64 MIDI file.

Note that we are adding some more MIDI control entries to support the following additional functions:

```
-   Start
-   Pause
-   Stop
-   (any more???)
```

To help with backward compatibility, the old c_midi_controls limit is supplemented with a new, higher limit, c_midi←_controls_extended. We also add a number of placeholders so we don't have to adjust the new limit again later. To aid the transition, g_midi_control_limit replaces c_midi_controls, though, for now, it has the same value.

9.2.5.88 c_midi_control_bpm_up

```
const int seq64::c_midi_control_bpm_up
```

9.2.5.89 c_midi_control_bpm_dn

```
const int seq64::c_midi_control_bpm_dn
```

9.2.5.90 c_midi_control_ss_up

```
const int seq64::c_midi_control_ss_up
```

9.2.5.91 c_midi_control_ss_dn

```
const int seq64::c_midi_control_ss_dn
```

9.2.5.92 c_midi_control_mod_replace

```
const int seq64::c_midi_control_mod_replace
```

9.2.5.93 c_midi_control_mod_snapshot

```
const int seq64::c_midi_control_mod_snapshot
```

9.2.5.94 c_midi_control_mod_queue

```
const int seq64::c_midi_control_mod_queue
```

9.2.5.95 c_midi_control_mod_gmute

```
const int seq64::c_midi_control_mod_gmute
```

9.2.5.96 c_midi_control_mod_glearn

```
const int seq64::c_midi_control_mod_glearn
```

9.2.5.97 c_midi_control_play_ss

```
const int seq64::c_midi_control_play_ss
```

9.2.5.98 c_midi_controls

```
const int seq64::c_midi_controls
```

9.2.5.99 c_midi_control_playback

```
const int seq64::c_midi_control_playback
```

9.2.5.100 c_midi_control_song_record

```
const int seq64::c_midi_control_song_record
```

9.2.5.101 c_midi_control_solo

```
const int seq64::c_midi_control_solo
```

9.2.5.102 c_midi_control_thru

```
const int seq64::c_midi_control_thru
```

9.2.5.103 c_midi_control_bpm_page_up

```
const int seq64::c_midi_control_bpm_page_up
```

9.2.5.104 c_midi_control_bpm_page_dn

```
const int seq64::c_midi_control_bpm_page_dn
```

9.2.5.105 c_midi_control_ss_set

```
const int seq64::c_midi_control_ss_set
```

9.2.5.106 c_midi_control_record

```
const int seq64::c_midi_control_record
```

9.2.5.107 c_midi_control_quan_record

```
const int seq64::c_midi_control_quan_record
```

9.2.5.108 c_midi_control_reset_seq

```
const int seq64::c_midi_control_reset_seq
```

9.2.5.109 c_midi_controls_extended

```
const int seq64::c_midi_controls_extended
```

9.2.5.110 g_midi_control_limit

```
int seq64::g_midi_control_limit
```

9.2.5.111 c_status_replace

```
const int seq64::c_status_replace
```

However, we now have to expose them for the Qt5 implementation, until we can entirely reconcile/refactor the Kepler34-based body of code. Note how they specify different bit values, as it they could be masked together to signal multiple functions.

This value signals the "replace" functionality. If this bit is set, then perform::sequence_playing_toggle() unsets this status and calls perform::off_sequences(), which calls sequence::set_playing(false) for all active sequences.

It works like this:

```
-#  The user presses the Replace key, or the MIDI control message for
    c_midi_control_mod_replace is received.
-#  This bit is OR'd into perform::m_control_status.  This status bit
    is used in perform::sequence_playing_toggle().
    -   Called in perform::sequence_key() so that keystrokes in
        the main window toggle patterns in the main window.
    -   Called in peform::toggle_other_seqs() to implement
        Shift-click to toggle all other patterns but the one
        clicked.
    -   Called in seqmenu::toggle_current_sequence(), called in
        mainwid to implement clicking on a pattern.
    -   Also used in MIDI control to toggle patterns 0 to 31,
        offset by the screen-set.
    -   perform::sequence_playing_off(), similarly used in MIDI control.
    -   perform::sequence_playing_on(), similarly used in MIDI control.
-#  When the key is released, this bit is AND'd out of
    perform::m_control_status.

Both the MIDI control and the keystroke set the sequence to be
"replaced".
```

9.2.5.112 c_status_snapshot

```
const int seq64::c_status_snapshot
```

By default, perform::sequence_playing_toggle() calls sequence::toggle_playing() on the given sequence number, plus what is noted for c_status_snapshot. It works like this:

```
-#  The user presses the Snapshot key.
-#  This bit is OR'd into perform::m_control_status.
-#  The playing state of the patterns is saved by
    perform::save_playing_state().
-#  When the key is released, this bit is AND'd out of
    perform::m_control_status.
-#  The playing state of the patterns is restored by
    perform::restore_playing_state().
```

9.2.5.113 c_status_queue

```
const int seq64::c_status_queue
```

If this bit is set, then perform::sequence_playing_toggle() calls sequence::toggle_queued() on the given sequence number. The regular queue key (configurable in File / Options / Keyboard) sets this bit when pressed, and unsets it when released. The keep-queue key sets it, but it is not unset until the regular queue key is pressed and released.

9.2.5.114 c_status_oneshot

```
const int seq64::c_status_oneshot
```

If this bit is set, then perform::sequence_playing_toggle() calls sequence::toggle_oneshot() on the given sequence number.

9.2.5.115 c_scales_policy

```
const bool seq64::c_scales_policy[c_scale_size][SEQ64_OCTAVE_SIZE]
```

See the following sites for more information:

```
 -   http://method-behind-the-music.com/theory/scalesandkeys/
 -   https://en.wikipedia.org/wiki/Heptatonic_scale
 -   https://en.wikibooks.org/wiki/Music_Theory/Scales_and_Intervals
```

Note that melodic minor descends in the same way as the natural minor scale, so it descends differently than it ascends. We don't deal with that trick, at all. In the following table, the scales all start with C, but seq24/sequencer64 allow other starting notes (e.g. "keys").

Chromatic	C	C#	D	D#	E	F	F#	G	G#	A	A#	B	Notes, chord
Major	C	.	D	.	E	F	.	G	.	A	.	B	
Minor	C	.	D	Eb	.	F	.	G	Ab	.	Bb	.	
Harmonic Minor	C	.	D	Eb	.	F	.	G	Ab	.	.	B	
Melodic Minor	C	.	D	Eb	.	F	.	G	.	A	.	B	Descending diff.
C Whole Tone	C	.	D	.	E	.	F#	.	G#	.	A#	.	C+7 chord
Blues	C	.	.	Eb	.	F	Gb	G	.	.	Bb	.	
Major Pentatonic	C	.	D	.	E	.	.	G	.	A	.	.	
Minor Pentatonic	C	.	.	Eb	.	F	.	G	.	.	Bb	.	
Octatonic 1	C	.	D	Eb	.	F	Gb	.	Ab	A	.	B	Unimplemented
Octatonic 2	C	Db	.	Eb	E	F	F#	G	.	A	Bb	.	Unimplemented

9.2.5.116 c_scales_transpose_up

```
const int seq64::c_scales_transpose_up[c_scale_size][SEQ64_OCTAVE_SIZE]
```

For example, if we simply add 1 semitone to each note, it remains a minor key, but it is in a different minor key. Using the transpositions in these arrays, the minor key remains the same minor key.

```
    Major               C  .  D  .  E  F  .  G  .  A  .  B
    Transpose up        2  0  2  0  1  2  0  2  0  2  0  1
    Result up           D  .  E  .  F  G  .  A  .  B  .  C


    Minor               C  .  D  D# .  F  .  G  G# .  A# .
    Transpose up        2  0  1  2  0  2  0  1  2  0  2  0
    Result up           D  .  D# F  .  G  .  G# A# .  C  .


    Harmonic minor      C  .  D  Eb .  F  .  G  Ab .  .  B
    Transpose up        2  .  1  2  .  2  .  1  3  .  .  1
    Result up           D  .  Eb F  .  G  .  Ab B  .  .  C


    Melodic minor       C  .  D  Eb .  F  .  G  .  A  .  B
    Transpose up        2  .  1  2  .  2  .  2  .  2  .  1
    Result up           D  .  Eb F  .  G  .  A  .  B  .  C


    C Whole Tone        C  .  D  .  E  .  F# .  G# .  A# .
    Transpose up        2  .  2  .  2  .  2  .  2  .  2  .
    Result up           D  .  E  .  F# .  G# .  A# .  C  .


    Blues               C  .  .  Eb .  F  Gb G  .  .  Bb .
    Transpose up        3  .  .  2  .  1  1  3  .  .  2  .
    Result up           Eb .  .  F  .  Gb G  Bb .  .  C  .


    Major Pentatonic    C  .  D  .  E  .  .  G  .  A  .  .
    Transpose up        2  .  2  .  3  .  .  2  .  3  .  .
    Result up           D  .  E  .  G  .  .  A  .  C  .  .


    Minor Pentatonic    C  .  .  Eb .  F  .  G  .  .  Bb .
    Transpose up        3  .  .  2  .  2  .  3  .  .  2  .
    Result up           Eb .  .  F  .  G  .  Bb .  .  C  .
```

9.2.5.117 c_scales_transpose_dn

```
const int seq64::c_scales_transpose_dn[c_scale_size][SEQ64_OCTAVE_SIZE]
```

```
    Major               C  .  D  .  E  F  .  G  .  A  .  B
    Transpose down      1  .  2  .  2  1  .  2  .  2  .  2
    Result down         B  .  C  .  D  E  .  F  .  G  .  A


    Minor               C  .  D  D# .  F  .  G  G# .  A# .
    Transpose down      2  .  2  1  .  2  .  2  1  .  2  .
    Result down         A# .  C  D  .  D# .  F  G  .  G# .
    Harmonic minor      C  .  D  Eb .  F  .  G  Ab .  .  B
    Transpose down      1  .  2  1  .  2  .  2  1  .  .  3
    Result down         B  .  C  D  .  Eb .  F  G  .  .  Ab


    Melodic minor       C  .  D  Eb .  F  .  G  .  A  .  B
    Transpose down      1  .  2  1  .  2  .  2  .  2  .  2
    Result down         B  .  C  D  .  Eb .  F  .  G  .  A


    C whole tone        C  .  D  .  E  .  F# .  G# .  A# .
    Transpose down      2  .  2  .  2  .  2  .  2  .  2  .
    Result down         A# .  C  .  D  .  E  .  F# .  G# .


    Blues               C  .  .  Eb .  F  Gb G  .  .  Bb .
    Transpose down      2  .  .  3  .  2  1  1  .  .  3  .
    Result down         Bb .  .  C  .  Eb F  Gb .  .  G  .


    Major Pentatonic    C  .  D  .  E  .  .  G  .  A  .  .
    Transpose down      3  .  2  .  2  .  .  3  .  2  .  .
    Result down         A  .  C  .  D  .  .  E  .  G  .  .


    Minor Pentatonic    C  .  .  Eb .  F  .  G  .  .  Bb .
    Transpose down      2  .  .  3  .  2  .  2  .  .  3  .
    Result down         Bb .  .  C  .  Eb .  F  .  .  G  .
```

9.2.5.118 c_scales_text

```
const char seq64::c_scales_text[c_scale_size][20]
```

9.2.5.119 c_key_text

```
const char seq64::c_key_text[SEQ64_OCTAVE_SIZE][4]
```

9.2.5.120 c_interval_text

```
const char seq64::c_interval_text[16][4]
```

9.2.5.121 c_chord_text

```
const char seq64::c_chord_text[8][6]
```

However, we have not seen this menu in the GUI! Ah, it only appears if the user has selected a musical scale like Major or Minor.

9.2.5.122 c_chord_number

```
const int seq64::c_chord_number
```

The chord-number is a count of the number of entries in c_chord_table_text. Will never change, luckily.

9.2.5.123 c_chord_table_text

```
const char seq64::c_chord_table_text[c_chord_number][12]
```

These chords appear in the sequence-editor chord-button dropdown menu. The longest string is 11 characters, and we add one for the null terminator. A good case for using std::string here. :-)

9.2.5.124 c_chord_size

```
const int seq64::c_chord_size
```

9.2.5.125 c_chord_table

```
const int seq64::c_chord_table[c_chord_number][c_chord_size]
```

These values indicate the note offsets needed for a particular kind of chord. 0 means no offset, and a -1 ends the list of note offsets for the chord.

9.2.5.126 c_max_instruments

```
const int seq64::c_max_instruments
```

With a value of 64, this is more of a sanity-check than a realistic number of instruments defined by a user.

9.2.5.127 c_max_busses

```
const int seq64::c_max_busses
```

9.2.5.128 versiontext

```
const std::string seq64::versiontext  [static]
```

This value ultimately comes from the configure.ac script.

This was too redundant:

SEQ64_PACKAGE " " SEQ64_VERSION " (" SEQ64_GIT_VERSION ") " **DATE** "\n"

This is out-of-date:

SEQ64_PACKAGE " " SEQ64_GIT_VERSION " " **DATE** "\n";

9.2.5.129 long_options

```
struct option seq64::long_options[]  [static]
```

Note the terminating null structure..

9.2.5.130 s_arg_list

```
const std::string seq64::s_arg_list  [static]
```

The following string keeps track of the characters used so far. An 'x' means the character is used; an 'o' means it is used for the legacy spelling of the option, which uses underscores instead of hyphens. An 'a' indicates we could repurpose the key with minimal impact. An asterisk indicates the option is reserved for application-specific options. Currently we will use it for options like "daemonize" in the seq64cli application.

```
        0123456789 @AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPpQqRrSsTtUuVvWwXxYyZz#
         ooooooooo oxxxxxx x  xx  xx xxx xxxxxxx *xx xxxxx xxxxx   x    x


Previous arg-list, items missing! "ChVH:lRrb:q:Lni:jJmaAM:pPusSU:x:"

* Also note that 'o' options argument cannot be included here due to
issues involving parse_o_options(), but it is *reserved* here, without the
argument indicator.
```

9.2.5.131 s_help_1a

```
const char* const seq64::s_help_1a  [static]
```

9.2.5.132 s_help_1b

```
const char* const seq64::s_help_1b  [static]
```

9.2.5.133 s_help_2

```
const char* const seq64::s_help_2  [static]
```

9.2.5.134 s_help_3

```
const char* const seq64::s_help_3  [static]
```

9.2.5.135 s_help_4

```
const char* const seq64::s_help_4  [static]
```

9.2.5.136 s_help_5

```
const char* const seq64::s_help_5  [static]
```

9.2.5.137 s_bitness

```
const std::string seq64::s_bitness  [static]
```

9.2.5.138 s_status_pairs

```
jack_status_pair_t seq64::s_status_pairs[]
```

Terminated by a 0 value and an empty string.

9.2.5.139 s_character_mapping

```
struct charpair_t seq64::s_character_mapping[]
```

9.2.5.140 s_global_lash_driver

```
lash* seq64::s_global_lash_driver  [static]
```

It is actually hidden in this module now, so that a function can be used in its place.

Like the font renderer, this item was once created in the main module, sequencer64.cpp. Now we make it a safer, more fool-proof, function. However, unlike the font-render, which always exists, the LASH driver is conditional, and might not be wanted. Therefore, we cannot return a reference, because there's no such thing as a null reference in C++. We have to return a pointer.

9.2.5.141 g_rc_settings

```
rc_settings seq64::g_rc_settings  [static]
```

9.2.5.142 g_user_settings

```
user_settings seq64::g_user_settings [static]
```

9.2.5.143 s_jitter_amount

```
const int seq64::s_jitter_amount [static]
```

9.2.5.144 gs_mainwid_pointer

```
mainwid* seq64::gs_mainwid_pointer [static]
```

We have decided that passing along a mainwnd reference among a number of constructors is too much and actually harder to understand and more error prone. This value is set at the end of the mainwnd constructor, but only the first time that constructor is called.

9.2.5.145 gs_perfedit_pointer_0

```
perfedit* seq64::gs_perfedit_pointer_0 [static]
```

9.2.5.146 gs_perfedit_pointer_1

```
perfedit* seq64::gs_perfedit_pointer_1 [static]
```

9.2.5.147 s_handlesize

```
const long seq64::s_handlesize [static]
```

Chapter 10

Data Structure Documentation

10.1 seq64::automutex Class Reference

Provides a mutex that locks automatically when created, and unlocks when destroyed.

Public Member Functions

- automutex (mutex &my_mutex)

  Principal constructor gets a reference to a mutex parameter, and then locks the mutex.
- ∼automutex ()

  The destructor unlocks the mutex.

Private Member Functions

- automutex ()
- automutex (const automutex &)
- automutex & operator= (const automutex &)

Private Attributes

- mutex & m_safety_mutex

  Provides the mutex reference to be used for locking.

10.1.1 Detailed Description

This has a couple of benefits. First, it is threadsafe in the face of exception handling. Secondly, it can be done with just one line of code.

10.1.2 Constructor & Destructor Documentation

10.1.2.1 automutex() [1/3]

```
seq64::automutex::automutex ( )  [private]
```

10.1.2.2 automutex() [2/3]

```
seq64::automutex::automutex (
            const automutex &  )  [private]
```

10.1.2.3 automutex() [3/3]

```
seq64::automutex::automutex (
            mutex & my_mutex )  [inline]
```

Parameters

my_mutex	The caller's mutex to be used for locking.

10.1.2.4 ∼automutex()

```
seq64::automutex::∼automutex ( )  [inline]
```

10.1.3 Member Function Documentation

10.1.3.1 operator=()

```
automutex& seq64::automutex::operator= (
            const automutex &  )  [private]
```

10.1.4 Field Documentation

10.1.4.1 m_safety_mutex

```
mutex& seq64::automutex::m_safety_mutex  [private]
```

10.2 seq64::busarray Class Reference

Holds a number of businfo objects.

Public Member Functions

- busarray ()

  A new class to hold a number of MIDI busses and flags for more controlled access than using arrays of booleans and pointers.
- ∼busarray ()

  Removes components from the container.
- bool add (midibus ∗bus, clock_e clock)

  Creates and adds a new midibus object to the list.
- bool add (midibus ∗bus, bool inputing)

  Creates and adds a new midibus object to the list.
- bool initialize ()

  Initializes all busses.
- int count () const
- midibus ∗ bus (bussbyte b)
- void start ()

  Starts all of the busses; used for output busses only, but no check is made at present.
- void stop ()

  Stops all of the busses; used for output busses only, but no check is made at present.
- void continue_from (midipulse tick)

  Continues from the given tick for all of the busses; used for output busses only.
- void init_clock (midipulse tick)

  Initializes the clocking at the given tick for all of the busses; used for output busses only.
- void clock (midipulse tick)

  Clocks at the given tick for all of the busses; used for output busses only.
- void sysex (event ∗ev)

  Handles SysEx events; used for output busses.
- void play (bussbyte bus, event ∗e24, midibyte channel)

  Plays an event, if the bus is proper.
- bool set_clock (bussbyte bus, clock_e clocktype)

  Sets the clock type for the given bus, usually the output buss.
- void set_all_clocks ()

  Sets the clock type for all busses, usually the output buss.
- clock_e get_clock (bussbyte bus)

  Gets the clock type for the given bus, usually the output buss.
- std::string get_midi_bus_name (int bus)

  Get the MIDI output buss name (i.e.
- void print () const

  Print some information about the available MIDI input or output busses.
- void port_exit (int client, int port)

  Turn off the given port for the given client.
- bool set_input (bussbyte bus, bool inputing)

  Set the status of the given input buss, if a legal buss number.
- void set_all_inputs ()

  Set the status of all input busses.
- bool get_input (bussbyte bus)

Get the input for the given (legal) buss number.
- bool is_system_port (bussbyte bus)

  Get the system-port status for the given (legal) buss number.
- int poll_for_midi ()

  Initiate a poll() on the existing poll descriptors.
- bool get_midi_event (event ∗inev)

  Gets the first MIDI event in finds on an input bus.
- int replacement_port (int bus, int port)

  Provides a function to use in api_port_start(), to determine if the port is to be a "replacement" port.

Private Attributes

- std::vector< businfo > m_container

  The full set of businfo objects, only some of which will actually be used.

10.2.1 Constructor & Destructor Documentation

10.2.1.1 busarray()

```
seq64::busarray::busarray ( )
```

10.2.1.2 ∼busarray()

```
seq64::busarray::∼busarray ( )
```

Question However, now that we swap containers, we cannot call this functionality, because it deletes the bus's midibus pointer and nullifies it. But we do call it, and it seems to work.

10.2.2 Member Function Documentation

10.2.2.1 add() [1/2]

```
bool seq64::busarray::add (
            midibus ∗ bus,
            clock_e clock )
```

Then the clock value is set. This function is meant for output ports.

We need to belay the initialization until later, when we know the configured clock settings for the output ports. So initialization has been removed from the constructor and moved to the initialize() function.

Parameters

bus	The midibus to be hooked into the array of busses.
clock	The clocking value for the bus.

Returns

Returns true if the bus was added successfully, though, really, it cannot fail.

10.2.2.2 add() [2/2]

```
bool seq64::busarray::add (
            midibus * bus,
            bool inputing )
```

Then the inputing value is set. This function is meant for input ports.

We need to belay the initialization until later, when we know the configured inputing settings for the input ports. So initialization has been removed from the constructor and moved to the initialize() function. However, now we know the configured status and can apply it right away.

Parameters

bus	The midibus to be hooked into the array of busses.
inputing	The input flag value for the bus. If true, this value indicates that the user has selected this bus to be the input MIDI bus.

Returns

Returns true if the bus was added successfully, though, really, it cannot fail.

10.2.2.3 initialize()

```
bool seq64::busarray::initialize ( )
```

Not sure we need this function.

Returns

Returns true if all busses initialized successfully.

10.2.2.4 count()

```
int seq64::busarray::count ( ) const  [inline]
```

10.2.2.5 bus()

```
midibus* seq64::busarray::bus (
             bussbyte b )  [inline]
```

10.2.2.6 start()

```
void seq64::busarray::start ( )
```

10.2.2.7 stop()

```
void seq64::busarray::stop ( )
```

10.2.2.8 continue_from()

```
void seq64::busarray::continue_from (
             midipulse tick )
```

Parameters

tick	Provides the tick value for all busses to continue from.

10.2.2.9 init_clock()

```
void seq64::busarray::init_clock (
             midipulse tick )
```

Parameters

tick	Provides the tick value for all busses use as the clock tick.

10.2.2.10 clock()

```
void seq64::busarray::clock (
            midipulse tick )
```

Parameters

tick	Provides the tick value for all busses use as the clock tick.

10.2.2.11 sysex()

```
void seq64::busarray::sysex (
            event * ev )
```

Parameters

ev	Provides the SysEx event to handle.

10.2.2.12 play()

```
void seq64::busarray::play (
            bussbyte bus,
            event * e24,
            midibyte channel )
```

Parameters

bus	The MIDI buss on which to play the event. The buss number must be valid (in range) and the bus must be active.
e24	A pointer to the event to be played.
channel	The MIDI channel on which to play the event. Sequencer64 controls the actual channel of playback, no matter what the channel specified in the event.

10.2.2.13 set_clock()

```
bool seq64::busarray::set_clock (
            bussbyte bus,
            clock_e clocktype )
```

This code is a bit more restrictive than the original code in mastermidibus::set_clock().

Parameters

bus	The MIDI bus for which the clock is to be set.
clocktype	Provides the type of clocking for the buss.

Returns

Returns true if the change was made.

10.2.2.14 set_all_clocks()

```
void seq64::busarray::set_all_clocks ( )
```

Note that the settings to apply are added when the add() call is made.

10.2.2.15 get_clock()

```
clock_e seq64::busarray::get_clock (
             bussbyte bus )
```

Parameters

bus	The MIDI bus for which the clock is to be set.

Returns

Returns the clock value set for the desired buss. If the buss is invalid, e_clock_off is returned. If the buss is not active, we still get the existing clock value. The theory here is that we don't want to junk the current clock value; it could alter what was read from the "rc" file.

10.2.2.16 get_midi_bus_name()

```
std::string seq64::busarray::get_midi_bus_name (
             int bus )
```

the full display name) for the given (legal) buss number.

This function adds the retrieval of client and port numbers that are not needed in the portmidi implementation, but seem generally useful to support in all implementations. It's main use is to display the full portname in one of two forms:

```
-   "[0] 0:0 clientname:portname"
-   "[0] 0:0 portname"
```

The second version is chosen if "clientname" is already included in the port name, as many MIDI clients do that. However, the name gets modified to reflect the remote system port to which it will connect.

Parameters

bus	Provides the output buss number. Checked before usage. Actually should now be an index number

Returns

Returns the buss name as a standard C++ string, truncated to 80-1 characters. Also contains an indication that the buss is disconnected or unconnected. If the buss number is illegal, this string is empty.

10.2.2.17 print()

```
void seq64::busarray::print ( ) const
```

10.2.2.18 port_exit()

```
void seq64::busarray::port_exit (
            int client,
            int port )
```

Both the busses for the given client are stopped: that is, set to inactive.

This function is called by api_get_midi_event() when the ALSA event SND_SEQ_EVENT_PORT_EXIT is received. Since port_exit() has no direct API-specific code in it, we do not need to create a virtual api_port_exit() function to implement the port-exit event.

Parameters

client	The client to be matched and acted on. This value is actually an ALSA concept.
port	The port to be acted on. Both parameter must be matched before the buss is made inactive. This value is actually an ALSA concept.

10.2.2.19 set_input()

```
bool seq64::busarray::set_input (
            bussbyte bus,
            bool inputing )
```

There's currently no implementation-specific API function called directly here. What happens is that midibase::set↩_input() uses the *inputing* parameter to decide whether to call init_in() or deinit_in(), and these functions ultimately lead to an API specific called.

Note that the call to midibase::set_input() will set its m_inputing flag, and then call init_in() or deinit_in() if that flag changed. This change is important, so we have to call midibase::set_input() first. Then the call to businfo::init_input() will set that flag again (plus another flag). A bit confusing in sequence and in function naming.

This function should be used only for the input busarray, obviously.

Threadsafe

Parameters

bus	Provides the buss number.
inputing	True if the input bus will be inputting MIDI data.

Returns

Returns true if the buss number is valid and was active, and so could be set.

10.2.2.20 set_all_inputs()

```
void seq64::busarray::set_all_inputs ( )
```

There's no implementation-specific API function here. This function should be used only for the input busarray, obviously. Note that the input settings used here were stored when the add() function was called. They can be changed by the user via the Options / MIDI Input tab.

10.2.2.21 get_input()

```
bool seq64::busarray::get_input (
            bussbyte bus )
```

There's currently no implementation-specific API function here.

Parameters

bus	Provides the buss number.

Returns

If the buss is a system buss, always returns true. Otherwise, if the buss is inactive, returns false. Otherwise, the buss's get_input() status is returned.

10.2.2.22 is_system_port()

```
bool seq64::busarray::is_system_port (
            bussbyte bus )
```

Parameters

bus	Provides the buss number.

Returns

Returns the selected buss's is-system-port status. If the buss number is out of range, then false is returned.

10.2.2.23 poll_for_midi()

```
int seq64::busarray::poll_for_midi ( )
```

This is a primitive poll, which exits when some data is obtained. It also applies only to the input busses.

One issue is that we have no way of knowing here which MIDI input device has MIDI input events waiting. Should we randomize the order of polling in order to avoid starving some input devices?

Returns

Returns the number of MIDI events detected on one of the busses. Note that this is no longer a boolean value.

10.2.2.24 get_midi_event()

```
bool seq64::busarray::get_midi_event (
             event * inev )
```

Note that this function risks starving the second input device if more than one is enabled in Sequencer64. We will figure that one out later.

Parameters

inev	A pointer to the event to be modified by incoming data, if any.

Returns

Returns true if an event's data was copied into the event pointer.

10.2.2.25 replacement_port()

```
int seq64::busarray::replacement_port (
             int bus,
             int port )
```

This function is meant only for the output buss (so far).

Still need to determine exactly what this function needs to do.

Parameters

bus	The buss to be affected.
port	The prot to be affected.

Returns

Returns -1 if no matching port is found, otherwise it returns the replacement-port number.

10.2.3 Field Documentation

10.2.3.1 m_container

```
std::vector<businfo> seq64::busarray::m_container  [private]
```

10.3 seq64::businfo Class Reference

A new class to consolidate a number of bus-related arrays into one array.

Public Member Functions

- businfo ()

  A new class to consolidate a number of bus-related arrays into one array.
- businfo (midibus ∗bus)

  Principal constructor.
- businfo (const businfo &rhs)

  Copy constructor.
- ∼businfo ()

  We can't destroy the bus pointer.
- void remove ()

  Deletes and nullifies the m_bus pointer.
- const midibus ∗ bus () const

  'Getter' function for member m_bus pointer, const version
- midibus ∗ bus ()

  'Getter' function for member m_bus pointer
- bool active () const

  'Getter' function for member m_active
- bool initialize ()

  This function is called when the businfo object is added to the busarray.
- bool initialized () const

  'Getter' function for member m_initialized
- clock_e init_clock () const

  'Getter' function for member m_init_clock
- bool init_input () const

'Getter' function for member m_init_input

- void bus (midibus ∗b)

  'Setter' function for member m_bus
- void activate ()

  'Setter' function for member m_active and m_initialized
- void deactivate ()

  'Setter' function for member m_active and m_initialized
- void init_clock (clock_e clocktype)

  'Setter' function for member m_init_clock and bus clock
- void init_input (bool flag)

  'Setter' function for member m_init_input and bus input

Private Member Functions

- void start ()
- void stop ()
- void continue_from (midipulse tick)
- void init_clock (midipulse tick)
- void clock (midipulse tick)
- void sysex (event ∗ev)
- void print () const

  Print some information about the MIDI bus.

Private Attributes

- midibus ∗ m_bus

  Points to an existing midibus object.
- bool m_active

  Indicates if the existing bus is active.
- bool m_initialized

  Indicates if the existing bus is initialized.
- clock_e m_init_clock

  Clock initialization.
- bool m_init_input

  Input initialization?

Friends

- class busarray

10.3.1 Detailed Description

There will be in input instance and an output instance of this object contained by mastermidibus.

10.3.2 Constructor & Destructor Documentation

10.3.2.1 businfo() [1/3]

```
seq64::businfo::businfo ( )
```

There will be in input instance and an output instance of this object contained by mastermidibus.

10.3.2.2 businfo() [2/3]

```
seq64::businfo::businfo (
            midibus * bus )
```

is_input_port():

```
Indicates if the midibus represents an input port (true) versus an
output port (false).
```

is_virtual_port():

```
Indicates if the midibus represents a virtual port (true) versus a
normal port (false).
```

Parameters

bus	Provides a pointer to the MIDI buss object to be represented by this object.

10.3.2.3 businfo() [3/3]

```
seq64::businfo::businfo (
            const businfo & rhs )
```

Currently it does not replicate the pointed-to object.

Parameters

rhs	The source object to be copied.

10.3.2.4 ∼businfo()

```
seq64::businfo::∼businfo ( ) [inline]
```

10.3.3 Member Function Documentation

10.3.3.1 remove()

```
void seq64::businfo::remove ( )  [inline]
```

10.3.3.2 bus() [1/3]

```
const midibus* seq64::businfo::bus ( ) const  [inline]
```

10.3.3.3 bus() [2/3]

```
midibus* seq64::businfo::bus ( )  [inline]
```

10.3.3.4 active()

```
bool seq64::businfo::active ( ) const  [inline]
```

10.3.3.5 initialize()

```
bool seq64::businfo::initialize ( )
```

It relies on the perform::launch() function to actually activate() all of the ports that have been flagged as "activated" here.

is_input_port():

```
 Indicates if the midibus represents an input port (true) versus an
 output port (false).  The way the mastermidibus currently works, it
 creates the API MIDI input objects there, so it does not need to be
 done here.  This falls under the heading of "tricky code".
```

is_virtual_port():

```
 Indicates if the midibus represents a manual/virtual port (true)
 versus a normal port (false).
```

The rules for port initialization follow those of seq24 for MIDI busses:

```
-   Manual (virtual) input and output ports always get their init
    functions called.  They are unconditionally marked as "active"
    and "initialized".
-   Normal output ports are marked as "active" and "initialized" if
    init_out() succeeds.
-   Normal input ports don't have init_in() called, but are marked
    as "active" and "initialized" anyway.  The settings from the "rc"
    file determine which inputs will operate.
```

Returns

Returns true if the buss is value, and it could be initialized (as an output port or a virtual output port.

10.3.3.6 initialized()

```
bool seq64::businfo::initialized ( ) const  [inline]
```

10.3.3.7 init_clock() [1/3]

```
clock_e seq64::businfo::init_clock ( ) const  [inline]
```

10.3.3.8 init_input() [1/2]

```
bool seq64::businfo::init_input ( ) const  [inline]
```

10.3.3.9 bus() [3/3]

```
void seq64::businfo::bus (
            midibus * b )  [inline]
```

10.3.3.10 activate()

```
void seq64::businfo::activate ( )  [inline]
```

10.3.3.11 deactivate()

```
void seq64::businfo::deactivate ( )  [inline]
```

10.3.3.12 init_clock() [2/3]

```
void seq64::businfo::init_clock (
            clock_e clocktype )  [inline]
```

10.3.3.13 init_input() [2/2]

```
void seq64::businfo::init_input (
            bool flag )  [inline]
```

10.3.3.14 start()

```
void seq64::businfo::start ( )  [inline], [private]
```

10.3.3.15 stop()

```
void seq64::businfo::stop ( )  [inline], [private]
```

10.3.3.16 continue_from()

```
void seq64::businfo::continue_from (
            midipulse tick )  [inline], [private]
```

10.3.3.17 init_clock() [3/3]

```
void seq64::businfo::init_clock (
            midipulse tick )  [inline], [private]
```

10.3.3.18 clock()

```
void seq64::businfo::clock (
            midipulse tick )  [inline], [private]
```

10.3.3.19 sysex()

```
void seq64::businfo::sysex (
            event * ev )  [inline], [private]
```

10.3.3.20 print()

```
void seq64::businfo::print ( ) const  [private]
```

10.3.4 Friends And Related Function Documentation

10.3.4.1 busarray

```
friend class busarray  [friend]
```

10.3.5 Field Documentation

10.3.5.1 m_bus

```
midibus* seq64::businfo::m_bus  [private]
```

10.3.5.2 m_active

```
bool seq64::businfo::m_active  [private]
```

10.3.5.3 m_initialized

```
bool seq64::businfo::m_initialized  [private]
```

10.3.5.4 m_init_clock

```
clock_e seq64::businfo::m_init_clock  [private]
```

10.3.5.5 m_init_input

```
bool seq64::businfo::m_init_input  [private]
```

10.4 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=SE↩ Q64_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.

10.4.1 Detailed Description

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

10.4.2 Constructor & Destructor Documentation

10.4.2.1 click() [1/3]

```
seq64::click::click ( )
```

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

10.4.2.2 click() [2/3]

```
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

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

10.4.2.3 click() [3/3]

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

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

Parameters

rhs	Provies the source object to be copied.

10.4.3 Member Function Documentation

10.4.3.1 operator=()

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

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

Parameters

rhs	Provies the source object to be assigned from. The assignment is not made if "this" has the same address as this parameter.

Returns

Returns a reference to self for usage in a string of assignments.

10.4.3.2 is_press()

```
bool seq64::click::is_press ( ) const  [inline]
```

10.4.3.3 is_left()

```
bool seq64::click::is_left ( ) const  [inline]
```

10.4.3.4 is_middle()

```
bool seq64::click::is_middle ( ) const  [inline]
```

10.4.3.5 is_right()

```
bool seq64::click::is_right ( ) const  [inline]
```

10.4.3.6 x()

```
int seq64::click::x ( ) const  [inline]
```

10.4.3.7 y()

```
int seq64::click::y ( ) const  [inline]
```

10.4.3.8 button()

```
int seq64::click::button ( ) const  [inline]
```

10.4.3.9 modifier()

```
seq_modifier_t seq64::click::modifier ( ) const  [inline]
```

10.4.3.10 mod_control()

```
bool seq64::click::mod_control ( ) const  [inline]
```

10.4.3.11 mod_control_shift()

```
bool seq64::click::mod_control_shift ( ) const  [inline]
```

10.4.3.12 mod_super()

```
bool seq64::click::mod_super ( ) const  [inline]
```

10.4.4 Field Documentation

10.4.4.1 m_is_press

```
bool seq64::click::m_is_press  [private]
```

10.4.4.2 m_x

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

0 is the left-most coordinate.

10.4.4.3 m_y

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

0 is the top-most coordinate.

10.4.4.4 m_button

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

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

10.4.4.5 m_modifier

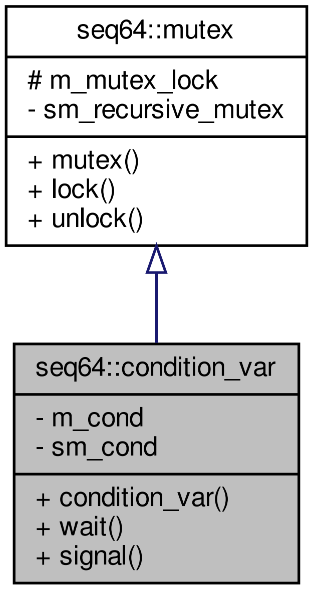
```
seq_modifier_t seq64::click::m_modifier  [private]
```

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

10.5 seq64::condition_var Class Reference

A mutex works best in conjunction with a condition variable.

Inheritance diagram for seq64::condition_var:



Public Member Functions

- condition_var ()

  Initialize the condition variable with the global variable.
- void wait ()

  Waits for the condition variable.
- void signal ()

  Signals the condition variable.

Private Attributes

- pthread_cond_t m_cond

  Provides a class-specific condition variable.

Static Private Attributes

- static const pthread_cond_t sm_cond

  Provides a "global" condition variable.

Additional Inherited Members

10.5.1 Detailed Description

Therefore this class derives from the mutex class. A "has-a" relationship might be more logical than this "is-a" relationship.

10.5.2 Constructor & Destructor Documentation

10.5.2.1 condition_var()

```
seq64::condition_var::condition_var ( )
```

10.5.3 Member Function Documentation

10.5.3.1 wait()

```
void seq64::condition_var::wait ( )
```

10.5.3.2 signal()

```
void seq64::condition_var::signal ( )
```

10.5.4 Field Documentation

10.5.4.1 sm_cond

```
const pthread_cond_t seq64::condition_var::sm_cond  [static], [private]
```

Define the static condition variable used by all mutex locks.

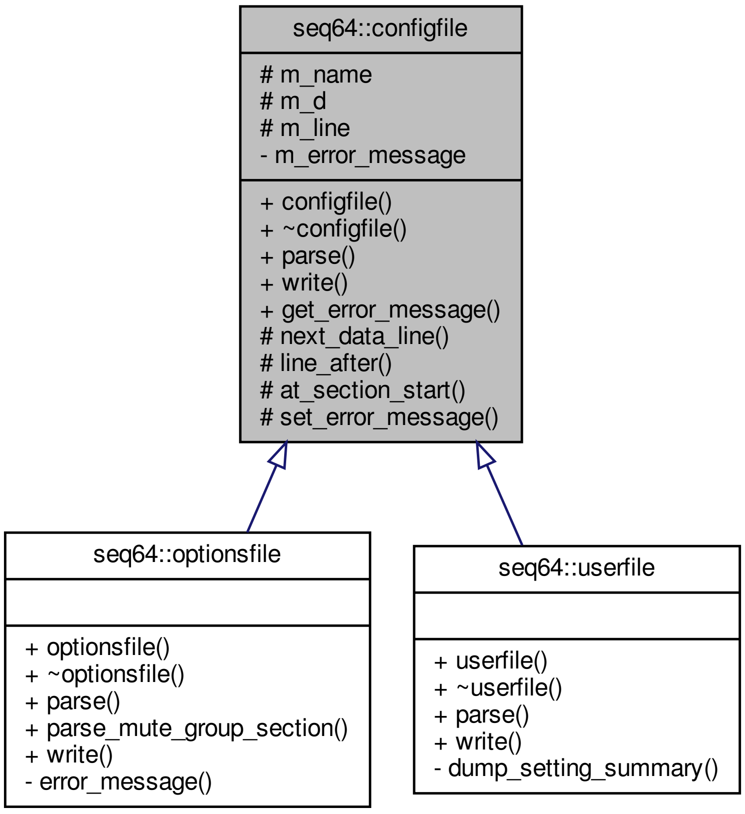
10.5.4.2 m_cond

```
pthread_cond_t seq64::condition_var::m_cond  [private]
```

10.6 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 &name)

  Provides the string constructor for a configuration file.
- virtual ∼configfile ()

  A rote destructor needed for a base class.
- virtual bool parse (perform &perf)=0
- virtual bool write (const perform &perf)=0
- const std::string & get_error_message () const

Protected Member Functions

- bool next_data_line (std::ifstream &file)

  Gets the next line of data from an input stream.

- bool line_after (std::ifstream &file, const std::string &tag)

  This function gets a specific line of text, specified as a tag.
- bool at_section_start () const

  Sometimes we need to know if there are new data lines at the end of an existing section.
- void set_error_message (const std::string &msg)

Protected Attributes

- std::string m_name

  Provides the name of the configuration file.
- 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.

Private Attributes

- std::string m_error_message

  Holds the last error message, if any.

10.6.1 Constructor & Destructor Documentation

10.6.1.1 configfile()

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

Parameters

name	The name of the configuration file.

10.6.1.2 ∼configfile()

```
virtual seq64::configfile::∼configfile ( )  [inline], [virtual]
```

10.6.2 Member Function Documentation

10.6.2.1 next_data_line()

```
bool 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.

Member m_line is a "global" return value.

Parameters

file	Points to an input stream. We converted this item to a reference; pointers can be subject to problems. For example, what if someone passes a null pointer?

Returns

Returns true if a presumed data line was found. False is returned if not found before an EOF or a section marker ("[") is found. This is a a new (ca 2016-02-14) feature of this function, to assist in adding new data to the file.

10.6.2.2 line_after()

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

Then it gets the next non-blank line (i.e. data line) after that.

This function always starts from the beginning of the file. Therefore, it can handle reading Sequencer64 configuration files that have had their tagged sections arranged in a different order. This feature makes the configuration file a little more robust against errors.

Parameters

file	Points to the input file stream.
tag	Provides a tag to be found. Lines are read until a match occurs with this tag. Normally, the tag is a section marker, such as "[user-interface]". Best to assume an exact match is needed.

Returns

Returns true if the tag was found. Otherwise, false is returned.

10.6.2.3 at_section_start()

```
bool seq64::configfile::at_section_start ( ) const  [inline], [protected]
```

One clue that there is not is that we're at the next section marker. This function tests for that condition.

Returns

Returns true if m_line[0] is the left-bracket character.

10.6.2.4 parse()

```
virtual bool seq64::configfile::parse (
             perform & perf )  [pure virtual]
```

Implemented in seq64::userfile, and seq64::optionsfile.

10.6.2.5 write()

```
virtual bool seq64::configfile::write (
             const perform & perf )  [pure virtual]
```

Implemented in seq64::optionsfile, and seq64::userfile.

10.6.2.6 get_error_message()

```
const std::string& seq64::configfile::get_error_message ( ) const  [inline]
```

10.6.2.7 set_error_message()

```
void seq64::configfile::set_error_message (
             const std::string & msg )  [inline], [protected]
```

10.6.3 Field Documentation

10.6.3.1 m_error_message

```
std::string seq64::configfile::m_error_message  [private]
```

Not a 100% foolproof yet.

10.6.3.2 m_name

```
std::string seq64::configfile::m_name  [protected]
```

10.6.3.3 m_d

```
char* seq64::configfile::m_d  [protected]
```

10.6.3.4 m_line

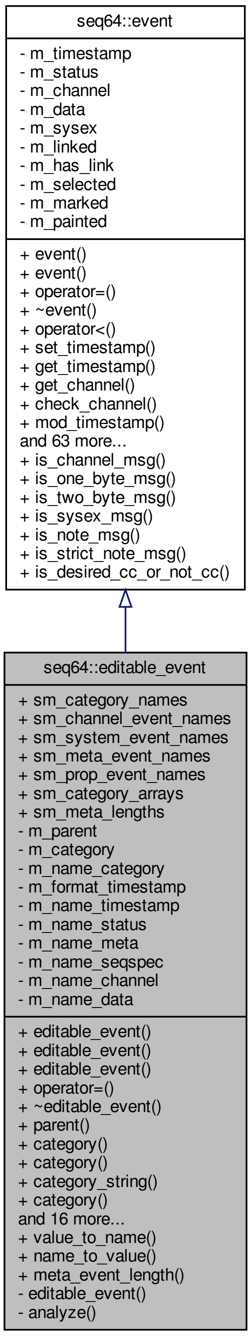
```
char seq64::configfile::m_line[SEQ64_LINE_MAX]  [protected]
```

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

10.7 seq64::editable_event Class Reference

Provides for the management of MIDI editable events.

Inheritance diagram for seq64::editable_event:



Data Structures

- struct meta_length_t

  Provides a type that contains the pair of values needed to get the Meta event's data length.
- struct name_value_t

  Provides a type that contains the pair of values needed for the various lookup maps that are needed to manage editable events.

Public Types

- enum category_t {
  category_name,
  category_channel_message,
  category_system_message,
  category_meta_event,
  category_prop_event }

  These values determine the major kind of event, which determines what types of events are possible for this editable event object.
- enum timestamp_format_t {
  timestamp_measures,
  timestamp_time,
  timestamp_pulses }

  Provides a code to indicate the desired timestamp format.

Public Member Functions

- editable_event (const editable_events &parent)

  Principal constructor.
- editable_event (const editable_events &parent, const event &ev)

  Event constructor.
- editable_event (const editable_event &rhs)

  This copy constructor initializes most of the class members.
- editable_event & operator= (const editable_event &rhs)
- virtual ∼editable_event ()

  This destructor current is a rote virtual function override.
- const editable_events & parent () const

  'Getter' function for member m_parent
- category_t category () const

  'Getter' function for member m_category
- void category (category_t c)

  'Setter' function for member m_category by value Also keeps the m_name_category member in synchrony.
- const std::string & category_string () const

  'Getter' function for member m_category
- void category (const std::string &cs)

  'Setter' function for member m_category by name Also keeps the m_name_category member in synchrony, but looks up the name, rather than using the name parameter, to avoid storing abbreviations.
- const std::string & timestamp_string () const

  'Getter' function for member m_name_timestamp
- midipulse timestamp () const

  'Getter' function for member event::get_timestamp() Implemented to allow a uniform naming convention that is not slavish to the get/set crowd [this ain't Java or, chuckle, C#].
- void timestamp (midipulse ts)

  'Setter' function for member event::set_timestamp() Implemented to allow a uniform naming convention that is not slavish to the get/set crowd [this ain't Java].
- void timestamp (const std::string &ts_string)

  'Setter' function for member event::set_timestamp() [string version]
- std::string time_as_pulses ()

  Converts the current time-stamp to a string representation in units of pulses.
- std::string time_as_measures ()

  Converts the current time-stamp to a string representation in units of measures, beats, and divisions.

- std::string time_as_minutes ()

  Converts the current time-stamp to a string representation in units of hours, minutes, seconds, and fraction.
- void set_status_from_string (const std::string &ts, const std::string &s, const std::string &sd0, const std::string &sd1)

  Converts a string into an event status, along with timestamp and data bytes.
- std::string format_timestamp ()

  Formats the current timestamp member as a string.
- std::string stock_event_string ()

  Converts the event into a string desribing the full event.
- std::string ex_data_string () const

  Assuming the event is a Meta event or a SysEx, this function returns a short string representation of the event data, usable in the eventeditor class or elsewhere.
- std::string status_string () const

  'Getter' function for member m_name_status
- std::string meta_string () const

  'Getter' function for member m_name_meta
- std::string seqspec_string () const

  'Getter' function for member m_name_seqspec
- std::string channel_string () const

  'Getter' function for member m_name_channel
- std::string data_string () const

  'Getter' function for member m_name_data

Static Public Member Functions

- static std::string value_to_name (midibyte value, category_t cat)

  Provides a static lookup function that returns the name, if any, associated with a midibyte value.
- static unsigned short name_to_value (const std::string &name, category_t cat)

  Provides a static lookup function that returns the value, if any, associated with a name string.
- static unsigned short meta_event_length (midibyte value)

  Provides a static lookup function that takes a meta-event number and returns the expected length of the data for that event.

Static Public Attributes

- static const name_value_t sm_category_names [ ]

  An array of event categories and their names.
- static const name_value_t sm_channel_event_names [ ]

  An array of MIDI channel events and their names.
- static const name_value_t sm_system_event_names [ ]

  An array of MIDI system events and their names.
- static const name_value_t sm_meta_event_names [ ]

  An array of Meta events and their names.
- static const name_value_t sm_prop_event_names [ ]

  An array of Sequencer64-specific events and their names.
- static const name_value_t ∗const sm_category_arrays [ ]

  Provides for fast access (no ifs) to the correct name array for the given category.
- static const meta_length_t sm_meta_lengths [ ]

  Provides a list of meta-event numbers and their expected lengths (if any).

Private Member Functions

- editable_event ()
- void analyze ()

    Analyzes an editable-event to make all the settings it needs.

Private Attributes

- const editable_events & m_parent

    Provides a reference to the container that holds this event.
- category_t m_category

    Indicates the overall category of this event, which will be category_channel_message, category_system_message, category_meta_event, and category_prop_event.
- std::string m_name_category

    Holds the name of the event category for this event.
- timestamp_format_t m_format_timestamp

    Indicates the format to display the time-stamp.
- std::string m_name_timestamp

    Holds the string version of the MIDI pulses time-stamp.
- std::string m_name_status

    Holds the name of the status value for this event.
- std::string m_name_meta

    Holds the name of the meta message, if applicable.
- std::string m_name_seqspec

    If we eventually implement the editing of the Seq24/Sequencer64 "proprietary" meta sequencer-specific events, the name of the SeqSpec will be stored here.
- std::string m_name_channel

    Holds the channel description, if applicable.
- std::string m_name_data

    Holds the data description, if applicable.

10.7.1 Detailed Description

It makes the following members of an event modifiable using human-readable strings:

```
-   m_timestamp
-   m_status
-   m_channel
-   m_data[]
```

Eventually, it would be nice to be able to edit, or at least view, the SysEx events and the Meta events. Those two will require extensions to make events out of them (SysEx is partly supported).

To the concepts of event, the editable_event class adds a category field and strings to represent all of these members.

10.7.2 Member Enumeration Documentation

10.7.2.1 category_t

`enum seq64::editable_event::category_t`

These tags are accompanied by category names in sm_category_names[]. The enum values are cast to midibyte values for the purposes of using the lookup infrastructure.

Enumerator

category_name	Indicates that the lookup needs to be done on the category names, as listed in sm_category_names[].
category_channel_message	Indicates a channel event, with a value ranging from 0x80 through 0xEF. Some examples are note on/off, control change, and program change. Values are looked up in sm_channel_event_names[].
category_system_message	Indicates a system event, with a value ranging from 0xF0 through 0xFF. Some examples are SysEx start/end, song position, and stop/start/continue/reset. Values are looked up in sm_system_event_names[]. These values are "real" only in MIDI data coming in "over the wire". In MIDI files, they represent Meta events.
category_meta_event	Indicates a meta event, and there is a second value that is used to look up the name of the meta event, in sm_meta_event_names[]. Meta messages are message that are stored in a MIDI file. Although they start with 0xFF, they are not to be confused with the 0xFF message that can be sent "over the wire", which denotes a Reset event.
category_prop_event	Indicates a "proprietary", Sequencer64 event. Indicates to look up the name of the event in sm_prop_event_names[]. Not sure if these kinds of events will be stored separately.

10.7.2.2 timestamp_format_t

```
enum seq64::editable_event::timestamp_format_t
```

Three are supported. All editable events will share the same timestamp format, but it seems good to make this a event class member, rather than something imposed from an outside static value. We shall see.

Enumerator

timestamp_measures	This format displays the time in "measures:beats:divisions" format, where measures and beats start at 1. Thus, "1:1:0" is equivalent to 0 pulses or to "0:0:0.0" in normal time values.
timestamp_time	This format displays the time in "hh:mm:second.fraction" format. The value displayed should not depend upon the internal timing parameters of the event.
timestamp_pulses	This format specifies a bare pulse format for the timestamp – a long integer ranging from 0 on up. Obviously, this representation depends on the PPQN value for the sequence holding this event.

10.7.3 Constructor & Destructor Documentation

10.7.3.1 editable_event() [1/4]

```
seq64::editable_event::editable_event ( )  [private]
```

10.7.3.2 editable_event() [2/4]

```
seq64::editable_event::editable_event (
            const editable_events & parent )
```

The default constructor is hidden and unimplemented. We will get the default controller name from the controllers module. We should also be able to look up the selected buss's entries for a sequence, and load up the CC/name pairs on the fly.

Parameters

parent	Provides the overall editable-events object that manages the whole set of editable-event.

10.7.3.3 editable_event() [3/4]

```
seq64::editable_event::editable_event (
            const editable_events & parent,
            const event & ev )
```

This function basically adds all of the extra editable_event stuff to a standard event, so that the resulting editable↩_event is container-ready.

10.7.3.4 editable_event() [4/4]

```
seq64::editable_event::editable_event (
            const editable_event & rhs )
```

This function is currently geared only toward support of the SMF 0 channel-splitting feature. Many of the members are not set to useful values when the MIDI file is read, so we don't handle them for now.

Warning

> This function does not yet copy the SysEx data. The inclusion of SysEx editable_events was not complete in Seq24, and it is still not complete in Sequencer64. Nor does it currently bother with the links.

Parameters

rhs	Provides the editable_event object to be copied.

10.7.3.5 ∼editable_event()

```
virtual seq64::editable_event::∼editable_event ( ) [inline], [virtual]
```

10.7.4 Member Function Documentation

10.7.4.1 value_to_name()

```
std::string seq64::editable_event::value_to_name (
            midibyte value,
            editable_event::category_t cat )  [static]
```

Parameters

value	The MIDI byte value to look up.
cat	The category of the MIDI byte. Each category calls a different name array into play.

Returns

Returns the name associated with the value. If there is no such name, then an empty string is returned.

10.7.4.2 name_to_value()

```
unsigned short seq64::editable_event::name_to_value (
            const std::string & name,
            editable_event::category_t cat )  [static]
```

The string_match() function, which can match abbreviations, case-insensitively, is used to make the string comparisons.

Parameters

name	The string value to look up.
cat	The category of the MIDI byte. Each category calls a different name array into play.

Returns

Returns the value associated with the name. If there is no such value, then SEQ64_END_OF_MIDIBYTE_↩ TABLE is returned.

10.7.4.3 meta_event_length()

```
unsigned short seq64::editable_event::meta_event_length (
            midibyte value )  [static]
```

Parameters

value	The MIDI byte value to look up.

Returns

Returns the length associated with the meta event. If the expected length is actually 0, or is variable, then 0 is returned.

10.7.4.4 operator=()

```
editable_event & seq64::editable_event::operator= (
            const editable_event & rhs )
```

10.7.4.5 parent()

```
const editable_events& seq64::editable_event::parent ( ) const  [inline]
```

10.7.4.6 category() [1/3]

```
category_t seq64::editable_event::category ( ) const  [inline]
```

10.7.4.7 category() [2/3]

```
void seq64::editable_event::category (
            category_t c )
```

Note that a bad value is translated to the enum value category_name.

Parameters

c	Provides the category value to set.

10.7.4.8 category_string()

```
const std::string& seq64::editable_event::category_string ( ) const  [inline]
```

10.7.4.9 category() [3/3]

```
void seq64::editable_event::category (
            const std::string & name )
```

Note that a bad value is translated to the value of category_name.

Parameters

name	Provides the category name for the category value to set.

10.7.4.10 timestamp_string()

```
const std::string& seq64::editable_event::timestamp_string ( ) const  [inline]
```

10.7.4.11 timestamp() [1/3]

```
midipulse seq64::editable_event::timestamp ( ) const  [inline]
```

10.7.4.12 timestamp() [2/3]

```
void seq64::editable_event::timestamp (
            midipulse ts )
```

Plus, we also have to set the string version at the same time.

The format of the string representation is of the format selected by the m_format_timestamp member and is set by the format_timestamp() function.

Parameters

ts	Provides the timestamp in units of MIDI pulses.

10.7.4.13 timestamp() [3/3]

```
void seq64::editable_event::timestamp (
            const std::string & ts_string )
```

The format of the string representation is of the format selected by the m_format_timestamp member and is set by the format_timestamp() function.

Parameters

ts_string	Provides the timestamp in units of MIDI pulses.

10.7.4.14 time_as_pulses()

```
std::string seq64::editable_event::time_as_pulses ( )  [inline]
```

10.7.4.15 time_as_measures()

```
std::string seq64::editable_event::time_as_measures ( )
```

Cannot be inlined because of a circular dependency between the editable_event and editable_events classes.

10.7.4.16 time_as_minutes()

```
std::string seq64::editable_event::time_as_minutes ( )
```

Cannot be inlined because of a circular dependency between the editable_event and editable_events classes.

10.7.4.17 set_status_from_string()

```
void seq64::editable_event::set_status_from_string (
             const std::string & ts,
             const std::string & s,
             const std::string & sd0,
             const std::string & sd1 )
```

Currently, this function handles only the following two messages:

- category_channel_message
- category_system_message

After all of the numbering member items have been set, they are converted and assigned to the string versions via a call to the analyze() function.

Parameters

ts	Provides the time-stamp string of the event.
s	Provides the name of the event, such as "Program Change".
sd0	Provides the string defining the first data byte of the event. For Meta events, this might have multiple values, though we support only Set Tempo and Time Signature at present.
sd1	Provides the string defining the second data byte of the event, if applicable to the event. Some meta event may provide multiple values in this string.

10.7.4.18 format_timestamp()

```
std::string seq64::editable_event::format_timestamp ( )
```

The format of the string representation is of the format selected by the m_format_timestamp member.

10.7.4.19 stock_event_string()

```
std::string seq64::editable_event::stock_event_string ( )
```

We get the time-stamp as a string, make sure the event is fully analyzed so that all items and strings are set correctly.

Returns

Returns a human-readable string describing this event. This string is displayed in an event list, such as in the eventedit module.

10.7.4.20 ex_data_string()

```
std::string seq64::editable_event::ex_data_string ( ) const
```

Most SysEx events will only show the first few bytes; we could make a SysEx viewer/editor for handling long events.

Returns

Returns the data string. If empty, the data is bad in some way, or the event is not a Meta event.

10.7.4.21 status_string()

```
std::string seq64::editable_event::status_string ( ) const [inline]
```

10.7.4.22 meta_string()

```
std::string seq64::editable_event::meta_string ( ) const [inline]
```

10.7.4.23 seqspec_string()

```
std::string seq64::editable_event::seqspec_string ( ) const  [inline]
```

10.7.4.24 channel_string()

```
std::string seq64::editable_event::channel_string ( ) const  [inline]
```

10.7.4.25 data_string()

```
std::string seq64::editable_event::data_string ( ) const  [inline]
```

10.7.4.26 analyze()

```
void seq64::editable_event::analyze ( )  [private]
```

Used in the constructors. Some of the setters indirectly set the appropriate string representation, as well.

Category:

```
This function can figure out if the status byte implies a channel
message or a system message, and set the category string as well.
However, at this time, detection of Meta events (0xFF) or
Proprietary/SeqSpec events (0xFF with 0x2424) doesn't work due to lack
of context here (and due to the fact that currently such events are
not yet stored in a Sequencer64 sequence/track, and the
least-significant-byte gets masked off anyway.)
```

Status:

```
We distinguish between channel and system messages, and then one- and
two-byte messages, but don't yet distinguish the data values fully.
```

Sysex and Meta events:

```
We are starting to support events with statuses ranging from 0xF0 to
0xFF, with a concentration on Set Tempo and Time Signature events.
We want them to be full-fledged Sequencer64 events.

The 0xFF byte represents a Meta event, not a Reset event, when we're
dealing with data from a MIDI file, as we are here. And we need to get
the next byte after the status byte.

We want Set Tempo events to appear as "Tempo 120.0" and Time Signature
events to appear as "Time Sig 4/4".
```

10.7.5 Field Documentation

10.7.5.1 sm_category_names

`const editable_event::name_value_t seq64::editable_event::sm_category_names [static]`

Initializes the array of event/name pairs for the MIDI events categories.

Terminated by an empty string, the latter being the preferred test, for consistency with the other arrays and because 0 is often a legitimate code value.

10.7.5.2 sm_channel_event_names

`const editable_event::name_value_t seq64::editable_event::sm_channel_event_names [static]`

Initializes the array of event/name pairs for the channel MIDI events.

We split channel and system messages into two arrays, for semantic reasons and for faster linear lookups.

Terminated by an empty string.

10.7.5.3 sm_system_event_names

`const editable_event::name_value_t seq64::editable_event::sm_system_event_names [static]`

Initializes the array of event/name pairs for the system MIDI events.

We split channel and system messages into two arrays, for semantic reasons and for faster linear lookups.

Terminated by an empty string.

10.7.5.4 sm_meta_event_names

`const editable_event::name_value_t seq64::editable_event::sm_meta_event_names [static]`

Initializes the array of event/name pairs for all of the Meta events.

Terminated only by the empty string.

10.7.5.5 sm_prop_event_names

`const editable_event::name_value_t seq64::editable_event::sm_prop_event_names [static]`

Initializes the array of event/name pairs for all of the seq24/sequencer64-specific events.

Terminated only by the empty string. Note that the numbers reflect the masking off of the high-order bits by 0x242400FF.

10.7.5.6 sm_category_arrays

```
const editable_event::name_value_t *const seq64::editable_event::sm_category_arrays  [static]
```

Contains pointers (references cannot be stored in an array) to the desired array for a given category.

Too bad that an array of references is not possible.

This code could be considered a bit rococo.

10.7.5.7 sm_meta_lengths

```
const editable_event::meta_length_t seq64::editable_event::sm_meta_lengths  [static]
```

Initializes the array of event/length pairs for all of the Meta events.

Terminated only by the empty string.

10.7.5.8 m_parent

```
const editable_events& seq64::editable_event::m_parent  [private]
```

The container's "children" need to go to their "parent" to get certain items of information.

10.7.5.9 m_category

```
category_t seq64::editable_event::m_category  [private]
```

The category_name value is not set here, since that category is used only for looking up the human-readable form of the category.

10.7.5.10 m_name_category

```
std::string seq64::editable_event::m_name_category  [private]
```

10.7.5.11 m_format_timestamp

```
timestamp_format_t seq64::editable_event::m_format_timestamp  [private]
```

The default is to display in timestamp_measures format.

10.7.5.12 m_name_timestamp

```
std::string seq64::editable_event::m_name_timestamp  [private]
```

10.7.5.13 m_name_status

```
std::string seq64::editable_event::m_name_status  [private]
```

It will include the names of the channel messages and the system messages. The latter includes SysEx and Meta messages.

10.7.5.14 m_name_meta

```
std::string seq64::editable_event::m_name_meta  [private]
```

If not applicable, this name will be empty.

10.7.5.15 m_name_seqspec

```
std::string seq64::editable_event::m_name_seqspec  [private]
```

10.7.5.16 m_name_channel

```
std::string seq64::editable_event::m_name_channel  [private]
```

10.7.5.17 m_name_data

```
std::string seq64::editable_event::m_name_data  [private]
```

10.8 seq64::editable_events Class Reference

Provides for the management of an ordered collection MIDI editable events.

Public Member Functions

- editable_events (sequence &seq, midibpm bpm)

  This constructor hooks into the sequence object.
- editable_events (const editable_events &rhs)

  This copy constructor initializes most of the class members.
- editable_events & operator= (const editable_events &rhs)

  This principal assignment operator sets most of the class members.
- virtual ∼editable_events ()

  This destructor current is a rote virtual function override.
- const midi_timing & timing () const

  'Getter' function for member m_midi_parameters
- midipulse string_to_pulses (const std::string &ts_string) const

  Calculates the MIDI pulses (divisions) from a string using one of the free functions of the calculations module.
- bool load_events ()

  Accesses the sequence's event-list, iterating through it from beginning to end, wrapping each event in the list in an editable event and inserting it into the editable-event container.
- bool save_events ()

  Erases the sequence's event container and recreates it using the edited container of editable events.
- Events & events ()

  'Getter' function for member m_events
- 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.
- midipulse get_length () const

  Provides the length of the events in MIDI pulses.
- bool add (const event &e)

  Adds an event, converted to an editable_event, to the internal event list.
- bool add (const editable_event &e)

  Adds an editable event to the internal event list.
- bool replace (iterator ie, const editable_event &e)

  Provides a wrapper for the iterator form of erase(), which is the only one that the editable_events container uses.
- 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 sort ()

  Sorts the event list; active only for the std::list implementation.
- iterator current_event () const

  'Getter' function for member m_current_event The caller must make sure the iterator is not Events::end().
- bool is_valid_iterator (iterator &cit) const

  Validates the given iterator.
- void print () const

  Prints a list of the currently-held events.

Static Public Member Functions

- static editable_event & dref (iterator ie)

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

  Dereference const access for list or map.

Private Types

- typedef event_list::event_key Key

  Types to use to with the multimap implementation.
- typedef std::pair< Key, editable_event > EventsPair
- typedef std::multimap< Key, editable_event > Events
- typedef Events::iterator iterator
- typedef Events::const_iterator const_iterator
- typedef Events::reverse_iterator reverse_iterator
- typedef Events::const_reverse_iterator const_reverse_iterator

Private Member Functions

- editable_events ()
- void current_event (iterator cei)

  'Setter' function for member m_current_event

Private Attributes

- Events m_events

  Holds the editable_events.
- iterator m_current_event

  Points to the current event, which is the event that has just been inserted.
- sequence & m_sequence

  Provides a reference to the sequence containing the events to be edited.
- midi_timing m_midi_parameters

  Holds the current settings for the sequence (and usually for the whole MIDI tune as well).

Friends

- class eventslots

10.8.1 Member Typedef Documentation

10.8.1.1 Key

```
typedef event_list::event_key seq64::editable_events::Key  [private]
```

These typenames are identical to those used in event_list, but of course they are in the editable_events scope instead. See the event_list class; that class once again uses std::list, but still defines event_list::event_key for use here. We think the std::list implementation breaks editing, so we're going back to the std::map implementation for the event-editor.

10.8.1.2 EventsPair

```
typedef std::pair<Key, editable_event> seq64::editable_events::EventsPair  [private]
```

10.8.1.3 Events

```
typedef std::multimap<Key, editable_event> seq64::editable_events::Events  [private]
```

10.8.1.4 iterator

```
typedef Events::iterator seq64::editable_events::iterator  [private]
```

10.8.1.5 const_iterator

```
typedef Events::const_iterator seq64::editable_events::const_iterator  [private]
```

10.8.1.6 reverse_iterator

```
typedef Events::reverse_iterator seq64::editable_events::reverse_iterator  [private]
```

10.8.1.7 const_reverse_iterator

```
typedef Events::const_reverse_iterator seq64::editable_events::const_reverse_iterator  [private]
```

10.8.2 Constructor & Destructor Documentation

10.8.2.1 editable_events() [1/3]

```
seq64::editable_events::editable_events ( )  [private]
```

10.8.2.2 editable_events() [2/3]

```
seq64::editable_events::editable_events (
            sequence & seq,
            midibpm bpm )
```

Parameters

seq	Provides a reference to the sequence object, which provides the events and some of the MIDI timing parameters.
bpm	Provides the beats/minute value, which the caller figures out how to get and provides in this parameter.

10.8.2.3 editable_events() [3/3]

```
seq64::editable_events::editable_events (
            const editable_events & rhs )
```

Note that we need to reconstitute the event links here, as well.

Parameters

rhs	Provides the editable_events object to be copied.

10.8.2.4 ∼editable_events()

```
virtual seq64::editable_events::∼editable_events ( )  [inline], [virtual]
```

10.8.3 Member Function Documentation

10.8.3.1 operator=()

```
editable_events & seq64::editable_events::operator= (
            const editable_events & rhs )
```

Note that we need to reconstitute the event links here, as well.

Parameters

rhs	Provides the editable_events object to be assigned.

Returns

Returns a reference to "this" object, to support the serial assignment of editable_eventss.

10.8.3.2 timing()

```
const midi_timing& seq64::editable_events::timing ( ) const  [inline]
```

10.8.3.3 string_to_pulses()

```
midipulse seq64::editable_events::string_to_pulses (
            const std::string & ts_string ) const  [inline]
```

10.8.3.4 load_events()

```
bool seq64::editable_events::load_events ( )
```

Note that the new events will not have valid links (actually, no links). These links are used for associating Note Off events with their respective Note On events. To be consistent, we must take the time to reconstitute these links, using event_list::verify_and_link().

Returns

Returns true if the size of the final editable_event container matches the size of the original events container.

10.8.3.5 save_events()

```
bool seq64::editable_events::save_events ( )
```

Note that the old events are replaced only if the container of editable events is not empty. There are safer ways for the user to erase all the events.

Todo Consider what to do about the sequence::m_is_modified flag.

Returns

Returns true if the size of the final event container matches the size of the original editable_events container.

10.8.3.6 events()

```
Events& seq64::editable_events::events ( )  [inline]
```

10.8.3.7 begin() [1/2]

```
iterator seq64::editable_events::begin ( )  [inline]
```

10.8.3.8 begin() [2/2]

```
const_iterator seq64::editable_events::begin ( ) const  [inline]
```

10.8.3.9 end() [1/2]

```
iterator seq64::editable_events::end ( )  [inline]
```

10.8.3.10 end() [2/2]

```
const_iterator seq64::editable_events::end ( ) const  [inline]
```

10.8.3.11 dref() [1/2]

```
static editable_event& seq64::editable_events::dref (
             iterator ie )  [inline], [static]
```

Parameters

ie	Provides the iterator to the event to which to get a reference.

10.8.3.12 dref() [2/2]

```
static const editable_event& seq64::editable_events::dref (
             const_iterator ie )  [inline], [static]
```

Parameters

ie	Provides the iterator to the event to which to get a reference.

10.8.3.13 count()

```
int seq64::editable_events::count ( ) const  [inline]
```

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

10.8.3.14 get_length()

```
midipulse seq64::editable_events::get_length ( ) const
```

This function gets the iterator for the last element and returns its length value.

Returns

Returns the timestamp of the latest event in the container.

10.8.3.15 add() [1/2]

```
bool seq64::editable_events::add (
             const event & e )
```

Parameters

e	Provides the regular event to be added to the list of editable events.

Returns

Returns true if the insertion succeeded, as evidenced by an increment in container size.

10.8.3.16 add() [2/2]

```
bool seq64::editable_events::add (
             const editable_event & e )
```

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;
```

Parameters

e	Provides the regular event to be added to the list of editable events.

Returns

Returns true if the insertion succeeded, as evidenced by an increment in container size.

Side-effect(s) Sets m_current_event, which can be used right-away in a single-threaded context to get an iterator to the event via the current_event() accessor.

10.8.3.17 replace()

```
bool seq64::editable_events::replace (
             iterator ie,
             const editable_event & e )  [inline]
```

10.8.3.18 remove()

```
void seq64::editable_events::remove (
             iterator ie )  [inline]
```

10.8.3.19 clear()

```
void seq64::editable_events::clear ( )  [inline]
```

10.8.3.20 sort()

```
void seq64::editable_events::sort ( )  [inline]
```

10.8.3.21 current_event() [1/2]

```
iterator seq64::editable_events::current_event ( ) const  [inline]
```

10.8.3.22 is_valid_iterator()

```
bool seq64::editable_events::is_valid_iterator (
             iterator & cit ) const  [inline]
```

10.8.3.23 print()

```
void seq64::editable_events::print ( ) const
```

Useful for debugging.

10.8.3.24 current_event() [2/2]

```
void seq64::editable_events::current_event (
             iterator cei )  [inline], [private]
```

Parameters

cei	Provide an iterator to the event to set as the current event.

10.8.4 Friends And Related Function Documentation

10.8.4.1 eventslots

```
friend class eventslots [friend]
```

10.8.5 Field Documentation

10.8.5.1 m_events

```
Events seq64::editable_events::m_events [private]
```

Just to be clear, since we currently do not define SEQ64_USE_EVENT_MAP, this is an std::list container, not a multimap. BELAY THAT! The multimap works better here.

10.8.5.2 m_current_event

```
iterator seq64::editable_events::m_current_event [private]
```

(From this event we can get the current time and other parameters.) If the container were a plain map, we could instead use a key to access it. But we can at least use an iterator, rather than a bare pointer.

10.8.5.3 m_sequence

```
sequence& seq64::editable_events::m_sequence [private]
```

Besides the events, this object also holds the beats/measure, beat-width, and the PPQN value. The beats/minute have to be obtained from the application's perform object, and passed to the editable_events constructor by the caller.

10.8.5.4 m_midi_parameters

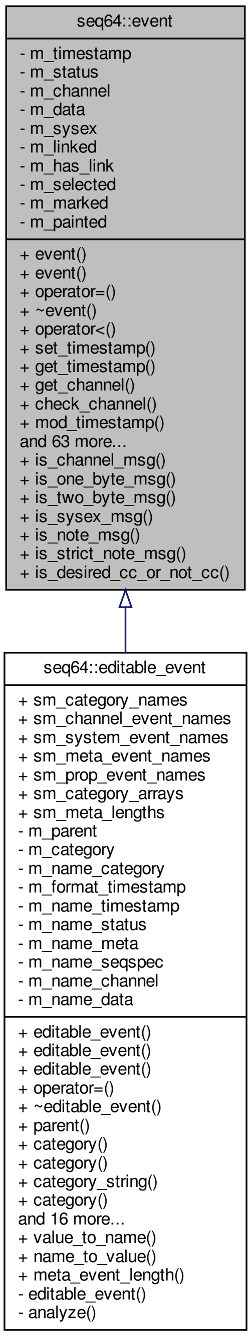
```
midi_timing seq64::editable_events::m_midi_parameters [private]
```

It holds the beats/minute, beats/measure, beat-width, and PPQN values needed to properly convert MIDI pulse timestamps to time and measure values.

10.9 seq64::event Class Reference

Provides events for management of MIDI events.

Inheritance diagram for seq64::event:



Public Types

- typedef std::vector< midibyte > SysexContainer

    Provides a type definition for a vector of midibytes.

Public Member Functions

- event ()

  This constructor simply initializes all of the class members.
- event (const event &rhs)

  This copy constructor initializes most of the class members.
- event & operator= (const event &rhs)

  This principal assignment operator sets most of the class members.
- virtual ∼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 (midipulse time)

  'Setter' function for member m_timestamp
- midipulse get_timestamp () const

  'Getter' function for member m_timestamp
- midibyte get_channel () const

  'Getter' function for member m_channel
- bool check_channel (int channel) const

  Checks the channel number to see if the event's channel matches it, or if the event has no channel.
- void mod_timestamp (midipulse modtick)

  Calculates the value of the current timestamp modulo the given parameter.
- void set_status (midibyte status)

  Sets the m_status member to the value of status.
- void set_status (midibyte eventcode, midibyte channel)

  This overload is useful when synthesizing events, such as converting a Note On event with a velocity of zero to a Note Off event.
- void set_meta_status (midibyte metatype)

  Sets a Meta event.
- void set_status_keep_channel (midibyte eventcode)

  This function is used in recording to preserve the input channel information for deciding what to do with an incoming MIDI event.
- void set_channel (midibyte channel)

  Sets the channel "nybble", without modifying the status "nybble".
- midibyte get_status () const

  'Getter' function for member m_status Note that we have ensured that status ranges from 0x80 to 0xFF.
- bool non_cc_match (midibyte status)

  Returns true if the event's status is not a control-change, but does match the given status.
- bool cc_match (midibyte st, midibyte cc)

  Returns true if the event's status is a control-change that matches the given status, and has a control value matching the given control-change value.
- void set_data (midibyte d1)

  Clears the most-significant-bit of the d1 parameter, and sets it into the first byte of m_data.
- void set_data (midibyte d1, midibyte d2)

  Clears the most-significant-bit of both parameters, and sets them into the first and second bytes of m_data.
- void get_data (midibyte &d0) const

  Retrieves only the first data byte from m_data[] and copies it into the parameter.
- void get_data (midibyte &d0, midibyte &d1) const

  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[0]) and clears the most significant bit.

- void decrement_data1 ()

  Decrements the first data byte (m_data[0]) 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.
- bool append_sysex (midibyte ∗data, int len)

  Appends SYSEX data to a new buffer.
- bool append_sysex (midibyte data)

  An overload for logging SYSEX data byte-by-byte.
- bool append_meta_data (midibyte metatype, midibyte ∗data, int len)

  Appends Meta-event data to a new buffer.
- bool append_meta_data (midibyte metatype, const std::vector< midibyte > &data)

  This overload appends Meta-event data from a vector to a new buffer.
- void restart_sysex ()

  Deletes and clears out the SYSEX buffer.
- bool set_sysex (midibyte ∗data, int len)

  Resets and adds ex data.
- SysexContainer & get_sysex ()

  'Getter' function for member m_sysex from stazed, non-const version for use by midibus.
- const SysexContainer & get_sysex () const

  'Getter' function for member m_sysex from stazed
- void set_sysex_size (int len)

  'Setter' function for member m_sysex from stazed
- int get_sysex_size () const

  'Getter' function for member m_sysex.size()
- void link (event ∗ev)

  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 and m_linked
- 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;.

- midibyte data (int index) const

  'Getter' function for member m_data[]

- midibyte 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 (midibyte note)

  Sets the note number, clearing off the most-significant-bit and assigning it to the first data byte, m_data[0].

- void transpose_note (int tn)

  Transpose the note, if possible.

- midibyte get_note_velocity () const

  'Getter' function for member m_data[1], the note velocity.

- void set_note_velocity (int vel)

  Sets the note velocity, which is held in the second data byte, and clearing off the most-significant-bit, storing it in m_data[1].

- bool is_note_on () const

  Check for the Note On value in m_status.

- bool is_note_off () const

  Check for the Note Off value in m_status.

- bool is_note () const

  Returns true if m_status is a Note On, Note Off, or Aftertouch message.

- bool is_note_off_recorded () const

  Some keyboards send Note On with velocity 0 for Note Off, so we provide this function to test that during recording.

- void adjust_note_off ()

  Some keyboards send Note On with velocity 0 for Note Off, so we take care of that situation here by creating a Note Off event, with the channel nybble preserved.

- bool is_one_byte () const

  Indicates if the m_status value is a one-byte message (Program Change or Channel Pressure.

- bool is_two_bytes () const

  Indicates if the m_status value is a two-byte message (everything except Program Change, Channel Pressure, and).

- bool is_sysex () const

  Indicates if the event is a System Exclusive event or not.

- bool is_meta () const

  Indicates if the event is a Meta event or not.

- bool is_ex_data () const

  Indicates if we need to use extended data (SysEx or Meta).

- bool is_tempo () const

  Indicates if the event is a tempo event.

- midibpm tempo () const

  Calculates the tempo from the stored event bytes, if the event is a Tempo meta-event and has valid data.

- void set_tempo (midibpm tempo)

  The inverse of tempo().

- bool is_time_signature () const

  Indicates if the event is a Time Signature event.

- bool is_key_signature () const

  Indicates if the event is a Key Signature event.

- void print () const

  Prints out the timestamp, data size, the current status byte, channel (which is the type value for Meta events), any SysEx or Meta 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.

Static Public Member Functions

- static bool is_channel_msg (midibyte m)

  Static test for the channel message/statuse values: Note On, Note Off, Aftertouch, Control Change, Program Change, Channel Pressure, and Pitch Wheel.
- static bool is_one_byte_msg (midibyte m)

  Static test for channel messages that have only one data byte: Program Change and Channel Pressure.
- static bool is_two_byte_msg (midibyte m)

  Static test for channel messages that have two data bytes: Note On, Note Off, Control Change, Aftertouch, and Pitch Wheel.
- static bool is_sysex_msg (midibyte m)

  Static test for a SysEx message.
- static bool is_note_msg (midibyte m)

  Static test for messages that involve notes and velocity: Note On, Note Off, and Aftertouch.
- static bool is_strict_note_msg (midibyte m)

  Static test for messages that involve notes only: Note On and Note Off.
- static bool is_desired_cc_or_not_cc (midibyte m, midibyte cc, midibyte datum)

  Static test for channel messages that are either not control-change messages, or are and match the given controller value.

Private Attributes

- midipulse m_timestamp

  Provides the MIDI timestamp in ticks, otherwise known as the "pulses" in "pulses per quarter note" (PPQN).
- midibyte m_status

  This is the status byte without the channel.
- midibyte m_channel

  In order to be able to handle MIDI channel-splitting of an SMF 0 file, we need to store the channel, even if we override it when playing the MIDI data.
- midibyte m_data [SEQ64_MIDI_DATA_BYTE_COUNT]

  The two bytes of data for the MIDI event.
- SysexContainer m_sysex

  The data buffer for SYSEX messages.
- 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.".

10.9.1 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.

10.9.2 Member Typedef Documentation

10.9.2.1 SysexContainer

```
typedef std::vector<midibyte> seq64::event::SysexContainer
```

This type will also hold the generally small amounts of data needed for Meta events, but doesn't help us encapsulate derived values, such as tempo.

10.9.3 Constructor & Destructor Documentation

10.9.3.1 event() [1/2]

```
seq64::event::event ( )
```

10.9.3.2 event() [2/2]

```
seq64::event::event (
            const event & rhs )
```

This function is currently geared only toward support of the SMF 0 channel-splitting feature. Many of the members are not set to useful values when the MIDI file is read, so we don't handle them for now.

Note that now events are also copied when creating the editable_events container, so this function is even more important. The event links, for linking Note Off events to their respective Note On events, are dropped. Generally, they will need to be reconstituted by calling the event_list::verify_and_link() function.

Warning

This function does not yet copy the SysEx data. The inclusion of SysEx events was not complete in Seq24, and it is still not complete in Sequencer64. Nor does it currently bother with the links, as noted above.

Parameters

rhs	Provides the event object to be copied.

10.9.3.3 ∼event()

```
seq64::event::∼event ( ) [virtual]
```

The restart_sysex() function does what we need. But now that m_sysex is a vector, no action is needed.

10.9.4 Member Function Documentation

10.9.4.1 operator=()

```
event & seq64::event::operator= (
             const event & rhs )
```

This function is currently geared only toward support of the SMF 0 channel-splitting feature. Many of the member are not set to useful value when the MIDI file is read, so we don't handle them for now.

Warning

This function now copies the SysEx data, but the inclusion of SysEx events was not complete in Seq24, and it is still not complete in Sequencer64. Nor does it currently bother with the link the event might have.

Parameters

rhs	Provides the event object to be assigned.

Returns

Returns a reference to "this" object, to support the serial assignment of events.

10.9.4.2 operator<()

```
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::mulitmap instead of an std::list.  Search for occurrences of
the SEQ64_USE_EVENT_MAP macro. (This actually works better than a
list, for loading MIDI event, we have found, but may cause the upper
limit of the number of playing sequences to drop a little, due to the
overhead of incrementing multimap iterators versus list iterators).
```

Parameters

rhs	The object to be compared against.

Returns

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

10.9.4.3 set_timestamp()

```
void seq64::event::set_timestamp (
            midipulse time )  [inline]
```

Parameters

time	Provides the time value, in ticks, to set as the timestamp.

10.9.4.4 get_timestamp()

```
midipulse seq64::event::get_timestamp ( ) const  [inline]
```

10.9.4.5 get_channel()

```
midibyte seq64::event::get_channel ( ) const  [inline]
```

10.9.4.6 check_channel()

```
bool seq64::event::check_channel (
             int channel ) const  [inline]
```

Used in the SMF 0 track-splitting code.

Parameters

channel	The channel to check.

Returns

Returns true if the given channel matches the event's channel.

10.9.4.7 is_channel_msg()

```
static bool seq64::event::is_channel_msg (
            midibyte m )  [inline], [static]
```

This function requires that the channel data have already been masked off.

Parameters

m	The channel status or message byte to be tested, with the channel bits masked off.

We could add an optional boolean to cause the channel nybble to be explicitly cleared.

Returns

Returns true if the byte represents a MIDI channel message.

10.9.4.8 is_one_byte_msg()

```
static bool seq64::event::is_one_byte_msg (
            midibyte m )  [inline], [static]
```

The rest of the channel messages have two data bytes. This function requires that the channel data have already been masked off.

Parameters

m	The channel status or message byte to be tested, with the channel bits masked off.

We could add an optional boolean to cause the channel nybble to be explicitly cleared.

Returns

Returns true if the byte represents a MIDI channel message that has only one data byte. However, if this function returns false, it might not be a channel message at all, so be careful.

10.9.4.9 is_two_byte_msg()

```
static bool seq64::event::is_two_byte_msg (
            midibyte m )  [inline], [static]
```

This function requires that the channel data have already been masked off.

Parameters

m	The channel status or message byte to be tested, with the channel bits masked off.

We could add an optional boolean to cause the channel nybble to be explicitly cleared.

Returns

Returns true if the byte represents a MIDI channel message that has two data bytes. However, if this function returns false, it might not be a channel message at all, so be careful.

10.9.4.10 is_sysex_msg()

```
static bool seq64::event::is_sysex_msg (
            midibyte m )  [inline], [static]
```

Parameters

m	The status/message byte to test, with the channel bits masked off.

10.9.4.11 is_note_msg()

```
static bool seq64::event::is_note_msg (
            midibyte m )  [inline], [static]
```

This function requires that the channel nybble has already been masked off.

Parameters

m	The channel status or message byte to be tested, with the channel bits masked off.

We could add an optional boolean to cause the channel nybble to be explicitly cleared.

Returns

Returns true if the byte represents a MIDI note message.

10.9.4.12 is_strict_note_msg()

```
static bool seq64::event::is_strict_note_msg (
            midibyte m )  [inline], [static]
```

Parameters

m	The channel status or message byte to be tested, with the channel bits masked off.

Returns

Returns true if the byte represents a MIDI note on/off message.

10.9.4.13 is_desired_cc_or_not_cc()

```
static bool seq64::event::is_desired_cc_or_not_cc (
            midibyte m,
            midibyte cc,
            midibyte datum )  [inline], [static]
```

Note

The old logic was the first line, but can be simplified to the second line; the third line shows the abstract representation. Also made sure of this using a couple truth tables.

```
(m != EVENT_CONTROL_CHANGE) || (m == EVENT_CONTROL_CHANGE && d == cc)
(m != EVENT_CONTROL_CHANGE) || (d == cc)
a || (! a && b)  =>  a || b
```

Parameters

m	The channel status or message byte to be tested, with the channel bits masked off.
cc	The desired cc value, which the datum must match, if the message is a control-change message.
datum	The current datum, to be compared to cc, if the message is a control-change message.

Returns

Returns true if the message is not a control-change, or if it is and the cc and datum parameters match.

10.9.4.14 mod_timestamp()

```
void seq64::event::mod_timestamp (
            midipulse modtick )  [inline]
```

Parameters

modtick	The tick value to mod the timestamp against.

Returns

Returns a value ranging from 0 to _mod-1.

10.9.4.15 set_status() [1/2]

```
void seq64::event::set_status (
             midibyte status )
```

If a_status is a channel event, then the channel portion of the status is cleared using a bitwise AND against EVENT↵ _CLEAR_CHAN_MASK. This version is basically the Seq24 version with the additional setting of the Sequencer64-specific m_channel member.

Found in yet another fork of seq24: // ORL fait de la merde He also provided a very similar routine: set_status_↵ midibus().

Stazed:

```
The record parameter, if true, does not clear channel portion
on record for channel specific recording. The channel portion is
cleared in sequence::stream_event() by calling set_status() (a_record
= false) after the matching channel is determined.  Otherwise, we use
a bitwise AND to clear the channel portion of the status.  All events
will be stored without the channel nybble.  This is necessary since
the channel is appended by midibus::play() based on the track.
```

Instead of adding a "record" parameter to set_status(), we provide a more specific function, set_status_keep_↵ channel(), for use in the mastermidibus class. This usage also has the side-effect of allowing the usage of channel in the MIDI-control feature.

Parameters

status	The status byte, perhaps read from a MIDI file or edited in the sequencer's event editor. Sometime, this byte will have the channel nybble masked off. If that is the case, the eventcode/channel overload of this function is more appropriate.

10.9.4.16 set_status() [2/2]

```
void seq64::event::set_status (
             midibyte eventcode,
             midibyte channel )
```

See its usage around line 681 of midifile.cpp.

Parameters

eventcode	The status byte, perhaps read from a MIDI file. This byte is assumed to have already had its low nybble cleared by masking against EVENT_CLEAR_CHAN_MASK.
channel	The channel byte. Combined with the event-code, this makes a valid MIDI "status" byte. This byte is assumed to have already had its high nybble cleared by masking against EVENT_GET_CHAN_MASK.

10.9.4.17 set_meta_status()

```
void seq64::event::set_meta_status (
            midibyte metatype )
```

Meta events have a status byte of EVENT_MIDI_META == 0xff and a channel value that reflects the type of Meta event (e.g. 0x51 for a "Set Tempo" event.

Note that the data bytes (if any) for this event will still need to be added to the event via (for example) the append↵_sysex() or set_sysex() function.

Parameters

metatype	Indicates the type of meta event.

10.9.4.18 set_status_keep_channel()

```
void seq64::event::set_status_keep_channel (
            midibyte eventcode )
```

It replaces stazed's set_status() that had an optional "record" parameter. This call allows channel to be detected and used in MIDI control events. It "keeps" the channel in the status byte.

Todo THIS function WILL set a BOGUS CHANNEL on events >= SYSEX !!!!!

Parameters

eventcode	The status byte, generally read from the MIDI buss.

10.9.4.19 set_channel()

```
void seq64::event::set_channel (
            midibyte channel )  [inline]
```

It actually just sets the m_channel member. Note that the sequence channel generally overrides this value in the usage of the event.

Parameters

channel	The channel byte to be set. It is masked to ensure the value ranges from 0x0 to 0xF. This update should be safe, but we could allow EVENT_NULL_CHANNEL if issues are uncovered.

10.9.4.20 get_status()

```
midibyte seq64::event::get_status ( ) const  [inline]
```

10.9.4.21 non_cc_match()

```
bool seq64::event::non_cc_match (
            midibyte status )  [inline]
```

Parameters

status	The status to be checked.

10.9.4.22 cc_match()

```
bool seq64::event::cc_match (
            midibyte st,
            midibyte cc )  [inline]
```

Parameters

st	The status to be checked.
cc	The control-change value to be checked against the events current "d0" value.

10.9.4.23 set_data() [1/2]

```
void seq64::event::set_data (
            midibyte d1 )  [inline]
```

The second byte of data is zeroed. The data bytes are in a two-byte array member, m_data. This setter is useful for Program Change and Channel Pressure events.

Parameters

d1	The byte value to set as the first data byte.

10.9.4.24 set_data() [2/2]

```
void seq64::event::set_data (
            midibyte d1,
            midibyte d2 )  [inline]
```

Parameters

d1	The first byte value to set.
d2	The second byte value to set.

10.9.4.25 get_data() [1/2]

```
void seq64::event::get_data (
            midibyte & d0 ) const  [inline]
```

Parameters

d0	[out] The return reference for the first byte.

10.9.4.26 get_data() [2/2]

```
void seq64::event::get_data (
            midibyte & d0,
            midibyte & d1 ) const  [inline]
```

Parameters

d0	[out] The return reference for the first byte.
d1	[out] The return reference for the first byte.

10.9.4.27 increment_data1()

```
void seq64::event::increment_data1 ( )  [inline]
```

10.9.4.28 decrement_data1()

```
void seq64::event::decrement_data1 ( )  [inline]
```

10.9.4.29 increment_data2()

```
void seq64::event::increment_data2 ( )  [inline]
```

10.9.4.30 decrement_data2()

```
void seq64::event::decrement_data2 ( )  [inline]
```

10.9.4.31 append_sysex() [1/2]

```
bool seq64::event::append_sysex (
            midibyte * data,
            int dsize )
```

We now use a vector instead of an array, so there is no need for reallocation and copying of the current SYSEX data. The data represented by data and dsize is appended to that data buffer.

Parameters

data	Provides the additional SysEx/Meta data. If not provided, nothing is done, and false is returned.
dsize	Provides the size of the additional SYSEX data. If not provided, nothing is done.

Returns

Returns false if there was an EVENT_MIDI_SYSEX_END byte in the appended data, or if an error occurred, and the caller needs to stop trying to process the data. We're not quite sure what to do with any extra data remains.

10.9.4.32 append_sysex() [2/2]

```
bool seq64::event::append_sysex (
            midibyte data )
```

Parameters

data	A single MIDI byte of data, assumed to be part of a SYSEX message event.

10.9.4.33 append_meta_data() [1/2]

```
bool seq64::event::append_meta_data (
            midibyte metatype,
            midibyte * data,
            int dsize )
```

Similar to append_sysex(), but useful for holding the data for a Meta event. Please note that Meta events and SysEx events shared the same "extended" data buffer that originated to support SysEx.

Also see set_meta_status(), which, like this function, sets the event::m_channel_member to indicate the type of Meta event, but, unlike this function, leaves the data alone. Also note that the set_status() call in midifile flags the event as a Meta event. The handling of Meta events is not yet uniform between all the modules.

Warning

Currently does not clear the "sysex" buffer first.

Parameters

metatype	Provides the type of the Meta event, which is stored in the m_channel member.
data	Provides the Meta event's data. If not provided, nothing is done, and false is returned.
dsize	Provides the size of the data. If not provided, nothing is done.

Returns

Returns false if an error occurred, and the caller needs to stop trying to process the data.

10.9.4.34 append_meta_data() [2/2]

```
bool seq64::event::append_meta_data (
            midibyte metatype,
            const std::vector< midibyte > & data )
```

Parameters

metatype	Provides the type of the Meta event, which is stored in the m_channel member.
data	Provides the Meta event's data as a vector.

Returns

Returns false if an error occurred, and the caller needs to stop trying to process the data.

10.9.4.35 restart_sysex()

```
void seq64::event::restart_sysex ( )
```

(The m_sysex member used to be a pointer.)

10.9.4.36 set_sysex()

```
bool seq64::event::set_sysex (
             midibyte * data,
             int len )  [inline]
```

Parameters

data	Provides the SysEx/Meta data. If not provided, nothing is done, and false is returned.
len	The number of bytes to set.

Returns

Returns true if the function succeeded.

10.9.4.37 get_sysex() [1/2]

```
SysexContainer& seq64::event::get_sysex ( )  [inline]
```

10.9.4.38 get_sysex() [2/2]

```
const SysexContainer& seq64::event::get_sysex ( ) const  [inline]
```

10.9.4.39 set_sysex_size()

```
void seq64::event::set_sysex_size (
             int len )  [inline]
```

10.9.4.40 get_sysex_size()

```
int seq64::event::get_sysex_size ( ) const  [inline]
```

10.9.4.41 link()

```
void seq64::event::link (
             event * ev )  [inline]
```

Parameters

ev	Provides a pointer to the event value to set. If null, then m_has_link is set to false, to guarantee that is_linked() is correct.

10.9.4.42 get_linked()

```
event* seq64::event::get_linked ( ) const  [inline]
```

10.9.4.43 is_linked()

```
bool seq64::event::is_linked ( ) const  [inline]
```

10.9.4.44 clear_link()

```
void seq64::event::clear_link ( )  [inline]
```

10.9.4.45 paint()

```
void seq64::event::paint ( )  [inline]
```

10.9.4.46 unpaint()

```
void seq64::event::unpaint ( )  [inline]
```

10.9.4.47 is_painted()

```
bool seq64::event::is_painted ( ) const  [inline]
```

10.9.4.48 mark()

```
void seq64::event::mark ( )  [inline]
```

10.9.4.49 unmark()

```
void seq64::event::unmark ( )  [inline]
```

10.9.4.50 is_marked()

```
bool seq64::event::is_marked ( ) const  [inline]
```

10.9.4.51 select()

```
void seq64::event::select ( )  [inline]
```

10.9.4.52 unselect()

```
void seq64::event::unselect ( )  [inline]
```

10.9.4.53 is_selected()

```
bool seq64::event::is_selected ( ) const  [inline]
```

10.9.4.54 make_clock()

```
void seq64::event::make_clock ( )  [inline]
```

10.9.4.55 data()

```
midibyte seq64::event::data (
             int index ) const  [inline]
```

10.9.4.56 get_note()

```
midibyte seq64::event::get_note ( ) const  [inline]
```

10.9.4.57 set_note()

```
void seq64::event::set_note (
             midibyte note )  [inline]
```

Parameters

note	Provides the note value to set.

10.9.4.58 transpose_note()

```
void seq64::event::transpose_note (
            int tn )
```

Parameters

tn	The amount (positive or negative) to transpose a note. If the result is out of range, the transposition is not performed.

10.9.4.59 get_note_velocity()

```
midibyte seq64::event::get_note_velocity ( ) const  [inline]
```

10.9.4.60 set_note_velocity()

```
void seq64::event::set_note_velocity (
            int vel )  [inline]
```

Parameters

vel	Provides the velocity value to set.

10.9.4.61 is_note_on()

```
bool seq64::event::is_note_on ( ) const  [inline]
```

Currently assumes that the channel nybble has already been stripped.

Returns

Returns true if m_status is EVENT_NOTE_ON.

10.9.4.62 is_note_off()

```
bool seq64::event::is_note_off ( ) const  [inline]
```

Currently assumes that the channel nybble has already been stripped.

Returns

Returns true if m_status is EVENT_NOTE_OFF.

10.9.4.63 is_note()

```
bool seq64::event::is_note ( ) const  [inline]
```

All of these are notes, associated with a MIDI key value. Uses the static function is_note_msg().

Returns

The return value of is_note_msg() is returned.

10.9.4.64 is_note_off_recorded()

```
bool seq64::event::is_note_off_recorded ( ) const  [inline]
```

The channel nybble is masked off before the test, but this is unnecessary since the velocity byte doesn't contain the channel! And it is a nasty bug!

"(m_data[1] & EVENT_CLEAR_CHAN_MASK) == 0" is wrong!

"m_status == EVENT_NOTE_ON && m_data[1] == 0" replaced by an inline function call for robustness.

Returns

Returns true if the event is a Note On event with velocity of 0.

10.9.4.65 adjust_note_off()

```
void seq64::event::adjust_note_off ( )
```

Note that we call event::set_status_keep_channel() instead of using stazed's set_status function with the "record" parameter. Also, we have to mask in the actual channel number.

Encapsulates some common code. This function assumes we have already set the status and data bytes.

10.9.4.66 is_one_byte()

```
bool seq64::event::is_one_byte ( ) const  [inline]
```

Channel is stripped, because sometimes we keep the channel.

10.9.4.67 is_two_bytes()

```
bool seq64::event::is_two_bytes ( ) const  [inline]
```

Channel is stripped, because sometimes we keep the channel.

10.9.4.68 is_sysex()

```
bool seq64::event::is_sysex ( ) const  [inline]
```

We're overloading the SysEx support to handle Meta events as well. Perhaps we need to split this support out at some point.

10.9.4.69 is_meta()

```
bool seq64::event::is_meta ( ) const  [inline]
```

We're overloading the SysEx support to handle Meta events as well.

10.9.4.70 is_ex_data()

```
bool seq64::event::is_ex_data ( ) const  [inline]
```

If true, then the m_channel byte is used to encode the type of meta event.

10.9.4.71 is_tempo()

```
bool seq64::event::is_tempo ( ) const  [inline]
```

See sm_meta_event_names[].

10.9.4.72 tempo()

```
midibpm seq64::event::tempo ( ) const
```

Remember that we are overloading the SysEx support to hold Meta-event data. Also note that we're treating the vector like an array, which is supposed to work.

Returns

Returns the result of calculating the tempo from the three data bytes. If an error occurs, 0.0 is returned.

10.9.4.73 set_tempo()

```
void seq64::event::set_tempo (
            midibpm tempo )
```

First, we convert beats/minute to a tempo microseconds value. Then we convert the microseconds to threee tempo bytes.

10.9.4.74 is_time_signature()

```
bool seq64::event::is_time_signature ( ) const  [inline]
```

See sm_meta_event_names[].

10.9.4.75 is_key_signature()

```
bool seq64::event::is_key_signature ( ) const  [inline]
```

See sm_meta_event_names[].

10.9.4.76 print()

```
void seq64::event::print ( ) const
```

10.9.4.77 get_rank()

```
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.

10.9.5 Field Documentation

10.9.5.1 m_timestamp

```
midipulse seq64::event::m_timestamp [private]
```

10.9.5.2 m_status

```
midibyte seq64::event::m_status [private]
```

The channel is included when recording MIDI, but, once a sequence with a matching channel is found, the channel nybble is cleared for storage. The channel will be added back on the MIDI bus upon playback. The high nybble = type of event; The low nybble = channel. Bit 7 is present in all status bytes.

Note that, for status values of 0xF0 (Sysex) or 0xFF (Meta), special handling of the event can occur. We would like to eventually use inheritance to keep the event class simple. For now, search for "tempo" and "sysex" to tease out their implementations. Sigh.

10.9.5.3 m_channel

```
midibyte seq64::event::m_channel [private]
```

This member adds another 4 bytes to the event object, most likely.

Overload: For Meta events, where is_meta() is true, this value holds the type of Meta event. See the editable_↵ event::sm_meta_event_names[] array. Note that EVENT_META_ILLEGAL (0xFF) indicates an illegal Meta event.

10.9.5.4 m_data

```
midibyte seq64::event::m_data[SEQ64_MIDI_DATA_BYTE_COUNT] [private]
```

Remember that the most-significant bit of a data byte is always 0. A one-byte message uses only the 0th index.

10.9.5.5 m_sysex

```
SysexContainer seq64::event::m_sysex [private]
```

Adapted from Stazed's Seq32 project on GitHub. This object will also hold the generally small amounts of data needed for Meta events. Compare is_sysex() to is_meta() and is_ex_data() [which tests for both].

10.9.5.6 m_linked

```
event* seq64::event::m_linked [private]
```

10.9.5.7 m_has_link

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

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

10.9.5.8 m_selected

```
bool seq64::event::m_selected  [private]
```

10.9.5.9 m_marked

```
bool seq64::event::m_marked  [private]
```

10.9.5.10 m_painted

```
bool seq64::event::m_painted  [private]
```

10.10 seq64::event_list::event_key Class Reference

Provides a key value for an event map.

Public Member Functions

- event_key (midipulse 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

- midipulse m_timestamp

  The primary key-value for the key.
- int m_rank

  The sub-key-value for the key.

10.10.1 Detailed Description

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

10.10.2 Constructor & Destructor Documentation

10.10.2.1 event_key() [1/2]

```
seq64::event_list::event_key::event_key (
            midipulse tstamp,
            int rank )
```

Parameters

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

10.10.2.2 event_key() [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

rhs	Provides the event key to be copied.

10.10.3 Member Function Documentation

10.10.3.1 operator<()

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

Parameters

rhs	Provides the event key to be compared against.

Returns

Returns true if the rank and timestamp of the current object are less than those of rhs.

10.10.4 Field Documentation

10.10.4.1 m_timestamp

```
midipulse seq64::event_list::event_key::m_timestamp  [private]
```

10.10.4.2 m_rank

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

10.11 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 Types

- typedef std::multimap< event_key, event > Events

  Types to use to swap between list and multimap implementations.
- typedef std::pair< event_key, event > EventsPair
- typedef Events::iterator iterator
- typedef Events::const_iterator const_iterator
- typedef Events::reverse_iterator reverse_iterator
- typedef Events::const_reverse_iterator const_reverse_iterator

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.
- midipulse get_length () const

  Provides the length of the events in MIDI pulses.
- bool empty () const

  Returns true if there are no events.
- bool add (const event &e)

  Adds an event to the internal event list in an optionally sorted manner.
- bool append (const event &e)

  Adds an event to the internal event list without sorting.
- void push_back (const event &)

  The multimap version of this function does nothing.
- bool is_modified () const

  'Getter' function for member m_is_modified
- bool has_tempo () const

  'Getter' function for member m_has_tempo
- bool has_time_signature () const

  'Getter' function for member m_has_time_signature
- void unmodify ()

  'Setter' function for member m_is_modified This function may be needed by some of the sequence editors.
- 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 ()

  Sorts the event list; active only for the std::list implementation.

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 Member Functions

- void link_new ()

  Links a new event.
- void clear_links ()

  Clears all event links and unmarks them all.
- void verify_and_link (midipulse slength)

  This function verifies state: all note-ons have an off, and it links note-offs with their note-ons.
- void link_tempos ()

  This function tries to link tempo events.
- void clear_tempo_links ()

  Clears all tempo event links.
- bool mark_selected ()

  Marks all selected events.
- void mark_out_of_range (midipulse slength)

  Marks all events that have a time-stamp that is out of range.
- void mark_all ()

  Marks all events.
- void unmark_all ()

  Unmarks all events.
- bool remove_marked ()

  Removes marked events.
- void unpaint_all ()

  Unpaints all list-events.
- int count_selected_notes () const

  Counts the selected note-on events in the event list.
- bool any_selected_notes () const

  Indicates that at least one note is selected.
- int count_selected_events (midibyte status, midibyte cc) const

  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 () const

  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.
- bool m_is_modified

  A flag to indicate if an event was added or removed.
- bool m_has_tempo

  A new flag to indicate that a tempo event has been added.
- bool m_has_time_signature

  A new flag to indicate that a time-signature event has been added.

Friends

- class editable_events
- class midifile
- class sequence

10.11.1 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 SEQ64_USE_EVENT_MAP macro near the top of this module.

10.11.2 Member Typedef Documentation

10.11.2.1 Events

```
typedef std::multimap<event_key, event> seq64::event_list::Events
```

10.11.2.2 EventsPair

```
typedef std::pair<event_key, event> seq64::event_list::EventsPair
```

10.11.2.3 iterator

```
typedef Events::iterator seq64::event_list::iterator
```

10.11.2.4 const_iterator

```
typedef Events::const_iterator seq64::event_list::const_iterator
```

10.11.2.5 reverse_iterator

```
typedef Events::reverse_iterator seq64::event_list::reverse_iterator
```

10.11.2.6 const_reverse_iterator

```
typedef Events::const_reverse_iterator seq64::event_list::const_reverse_iterator
```

10.11.3 Constructor & Destructor Documentation

10.11.3.1 event_list() [1/2]

```
seq64::event_list::event_list ( )
```

10.11.3.2 event_list() [2/2]

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

Parameters

rhs	Provides the event list to be copied.

10.11.3.3 ∼event_list()

```
seq64::event_list::∼event_list ( )
```

10.11.4 Member Function Documentation

10.11.4.1 operator=()

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

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

Parameters

rhs	Provides the event list to be assigned.

10.11.4.2 begin() [1/2]

```
iterator seq64::event_list::begin ( ) [inline]
```

10.11.4.3 begin() [2/2]

```
const_iterator seq64::event_list::begin ( ) const [inline]
```

10.11.4.4 end() [1/2]

```
iterator seq64::event_list::end ( ) [inline]
```

10.11.4.5 end() [2/2]

```
const_iterator seq64::event_list::end ( ) const [inline]
```

10.11.4.6 count()

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

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

10.11.4.7 get_length()

```
midipulse seq64::event_list::get_length ( ) const
```

This function gets the iterator for the last element and returns its length value.

Returns

Returns the timestamp of the latest event in the container.

10.11.4.8 empty()

```
bool seq64::event_list::empty ( ) const [inline]
```

return m_events.size() == 0;

10.11.4.9 add()

```
bool seq64::event_list::add (
             const event & e ) [inline]
```

Parameters

e	Provides the event to be added to the list.

Returns

Returns true. We assume the insertion succeeded, and no longer care about an increment in container size. It's a multimap, so it always inserts, and if we don't have memory left, all bets are off anyway.

10.11.4.10 append()

```
bool seq64::event_list::append (
            const event & e )
```

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

The add() function without sorting, useful to speed up the initial container loading into the event-list.

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

If the std::list implementation has been built in, then the event list is not sorted after the addition. This is a time-consuming operation.

We also have to raise some new flags if the event is a Set Tempo or Time Signature event, so that we do not force the current tempo and time-signature when writing the MIDI file.

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 now preferring to use a multimap as the container.

Parameters

e	Provides the event to be added to the list.

Returns

Returns true. We assume the insertion succeeded, and no longer care about an increment in container size. It's a multimap, so it always inserts, and if we don't have memory left, all bets are off anyway.

10.11.4.11 push_back()

```
void seq64::event_list::push_back (
            const event & ) [inline]
```

10.11.4.12 is_modified()

```
bool seq64::event_list::is_modified ( ) const  [inline]
```

10.11.4.13 has_tempo()

```
bool seq64::event_list::has_tempo ( ) const  [inline]
```

10.11.4.14 has_time_signature()

```
bool seq64::event_list::has_time_signature ( ) const  [inline]
```

10.11.4.15 unmodify()

```
void seq64::event_list::unmodify ( )  [inline]
```

But use it with great caution.

10.11.4.16 remove()

```
void seq64::event_list::remove (
             iterator ie )  [inline]
```

Currently, no check on removal is performed. Sets the modified-flag.

Parameters

ie	Provides the iterator to the event to be removed.

10.11.4.17 clear()

```
void seq64::event_list::clear ( )  [inline]
```

Sets the modified-flag.

10.11.4.18 merge()

```
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

el	Provides the event list to be merged into the current event list.
presort	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.

10.11.4.19 sort()

```
void seq64::event_list::sort ( )  [inline]
```

10.11.4.20 dref() [1/2]

```
static event& seq64::event_list::dref (
            iterator ie )  [inline], [static]
```

Parameters

ie	Provides the iterator to the event to which to get a reference.

10.11.4.21 dref() [2/2]

```
static const event& seq64::event_list::dref (
            const_iterator ie ) [inline], [static]
```

Parameters

ie	Provides the iterator to the event to which to get a reference.

10.11.4.22 link_new()

```
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.

10.11.4.23 clear_links()

```
void seq64::event_list::clear_links ( ) [private]
```

10.11.4.24 verify_and_link()

```
void seq64::event_list::verify_and_link (
            midipulse slength ) [private]
```

Stazed (seq32):

```
 This function now deletes any notes that are >= m_length, so any
 resize or move of notes must modify for wrapping if Note Off is >=
 m_length.
```

Not threadsafe As in most case, the caller will use an automutex to call this function safely.

Parameters

slength	Provides the length beyond which events will be pruned.

10.11.4.25 link_tempos()

```
void seq64::event_list::link_tempos ( ) [private]
```

Native support for temp tracks is a new feature of seq64. These links are only in one direction: forward in time, to the next tempo event, if any.

Also, at present, tempo events are not markable.

Not threadsafe As in most case, the caller will use an automutex to call this function safely.

10.11.4.26 clear_tempo_links()

```
void seq64::event_list::clear_tempo_links ( )  [private]
```

10.11.4.27 mark_selected()

```
bool seq64::event_list::mark_selected ( )  [private]
```

Returns

Returns true if there was even one event selected and marked.

10.11.4.28 mark_out_of_range()

```
void seq64::event_list::mark_out_of_range (
            midipulse 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.

Note

This code was comparing the timestamp as greater than or equal to the sequence length. However, being equal is fine. This may explain why the midifile code would add one tick to the length of the last note when processing the end-of-track.

Parameters

slength	Provides the length beyond which events will be pruned.

10.11.4.29 mark_all()

```
void seq64::event_list::mark_all ( )  [private]
```

Not yet used, but might come in handy with the event editor dialog.

10.11.4.30 unmark_all()

```
void seq64::event_list::unmark_all ( ) [private]
```

10.11.4.31 remove_marked()

```
bool seq64::event_list::remove_marked ( ) [private]
```

Note how this function handles removing a value to avoid incrementing a now-invalid iterator.

Threadsafe

Returns

Returns true if at least one event was removed.

10.11.4.32 unpaint_all()

```
void seq64::event_list::unpaint_all ( ) [private]
```

10.11.4.33 count_selected_notes()

```
int seq64::event_list::count_selected_notes ( ) const [private]
```

10.11.4.34 any_selected_notes()

```
bool seq64::event_list::any_selected_notes ( ) const [private]
```

Acts like event_list::count_selected_notes(), but stops after finding a selected note.

Returns

Returns true if at least one note is selected.

10.11.4.35 count_selected_events()

```
int seq64::event_list::count_selected_events (
            midibyte status,
            midibyte cc ) const [private]
```

If the event is a control change (CC), then it must also match the given CC value. The one exception is tempo events, which are always selectable.

Parameters

status	The desired status value to count.
cc	The desired control-change to count. Used only if the status parameter indicates a control-change event.

Returns

Returns the number of selected events.

10.11.4.36 select_all()

```
void seq64::event_list::select_all ( )  [private]
```

10.11.4.37 unselect_all()

```
void seq64::event_list::unselect_all ( )  [private]
```

10.11.4.38 print()

```
void seq64::event_list::print ( ) const  [private]
```

Useful for debugging.

10.11.4.39 events()

```
const Events& seq64::event_list::events ( ) const  [inline], [private]
```

10.11.5 Friends And Related Function Documentation

10.11.5.1 editable_events

```
friend class editable_events  [friend]
```

10.11.5.2 midifile

```
friend class midifile [friend]
```

10.11.5.3 sequence

```
friend class sequence [friend]
```

10.11.6 Field Documentation

10.11.6.1 m_events

```
Events seq64::event_list::m_events [private]
```

10.11.6.2 m_is_modified

```
bool seq64::event_list::m_is_modified [private]
```

We may need to give client code a way to reload the sequence. This is currently an issue when a seqroll and an eventedit/eventslots are active for the same sequence.

10.11.6.3 m_has_tempo

```
bool seq64::event_list::m_has_tempo [private]
```

Legacy behavior forces the tempo to be written to the track-0 sequence, but we don't want to do that if the MIDI file (or the current event list) contains a tempo event.

10.11.6.4 m_has_time_signature

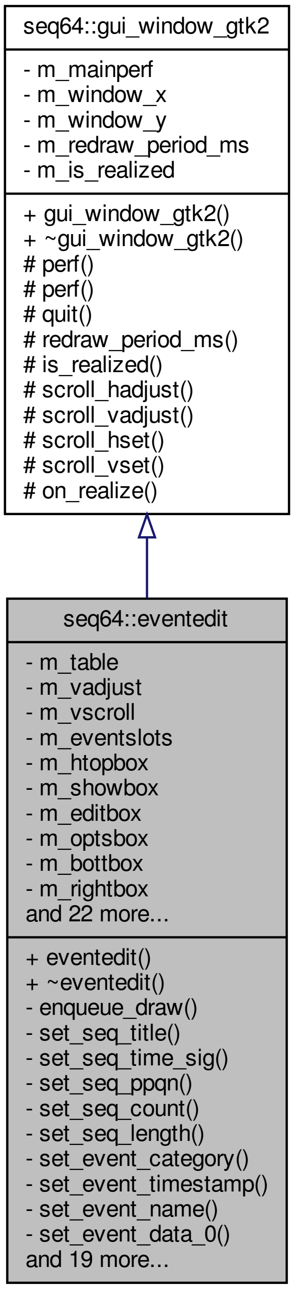
```
bool seq64::event_list::m_has_time_signature [private]
```

Legacy behavior forces the time-signature to be written to the track-0 sequence, but we don't want to do that if the MIDI file (or the current event list) contains a time-signature event.

10.12 seq64::eventedit Class Reference

This class supports an Event Editor that is used to tweak the details of events and get a better idea of the mix of events in a sequence.

Inheritance diagram for seq64::eventedit:



Public Member Functions

- eventedit (perform &p, sequence &seq)

Principal constructor, has a reference to a perform object.
- virtual ∼eventedit ()

    This rote constructor does nothing.

Private Member Functions

- void enqueue_draw ()

    Helper wrapper for calling eventslots::queue_draw().
- void set_seq_title (const std::string &title)

    Sets m_label_seq_name to the title.
- void set_seq_time_sig (const std::string &sig)

    Sets m_label_time_sig to the time-signature string.
- void set_seq_ppqn (const std::string &p)

    Sets m_label_ppqn to the parts-per-quarter-note string.
- void set_seq_count ()

    Sets m_label_ev_count to the number-of-events string.
- void set_seq_length ()

    Sets m_label_seq_length to the number-of-events string.
- void set_event_category (const std::string &c)

    Sets m_label_category to the category string.
- void set_event_timestamp (const std::string &ts)

    Sets m_entry_ev_timestamp to the time-stamp string.
- void set_event_name (const std::string &n)

    Sets m_entry_ev_name to the name-of-event string.
- void set_event_data_0 (const std::string &d)

    Sets m_entry_ev_data_0 to the first data byte string.
- void set_event_data_1 (const std::string &d)

    Sets m_entry_data_1 to the second data byte string.
- void perf_modify ()

    Provides a way to mark the perform object as modified, when the modified sequence is saved.
- void set_dirty (bool flag=true)

    Sets the "modified" status of the user-interface.
- void v_adjustment (int value)

    Sets the parameters for the vertical scroll-bar, using only the value parameter.
- void v_adjustment (int value, int lower, int upper)

    Sets the parameters for the vertical scroll-bar that is associated with the eventslots event-list user-interface.
- void change_focus (bool set_it=true)

    Changes what perform and mainwid see as the "current sequence".
- void close_out ()

    Handles closing the sequence editor, common code for handle_cancel() and handle_close().
- void handle_close ()

    Handles closing the sequence editor.
- void handle_delete ()

    Initiates the deletion of the current editable event.
- void handle_insert ()

    Initiates the insertion of a new editable event.
- void handle_modify ()

    Passes the edited fields to the current editable event in the eventslot.
- void handle_save ()

    Handles saving the edited data back to the original sequence.

- void handle_cancel ()

    Cancels the edits and closes the dialog box.
- void on_realize ()

    This callback function calls the base-class on_realize() function.
- void on_set_focus (Widget ∗focus)

    On receiving focus, attempt to tell mainwid that this sequence is now the current sequence.
- 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)

    This function is the callback for a key-press event.
- bool on_delete_event (GdkEventAny ∗event)

    Handles an on-delete event.

Private Attributes

- Gtk::Table ∗ m_table

    A whole horde of GUI elements.
- Gtk::Adjustment ∗ m_vadjust

    Vertical paging for event list.
- Gtk::VScrollbar ∗ m_vscroll

    Vertical scroll for event list.
- eventslots ∗ m_eventslots

    Drawing area for events.
- Gtk::HBox ∗ m_htopbox

    Padding at the top of the dialog.
- Gtk::VBox ∗ m_showbox

    Area for sequence information.
- Gtk::VBox ∗ m_editbox

    Text-edits and buttons for data.
- Gtk::VBox ∗ m_optsbox

    Reserved for future options.
- Gtk::HBox ∗ m_bottbox

    Holds the Save and Close buttons.
- Gtk::VBox ∗ m_rightbox

    Used for padding on right side.
- Gtk::Button ∗ m_button_del

    "Delete Current Event (∗)" button.
- Gtk::Button ∗ m_button_ins

    "Insert New Event" button.
- Gtk::Button ∗ m_button_modify

    "Modify New Event" button.
- Gtk::Button ∗ m_button_save

    "Save to Sequence" button.
- Gtk::Button ∗ m_button_cancel

    "Close" button.
- Gtk::Label ∗ m_label_seq_name

    Items for the inside of the m_showbox member.
- Gtk::Label ∗ m_label_time_sig

Shows time signature for pattern.

- Gtk::Label ∗ m_label_ppqn

  Shows the parts per quarter note.
- Gtk::Label ∗ m_label_channel

  Shows channel number of pattern.
- Gtk::Label ∗ m_label_ev_count

  Shows the count of pattern events.
- Gtk::Label ∗ m_label_seq_length

  Shows the length of the pattern.
- Gtk::Label ∗ m_label_spacer

  Spacer for the showbox elements.
- Gtk::Label ∗ m_label_modified

  Shows "[Modified]" if edited.
- Gtk::Label ∗ m_label_category

  Items for the inside of the m_editbox member.
- Gtk::Entry ∗ m_entry_ev_timestamp

  Text edit for event time-stamp.
- Gtk::Entry ∗ m_entry_ev_name

  Text edit for MIDI event name.
- Gtk::Entry ∗ m_entry_ev_data_0

  Text edit for first event datum.
- Gtk::Entry ∗ m_entry_ev_data_1

  Text edit for second event datum.
- Gtk::Label ∗ m_label_time_fmt

  Optsbox item, only "Sequencer64".
- Gtk::Label ∗ m_label_right

  Padding at the right of dialog.
- sequence & m_seq

  A reference to the sequence being edited, to control its editing flag.
- bool m_have_focus

  Indicates that the focus has already been changed to this sequence.

Friends

- class eventslots

Additional Inherited Members

10.12.1 Constructor & Destructor Documentation

10.12.1.1 eventedit()

```
seq64::eventedit::eventedit (
            perform & p,
            sequence & seq )
```

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

Adjustment parameters:

```
        value            initial value
        lower            minimum value
        upper            maximum value
        step_increment   step increment
        page_increment   page increment
        page_size        page size
```

```
Table constructor parameters:
```

```
        rows
        columns
        homogenous
```

```
Table attach() parameters:
```

```
        child           widget to add.
        left_attach     column number to attach left side of a child widget
        right_attach    column number to attach right side of a child widget
        top_attach      row number to attach the top of a child widget
        bottom_attach   row number to attach the bottom of a child widget
        xoptions        properties of the child widget when table resized
        yoptions        same as xoptions, except vertical.
        xpadding        padding on L and R of widget added to table
        ypadding        amount of padding above and below the child widget
```

Layout:

```
          0                             1   2                         3   4
           ---------------------------------------------------------------   0
     htop |  (OLD LAYOUT)               :   :                             |
          |---------------------------------------- showbox --------------|  1
  e'slots |  1-120:0:192 Program Change | ^ | "Sequence name"         |   |
          |- - - - - - - - - - - - - - -|   | 4/4 PPQN 192            | r |  2
          |  2-120:1:0   Program Change | s | 9999 events             | i |  3
          |- - - - - - - - - - - - - - -| c |------ editbox ----------| g |  4
          | ...    ...          ...     | r | Channel Event: Ch. 5    | h |
          | ...    ...          ...     | o |- - - - - - - - - - - - -| t |  6
          | ...    ...          ...     | l | [Edit field: Note On  ] |   |
          | ...    ...          ...     | l |- - - - - - - - - - - - -| b |  7
          | ...    ...          ...     |   | [Edit field: Key #    ] | o |
          | ...    ...          ...     | b |- - - - - - - - - - - - -| x |  8
          | ...    ...          ...     | a | [Edit field: Vel #    ] |   |
          | ...    ...          ...     | r |- - - - - - - - - - - - -|   |  9
          | ...    ...          ...     |   | [Optional more data?  ] |   |
          | ...    ...          ...     |   |------ optsbox ----------|   | 10
          | ...    ...          ...     |   |  o Pulses               |   |
          | ...    ...          ...     |   |  o Measures             |   |
          | ...    ...          ...     | v |  o Time                 |   |
          |- - - - - - - - - - - - - - -|   |------ bottbox ----------|   | 13
          | 56-136:3:133 Program Change | v |  | Save |    |  Close | |   |
           ---------------------------------------------------------------  14
```

Parameters

p	Refers to the main performance object.
seq	Refers to the sequence holding the event data to be edited.

The seqedit class indirectly sets the sequence dirty flags, and this allows the sequence's pattern slot to be updated, which, for example, allows the new optional in-edit-highlight feature to work. To get the eventedit to also show the in-edit highlighting, we can make the sequence::set_dirty_mp() call. This call does not cause a prompt for saving the file when exiting.

10.12.1.2 ∼eventedit()

```
seq64::eventedit::∼eventedit ( )  [virtual]
```

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

10.12.2 Member Function Documentation

10.12.2.1 enqueue_draw()

```
void seq64::eventedit::enqueue_draw ( )  [private]
```

10.12.2.2 set_seq_title()

```
void seq64::eventedit::set_seq_title (
            const std::string & title )  [private]
```

Parameters

title	The name of the sequence.

10.12.2.3 set_seq_time_sig()

```
void seq64::eventedit::set_seq_time_sig (
            const std::string & sig )  [private]
```

Parameters

sig	The time signature of the sequence.

10.12.2.4 set_seq_ppqn()

```
void seq64::eventedit::set_seq_ppqn (
            const std::string & p )  [private]
```

Parameters

p	The parts-per-quarter-note string for the sequence.

10.12.2.5 set_seq_count()

```
void seq64::eventedit::set_seq_count ( )  [private]
```

10.12.2.6 set_seq_length()

```
void seq64::eventedit::set_seq_length ( )  [private]
```

m_eventslots->seq().calculate_measures()

10.12.2.7 set_event_category()

```
void seq64::eventedit::set_event_category (
            const std::string & c )  [private]
```

Parameters

c	The category string for the current event.

10.12.2.8 set_event_timestamp()

```
void seq64::eventedit::set_event_timestamp (
            const std::string & ts )  [private]
```

Parameters

ts	The time-stamp string for the current event.

10.12.2.9 set_event_name()

```
void seq64::eventedit::set_event_name (
            const std::string & n )  [private]
```

Parameters

n	The name-of-event string for the current event.

10.12.2.10 set_event_data_0()

```
void seq64::eventedit::set_event_data_0 (
            const std::string & d )  [private]
```

Parameters

d	The first data byte string for the current event.

10.12.2.11 set_event_data_1()

```
void seq64::eventedit::set_event_data_1 (
            const std::string & d )  [private]
```

Parameters

d	The second data byte string for the current event.

10.12.2.12 perf_modify()

```
void seq64::eventedit::perf_modify ( )  [private]
```

10.12.2.13 set_dirty()

```
void seq64::eventedit::set_dirty (
            bool flag = true )  [private]
```

This includes changing a label, enabling/disabling the Save button, and modifying the event count and sequence length (in measures).

Parameters

flag	If true, the modified status is indicated, otherwise it is cleared.

10.12.2.14 v_adjustment() [1/2]

```
void seq64::eventedit::v_adjustment (
             int value )  [private]
```

This function overload provides a common use case.

Parameters

value	The new current value to be indicated by the scroll-bar.

10.12.2.15 v_adjustment() [2/2]

```
void seq64::eventedit::v_adjustment (
             int value,
             int lower,
             int upper )  [private]
```

It keeps the frame scroll-bar in sync with the frame movement actions. Some of the parameters are obtained from the eventslots object:

```
-   Page size comes from eventslots::line_maximum().
-   Page increment is a little less than the page-size value.
```

Parameters

value	The current value to be indicated by the scroll-bar. It will lie between the lower and upper parameter.
lower	The lowest value to be indicated by the scroll-bar.
upper	The highest value to be indicated by the scroll-bar.

10.12.2.16 change_focus()

```
void seq64::eventedit::change_focus (
             bool set_it = true )  [private]
```

Similar to the same function in seqedit.

Parameters

set←_it	If true (the default value), indicates we want focus, otherwise we want to give up focus.

10.12.2.17 close_out()

```
void seq64::eventedit::close_out ( ) [private]
```

10.12.2.18 handle_close()

```
void seq64::eventedit::handle_close ( ) [private]
```

Simply calls close_out().

10.12.2.19 handle_delete()

```
void seq64::eventedit::handle_delete ( ) [private]
```

10.12.2.20 handle_insert()

```
void seq64::eventedit::handle_insert ( ) [private]
```

The event's location will be determined by the timestamp and existing events. Note that we have to recalibrate the scroll-bar when we insert/delete events by calling v_adjustment().

As a new feature, we will allow events to extend the official length of the sequence.

10.12.2.21 handle_modify()

```
void seq64::eventedit::handle_modify ( ) [private]
```

Note that there are two cases to worry about. If the timestamp has not changed, then we can simply modify the existing current event in place. Otherwise, we need to delete the old event and insert the new one. But that is done for us by eventslots::modify_current_event().

10.12.2.22 handle_save()

```
void seq64::eventedit::handle_save ( )  [private]
```

The event list in the original sequence is cleared, and the editable events are converted to plain events, and added to the container, one by one.

Todo Could also support writing the events to a new sequence, for added flexibility.

10.12.2.23 handle_cancel()

```
void seq64::eventedit::handle_cancel ( )  [private]
```

In order for removing the current-highlighting in the mainwd or perfedit windows, some of the work of handle_close() needs to be done here as well.

10.12.2.24 on_realize()

```
void seq64::eventedit::on_realize ( )  [private]
```

Then it sets the vertical adjustment to account for the number of events in the eventslot.

10.12.2.25 on_set_focus()

```
void seq64::eventedit::on_set_focus (
             Widget * focus )  [private]
```

Only works in certain circumstances.

Parameters

focus	The widget that has the focus. Merely passed on to gui_window_gtk2's version of this function.

10.12.2.26 on_focus_in_event()

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

It sets the focus flag and calls change_focus().

10.12.2.27 on_focus_out_event()

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

It resets the focus flag and calls change_focus().

10.12.2.28 on_key_press_event()

```
bool seq64::eventedit::on_key_press_event (
            GdkEventKey * ev )  [private]
```

If the Up or Down arrow is pressed (later, k and j :-), then we tell the eventslots object to move the "current event" highlighting up or down. In Gtkmm, these arrows also cause movement from one edit field to the next, so we disable that process if the event was handled here.

Note that the Delete key is needed for the edit fields. For now, we replace it with the asterisk, which is easy to access from the numeric pad of a keyboard, and allows for rapid deletion. The Insert key also causes confusing effects in the edit fields, so we replaced it by the slash, but that didn't work. Note that the asterisk and slash should not be required in any of the edit fields. HOWEVER, "/" still gets passed the edit fields (!), so you'll just have to click the button to insert an event. Let's try the backslash! No go there, either.

Parameters

ev	The key event to process.

Returns

Returns true if the event got handled somewhere along the line.

10.12.2.29 on_delete_event()

```
bool seq64::eventedit::on_delete_event (
            GdkEventAny * event )  [private]
```

It sets the sequence object's editing flag to false, and deletes "this". This function is called if the "Close" ("X") button in the window's title bar is clicked. That is a different action from clicking the Close button.

Returns

Always returns false.

10.12.3 Friends And Related Function Documentation

10.12.3.1 eventslots

```
friend class eventslots  [friend]
```

10.12.4 Field Documentation

10.12.4.1 m_table

```
Gtk::Table* seq64::eventedit::m_table  [private]
```

Provides the layout table for UI.

10.12.4.2 m_vadjust

```
Gtk::Adjustment* seq64::eventedit::m_vadjust  [private]
```

10.12.4.3 m_vscroll

```
Gtk::VScrollbar* seq64::eventedit::m_vscroll  [private]
```

10.12.4.4 m_eventslots

```
eventslots* seq64::eventedit::m_eventslots  [private]
```

10.12.4.5 m_htopbox

```
Gtk::HBox* seq64::eventedit::m_htopbox  [private]
```

10.12.4.6 m_showbox

```
Gtk::VBox* seq64::eventedit::m_showbox  [private]
```

10.12.4.7 m_editbox

```
Gtk::VBox* seq64::eventedit::m_editbox  [private]
```

10.12.4.8 m_optsbox

```
Gtk::VBox* seq64::eventedit::m_optsbox  [private]
```

10.12.4.9 m_bottbox

```
Gtk::HBox* seq64::eventedit::m_bottbox  [private]
```

10.12.4.10 m_rightbox

```
Gtk::VBox* seq64::eventedit::m_rightbox  [private]
```

10.12.4.11 m_button_del

```
Gtk::Button* seq64::eventedit::m_button_del  [private]
```

10.12.4.12 m_button_ins

```
Gtk::Button* seq64::eventedit::m_button_ins  [private]
```

10.12.4.13 m_button_modify

```
Gtk::Button* seq64::eventedit::m_button_modify  [private]
```

10.12.4.14 m_button_save

```
Gtk::Button* seq64::eventedit::m_button_save  [private]
```

10.12.4.15 m_button_cancel

```
Gtk::Button* seq64::eventedit::m_button_cancel  [private]
```

10.12.4.16 m_label_seq_name

```
Gtk::Label* seq64::eventedit::m_label_seq_name  [private]
```

Shows the name of the pattern.

10.12.4.17 m_label_time_sig

```
Gtk::Label* seq64::eventedit::m_label_time_sig  [private]
```

10.12.4.18 m_label_ppqn

```
Gtk::Label* seq64::eventedit::m_label_ppqn  [private]
```

10.12.4.19 m_label_channel

```
Gtk::Label* seq64::eventedit::m_label_channel  [private]
```

10.12.4.20 m_label_ev_count

```
Gtk::Label* seq64::eventedit::m_label_ev_count  [private]
```

10.12.4.21 m_label_seq_length

```
Gtk::Label* seq64::eventedit::m_label_seq_length  [private]
```

10.12.4.22 m_label_spacer

```
Gtk::Label* seq64::eventedit::m_label_spacer  [private]
```

10.12.4.23 m_label_modified

```
Gtk::Label* seq64::eventedit::m_label_modified  [private]
```

10.12.4.24 m_label_category

```
Gtk::Label* seq64::eventedit::m_label_category  [private]
```

Shows the type of MIDI event.

10.12.4.25 m_entry_ev_timestamp

```
Gtk::Entry* seq64::eventedit::m_entry_ev_timestamp  [private]
```

10.12.4.26 m_entry_ev_name

```
Gtk::Entry* seq64::eventedit::m_entry_ev_name  [private]
```

10.12.4.27 m_entry_ev_data_0

```
Gtk::Entry* seq64::eventedit::m_entry_ev_data_0  [private]
```

10.12.4.28 m_entry_ev_data_1

```
Gtk::Entry* seq64::eventedit::m_entry_ev_data_1  [private]
```

10.12.4.29 m_label_time_fmt

```
Gtk::Label* seq64::eventedit::m_label_time_fmt  [private]
```

10.12.4.30 m_label_right

```
Gtk::Label* seq64::eventedit::m_label_right  [private]
```

10.12.4.31 m_seq

```
sequence& seq64::eventedit::m_seq  [private]
```

10.12.4.32 m_have_focus

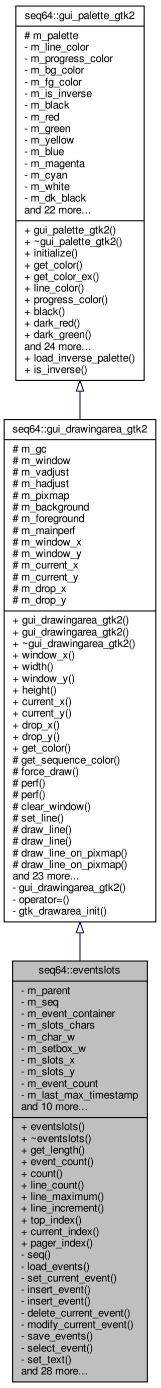
```
bool seq64::eventedit::m_have_focus  [private]
```

This item is to modify the mainwid and perfedit "edit-sequence" value in order to highlight pattern slot of the pattern/event editor that currently has the user-input focus.

10.13 seq64::eventslots Class Reference

This class implements the left-side list of events in the pattern event-edit window.

Inheritance diagram for seq64::eventslots:



Public Member Functions

- eventslots (perform &p, eventedit &parent, sequence &seq, Gtk::Adjustment &vadjust)

  Principal constructor for this user-interface object.
- virtual ∼eventslots ()

  Let's provide a do-nothing virtual destructor.
- midipulse get_length () const

'Getter' function for member m_event_container.get_length()

- int event_count () const

  'Getter' function for member m_event_count Returns the number of total events in the sequence represented by the eventslots object.
- int count () const

  'Getter' function for member m_event_count
- int line_count () const

  'Getter' function for member m_line_count Returns the current number of rows (events) in the eventslots's display.
- int line_maximum () const

  'Getter' function for member m_line_maximum Returns the maximum number of rows (events) in the eventslots's display.
- int line_increment () const

  Provides the "page increment" or "line increment" of the frame, This value is the current line-maximum of the frame minus its overlap value.
- int top_index () const

  'Getter' function for member m_top_index
- int current_index () const

  'Getter' function for member m_current_index
- int pager_index () const

  'Getter' function for member m_pager_index

Private Member Functions

- const sequence & seq () const

  'Getter' function for member m_seq const version
- bool load_events ()

  Grabs the event list from the sequence and uses it to fill the editable-event list.
- void set_current_event (const editable_events::iterator ei, int index, bool full_redraw=true)

  Set the current event, which is the event that is highlighted.
- bool insert_event (const editable_event &edev)

  Inserts an event.
- bool insert_event (const std::string &evtimestamp, const std::string &evname, const std::string &evdata0, const std::string &evdata1)

  Inserts an event based on the setting provided, which the eventedit object gets from its Entry fields.
- bool delete_current_event ()

  Deletes the current event, and makes adjustments due to that deletion.
- bool modify_current_event (const std::string &evtimestamp, const std::string &evname, const std::string &evdata0, const std::string &evdata1)

  Modifies the data in the currently-selected event.
- bool save_events ()

  Writes the events back to the sequence.
- void select_event (int event_index=SEQ64_NULL_EVENT_INDEX, bool full_redraw=true)

  Selects and highlights the event that is located in the frame at the given event index.
- void set_text (const std::string &evcategory, const std::string &evtimestamp, const std::string &evname, const std::string &evdata0, const std::string &evdata1)

  Sets the text in the parent dialog, eventedit.
- void enqueue_draw ()

  Wraps queue_draw().
- int convert_y (int y)

  Converts a y-value into an event index relative to 0 (the top of the eventslots window/pixmap) and returns it.
- void draw_event (editable_events::iterator ei, int index)

Draw the given slot/event.
- void draw_events ()

  Draws all of the events in the current eventslots frame.
- void change_vert ()

  Change the vertical offset of events.
- void page_movement (int new_value)

  Adjusts the vertical position of the frame according to the given new scrollbar/vadjust value.
- void page_topper (editable_events::iterator newcurrent)

  Adjusts the vertical position of the frame according to the given new bottom iterator.
- int decrement_top ()

  Decrements the top iterator, if possible.
- int increment_top ()

  Increments the top iterator, if possible.
- int decrement_current ()

  Decrements the current iterator, if possible.
- int increment_current ()

  Increments the current iterator, if possible.
- int decrement_bottom ()

  Decrements the bottom iterator, if possible.
- int increment_bottom ()

  Increments the bottom iterator, if possible.
- int calculate_measures () const

  This function basically duplicates sequence::calculate_measures().
- 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)

  Currently does nothing.
- bool on_focus_in_event (GdkEventFocus ∗ev)

  This callback is an attempt to get keyboard focus into the eventslots pixmap area.
- bool on_focus_out_event (GdkEventFocus ∗ev)

  This callback handles an out-of-focus event by resetting the flag HAS_FOCUS.
- bool on_scroll_event (GdkEventScroll ∗ev)

  Handle the scrolling of the window.
- void on_size_allocate (Gtk::Allocation &)

  Handles a size-allocation event.
- void on_move_up ()

  Move to the previous event.
- void on_move_down ()

  Move to the next event.
- void on_frame_up ()

  Move to the previous frame.
- void on_frame_down ()

  Move to the next frame.
- void on_frame_home ()

  Move to the first frame.
- void on_frame_end ()

  Move to the last frame.

Private Attributes

- eventedit & m_parent

  Provides a link to the eventedit that created this object.
- sequence & m_seq

  Provides a reference to the sequence that this dialog is meant to view or modify.
- editable_events m_event_container

  Holds the editable events for this sequence.
- int m_slots_chars

  Provides the number of the characters in the name box.
- int m_char_w

  Provides the "real" width of a character.
- int m_setbox_w

  Provides the width of the "set number" box.
- int m_slots_x

  Provides the width of the names box, which is the width of a character for 24 characters.
- int m_slots_y

  Provides the height of the names box, which is hardwired to 24 pixels.
- int m_event_count

  The current number of events in the edited container.
- midipulse m_last_max_timestamp

  Holds the previous length of the edited sequence, in MIDI pulses, so that we can detect changes in the length of the sequence.
- int m_measures

  Holds the current number of measures, for display purposes.
- int m_line_count

  Counts the number of displayed events, which depends on how many events there are (m_event_count) and the size of the event list (m_line_maximum).
- int m_line_maximum

  Counts the maximum number of displayed events, which depends on the size of the event list (and thus the size of the dialog box for the event editor).
- int m_line_overlap

  Provides a little overlap for paging through the frame.
- int m_top_index

  The index of the event that is 0th in the visible list of events.
- int m_current_index

  Indicates the index of the current event within the frame.
- editable_events::iterator m_top_iterator

  Provides the top "pointer" to the start of the editable-events section that is being shown in the user-interface.
- editable_events::iterator m_bottom_iterator

  Provides the bottom "pointer" to the end of the editable-events section that is being shown in the user-interface.
- editable_events::iterator m_current_iterator

  Provides the "pointer" to the event currently in focus.
- int m_pager_index

  Indicates the event index that matches the index value of the vertical pager.

Friends

- class eventedit

Additional Inherited Members

10.13.1 Constructor & Destructor Documentation

10.13.1.1 eventslots()

```
seq64::eventslots::eventslots (
            perform & p,
            eventedit & parent,
            sequence & seq,
            Gtk::Adjustment & vadjust )
```

Parameters

p	The parent perform object.
parent	The parent event-editor object.
seq	Provides the sequence represented by this event-editing object.
vadjust	Provides the vertical-adjustment object, used in updating the window that represents the events being edited.

10.13.1.2 ∼eventslots()

```
virtual seq64::eventslots::∼eventslots ( )  [inline], [virtual]
```

10.13.2 Member Function Documentation

10.13.2.1 get_length()

```
midipulse seq64::eventslots::get_length ( ) const  [inline]
```

10.13.2.2 event_count()

```
int seq64::eventslots::event_count ( ) const  [inline]
```

10.13.2.3 count()

```
int seq64::eventslots::count ( ) const  [inline]
```

10.13.2.4 line_count()

```
int seq64::eventslots::line_count ( ) const  [inline]
```

10.13.2.5 line_maximum()

```
int seq64::eventslots::line_maximum ( ) const  [inline]
```

10.13.2.6 line_increment()

```
int seq64::eventslots::line_increment ( ) const  [inline]
```

10.13.2.7 top_index()

```
int seq64::eventslots::top_index ( ) const  [inline]
```

10.13.2.8 current_index()

```
int seq64::eventslots::current_index ( ) const  [inline]
```

10.13.2.9 pager_index()

```
int seq64::eventslots::pager_index ( ) const  [inline]
```

10.13.2.10 seq()

```
const sequence& seq64::eventslots::seq ( ) const  [inline], [private]
```

10.13.2.11 load_events()

```
bool seq64::eventslots::load_events ( )  [private]
```

Determines how many events can be shown in the GUI [later] and adjusts the top and bottom editable-event iterators to show the first page of events.

Returns

Returns true if the event iterators were able to be set up as valid.

10.13.2.12 set_current_event()

```
void seq64::eventslots::set_current_event (
             const editable_events::iterator ei,
             int index,
             bool full_redraw = true )  [private]
```

Note in the snprintf() calls that the first digit is part of the data byte, so that translation is easier.

Parameters

ei	The iterator that points to the event.
index	The index (re 0) of the event, starting at the top line of the frame. It is a frame index, not a container index.
full_redraw	If true (the default) does a full redraw of the frame. Otherwise, only the current event is drawn. Generally, the only time a single event (actually, two adjacent events) is convenient to draw is when using the arrow keys, where the speed of keystroke auto-repeats makes the full-frame update scrolling very flickery and disconcerting.

10.13.2.13 insert_event() [1/2]

```
bool seq64::eventslots::insert_event (
             const editable_event & edev )  [private]
```

What actually happens here depends if the new event is before the frame, within the frame, or after the frame, based on the timestamp. Also, we want to allow the lengthening of a sequence by inserting an event past its current length. Especially useful for the tempo track.

If before the frame: To keep the previous events visible, we do not need to increment the iterators (insertion does not affect multimap iterators), but we do need to increment their indices. The contents shown in the frame should not change.

If at the frame top: The new timestamp equals the top timestamp. We don't know exactly where the new event goes in the multimap, but we do have an new event.

If at the frame bottom: TODO

If after the frame: No action needed if the bottom event is actually at the bottom of the frame. But if the frame is not yet filled, we need to increment the bottom iterator, and its index.

Note

Actually, it is far easier to just adjust all the counts and iterators and redraw the screen, as done by the page_topper() function.

Parameters

edev	The event to insert, prebuilt.

Returns

Returns true if the event was inserted.

10.13.2.14 insert_event() [2/2]

```
bool seq64::eventslots::insert_event (
            const std::string & evtimestamp,
            const std::string & evname,
            const std::string & evdata0,
            const std::string & evdata1 )  [private]
```

It calls the other insert_event() overload.

Note that we need to qualify the temporary event class object we create below, with the seq64 namespace, otherwise the compiler thinks we're trying to access some Gtkmm thing.

Parameters

evtimestamp	The time-stamp of the new event, as obtained from the event-edit timestamp field.
evname	The type name (status name) of the new event, as obtained from the event-edit event-name field.
evdata0	The first data byte of the new event, as obtained from the event-edit data 1 field.
evdata1	The second data byte of the new event, as obtained from the event-edit data 2 field. Used only for two-parameter events.

Returns

Returns true if the event was inserted.

10.13.2.15 delete_current_event()

```
bool seq64::eventslots::delete_current_event ( )  [private]
```

To delete the current event, this function moves the current iterator to the next event, deletes the previously-current iterator, adjusts the event count and the bottom iterator, and redraws the pixmap. The exact changes depend upon whether the deleted event was at the top of the visible frame, within the visible frame, or at the bottom the visible frame. Note that only visible events can be the current event, and thus get deleted.

```
         Event Index
          0
          1
          2         Top
          3  <--------- Top case: The new top iterator, index becomes 2
          4
          .
          .         Inside of Visible Frame
          .
         43
         44         Bottom
         45  <--------- Top case: The new bottom iterator, index becomes 44
         46             Bottom case: Same result
```

```
Basically, when an event is deleted, the frame (delimited by the
event-index members) stays in place, while the frame iterators move to the
previous event.  If the top of the frame would move to before the first
event, then the frame must shrink.

Top case: If the current iterator is the top (of the frame) iterator, then
the top iterator needs to be incremented.  The new top event has the same
index as the now-gone top event. The index of the bottom event is
decremented, since an event before it is now gone.  The bottom iterator
moves to the next event, which is now at the bottom of the frame.  The
current event is treated like the top event.

Inside case: If the current iterator is in the middle of the frame, the top
iterator and index remain unchanged.  The current iterator is incremented,
but its index is now the same as the old bottom index.  Same for the bottom
iterator.

Bottom case: If the current iterator (and bottom iterator) point to the
last event in the frame, then both of them need to be
decremented.  The frame needs to be moved up by one event, so that the
current event remains at the bottom (it's just simpler to manage that way).

If there is no event after the bottom of the frame, the iterators that now
point to end() must backtrack one event.  If the container becomes empty,
then everything is invalidated.
```

Returns

Returns true if the delete was possible. If the container was empty or became empty, then false is returned.

10.13.2.16 modify_current_event()

```
bool seq64::eventslots::modify_current_event (
             const std::string & evtimestamp,
             const std::string & evname,
             const std::string & evdata0,
             const std::string & evdata1 )  [private]
```

If the timestamp has changed, however, we can't just modify the event in place. Instead, we finish modifying the event, but tell the caller to delete and reinsert the new event (in its proper new location based on timestamp).

This function always copies the original event, modifiies the copy, deletes the original event, and inserts the "new" event into the editable-event container. The insertion takes care of updating any length increase of the sequence.

Parameters

evtimestamp	Provides the new event time-stamp as edited by the user.
evname	Provides the event name as edited by the user.
evdata0	Provides the first data byte as edited by the user.
evdata1	Provides the second data byte as edited by the user.

Returns

Returns true simply if the event-count is greater than 0.

10.13.2.17 save_events()

```
bool seq64::eventslots::save_events ( )  [private]
```

Also sets the dirty flag for the sequence, via the sequence::add_event() function, but this doesn't seem to set the perform dirty flag. So now we pass the modification buck to the parent, who passes it to the perform object.

We added a copy_events() function in the sequence class to replace add_event() for the purpose of reconstructing the events container for the sequence. It is locked by a mutex, and so will not draw until all is done, preventing a nasty segfault (all segfaults are nasty).

We create a new plain event container here, and then passing it to the new locked/threadsafe sequence::copy_↩ events() function that clears the sequence container and copies the events from the parameter container.

Note that this code will operate event if all events were deleted.

Returns

Returns true if the operations succeeded.

10.13.2.18 select_event()

```
void seq64::eventslots::select_event (
             int event_index = SEQ64_NULL_EVENT_INDEX,
             bool full_redraw = true )  [private]
```

The event index is provided by converting the y-coordinate of the mouse pointer into a slot number, and then an event index (actually the slot-distance from the m_top_iterator. Confusing, yes no?

Note that, if the event index is negative, then we just queue up a draw operation, which should paint an empty frame – the event container is empty.

Parameters

event_index	Provides the numeric index of the event in the event frame, or SEQ64_NULL_EVENT if there is no event to draw.
full_redraw	Defaulting to true, this parameter can be set to false in some case to reduce the flickering of the frame under fast movement.

10.13.2.19 set_text()

```
void seq64::eventslots::set_text (
            const std::string & evcategory,
            const std::string & evtimestamp,
            const std::string & evname,
            const std::string & evdata0,
            const std::string & evdata1 )  [private]
```

Parameters

evcategory	The category of event to be set in the parent.
evtimestamp	The event time-stamp to be set in the parent.
evname	The event name to be set in the parent.
evdata0	The first event data byte to be set in the parent.
evdata1	The second event data byte to be set in the parent.

10.13.2.20 enqueue_draw()

```
void seq64::eventslots::enqueue_draw ( )  [private]
```

10.13.2.21 convert_y()

```
int seq64::eventslots::convert_y (
            int y )  [private]
```

Parameters

y	The y coordinate of the position of the mouse click in the eventslot window/pixmap.

Returns

Returns the index of the event position in the user-interface, which should range from 0 to m_line_count.

10.13.2.22 draw_event()

```
void seq64::eventslots::draw_event (
            editable_events::iterator ei,
            int index )  [private]
```

The slot contains the event details in (so far) one line of text in the box:

| timestamp | event kind | channel | data 0 name + value | data 1 name + value

Currently, this view shows only events that get copied to the sequence's event list. This rules out the following items from the view:

```
-   MThd (song header)
-   MTrk and Meta TrkEnd (track marker, a sequence has only one track)
-   SeqNr (sequence number)
-   SeqSpec (but there are three that might appear, see below)
-   Meta TrkName
```

The events that are shown in this view are:

```
-   One-data-value events:
    -   Program Change
    -   Channel Pressure
-   Two-data-value events:
    -   Note Off
    -   Note On
    -   Aftertouch
    -   Control Change
    -   Pitch Wheel
-   Other:
    -   SysEx events, with partial show of data bytes
    -   SeqSpec events (TBD):
        -   Key
        -   Scale
        -   Background sequence
```

The index of the event is shown in the editor portion of the eventedit dialog.

10.13.2.23 draw_events()

```
void seq64::eventslots::draw_events ( )  [private]
```

It first clears the whole bitmap to white, so that no artifacts from the previous state of the frame are left behind.

Need to figure out how to calculate the number of displayable events.

```
m_line_maximum = ???
```

10.13.2.24 change_vert()

```
void seq64::eventslots::change_vert ( )  [private]
```

Note that m_vadjust is the Gtk::Adjustment object that the eventedit parent passes to the gui_drawingarea_gtk2 constructor.

The top-event and bottom-event indices (and their corresponding editable-event iterators) delimit the part of the event container that is displayed in the eventslots user-interface. The top-event index starts at 0, and the bottom-event is larger (initially, by 42 slots).

When the scroll-bar thumb moves up or down, we need to change both event indices and both event iterators by the corresponding amount. Luckily, the std::multimap iterator is bidirectional.

Note that we may need to reduce the movement of events to a value less than a page; it can be limited backwards by the value of the top index, and forward by the value of the bottom index.

10.13.2.25 page_movement()

```
void seq64::eventslots::page_movement (
            int new_value )  [private]
```

The adjustment is done via movement from the current position.

Do we even need a way to detect excess movement? The scrollbar, if properly set up, should never move the frame too high or too low. Verified by testing.

Parameters

new_value	Provides the new value of the scrollbar position.

10.13.2.26 page_topper()

```
void seq64::eventslots::page_topper (
            editable_events::iterator newcurrent )  [private]
```

The adjustment is done "from scratch". We've found page movement to be an insoluable problem in some editing circumstances. So now we move to the inserted event, and make it the top event.

However, always moving an inserted event to the top is a bit annoying. So now we backtrack so that the inserted event is at the bottom.

Parameters

newcurrent	Provides the iterator to the event to be shown at the bottom of the frame.

10.13.2.27 decrement_top()

```
int seq64::eventslots::decrement_top ( )  [private]
```

Returns

Returns 0, or SEQ64_NULL_EVENT_INDEX if the iterator could not be decremented.

10.13.2.28 increment_top()

```
int seq64::eventslots::increment_top ( )  [private]
```

Also handles the top-event index, so that the GUI can display the proper event numbers.

Returns

Returns the top index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be incremented, or would increment to the end of the container.

10.13.2.29 decrement_current()

```
int seq64::eventslots::decrement_current ( )  [private]
```

Returns

Returns the decremented index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be decremented. Remember that the index ranges only from 0 to m_line_count-1, and that is enforced here.

10.13.2.30 increment_current()

```
int seq64::eventslots::increment_current ( )  [private]
```

Returns

Returns the incremented index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be incremented. Remember that the index ranges only from 0 to m_line_count-1, and that is enforced here.

10.13.2.31 decrement_bottom()

```
int seq64::eventslots::decrement_bottom ( )  [private]
```

Returns

Returns 0, or SEQ64_NULL_EVENT_INDEX if the iterator could not be decremented.

10.13.2.32 increment_bottom()

```
int seq64::eventslots::increment_bottom ( )  [private]
```

There is an issue in paging down using the scrollbar where, at the bottom of the scrolling, the bottom iterator ends up bad. Not yet sure how this happens, so for now we backtrack one event if this happens.

Returns

Returns the incremented index, or SEQ64_NULL_EVENT_INDEX if the iterator could not be incremented.

10.13.2.33 calculate_measures()

```
int seq64::eventslots::calculate_measures ( ) const  [private]
```

Returns

Returns the number of measures needed to cover the full length of the current events in the container. The lowest valid measure is 1.

10.13.2.34 on_realize()

```
void seq64::eventslots::on_realize ( )  [private]
```

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

10.13.2.35 on_expose_event()

```
bool seq64::eventslots::on_expose_event (
             GdkEventExpose * ev )  [private]
```

It draws all of the sequences.

10.13.2.36 on_button_press_event()

```
bool seq64::eventslots::on_button_press_event (
             GdkEventButton * ev )  [private]
```

10.13.2.37 on_button_release_event()

```
bool seq64::eventslots::on_button_release_event (
             GdkEventButton * ev )  [private]
```

10.13.2.38 on_focus_in_event()

```
bool seq64::eventslots::on_focus_in_event (
             GdkEventFocus * ev )  [private]
```

See the same function in the perfroll module.

10.13.2.39 on_focus_out_event()

```
bool seq64::eventslots::on_focus_out_event (
            GdkEventFocus * ev )  [private]
```

10.13.2.40 on_scroll_event()

```
bool seq64::eventslots::on_scroll_event (
            GdkEventScroll * ev )  [private]
```

10.13.2.41 on_size_allocate()

```
void seq64::eventslots::on_size_allocate (
            Gtk::Allocation & a )  [private]
```

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

10.13.2.42 on_move_up()

```
void seq64::eventslots::on_move_up ( )  [private]
```

We must scroll up if the event is now before the frame, and should be made the new top event of the frame. Note that this function isn't really an event-response callback. It is called by eventedit::on_key_press_event().

10.13.2.43 on_move_down()

```
void seq64::eventslots::on_move_down ( )  [private]
```

We must scroll down if the event is now after the frame. Note that this function isn't really an event-response callback. It is called byh eventedit::on_key_press_event().

10.13.2.44 on_frame_up()

```
void seq64::eventslots::on_frame_up ( )  [private]
```

10.13.2.45 on_frame_down()

```
void seq64::eventslots::on_frame_down ( )  [private]
```

10.13.2.46 on_frame_home()

```
void seq64::eventslots::on_frame_home ( )  [private]
```

10.13.2.47 on_frame_end()

```
void seq64::eventslots::on_frame_end ( )  [private]
```

10.13.3 Friends And Related Function Documentation

10.13.3.1 eventedit

```
friend class eventedit  [friend]
```

10.13.4 Field Documentation

10.13.4.1 m_parent

```
eventedit& seq64::eventslots::m_parent  [private]
```

10.13.4.2 m_seq

```
sequence& seq64::eventslots::m_seq  [private]
```

10.13.4.3 m_event_container

```
editable_events seq64::eventslots::m_event_container  [private]
```

This container is what is edited, and any changes made to it are not saved to the container until the user pushes the "save" button.

10.13.4.4 m_slots_chars

```
int seq64::eventslots::m_slots_chars  [private]
```

Pretty much hardwired to 64 at present. It helps determine the m_slots_x value (the width of the eventslots list).

10.13.4.5 m_char_w

```
int seq64::eventslots::m_char_w  [private]
```

This value is obtained from a font-renderer accessor function.

10.13.4.6 m_setbox_w

```
int seq64::eventslots::m_setbox_w  [private]
```

This used to be hardwired to 6 $*$ 2 (character-width times two).

10.13.4.7 m_slots_x

```
int seq64::eventslots::m_slots_x  [private]
```

10.13.4.8 m_slots_y

```
int seq64::eventslots::m_slots_y  [private]
```

This value was once 22 pixels, but we need a little extra room for our new font. This extra room is compatible enough with the old font, as well.

10.13.4.9 m_event_count

```
int seq64::eventslots::m_event_count  [private]
```

10.13.4.10 m_last_max_timestamp

```
midipulse seq64::eventslots::m_last_max_timestamp  [private]
```

10.13.4.11 m_measures

```
int seq64::eventslots::m_measures [private]
```

10.13.4.12 m_line_count

```
int seq64::eventslots::m_line_count [private]
```

10.13.4.13 m_line_maximum

```
int seq64::eventslots::m_line_maximum [private]
```

10.13.4.14 m_line_overlap

```
int seq64::eventslots::m_line_overlap [private]
```

10.13.4.15 m_top_index

```
int seq64::eventslots::m_top_index [private]
```

It is used in numbering the events that are shown in the event-slot frame. Do not confuse it with m_current_index, which is relative to the frame, not the container-beginning.

10.13.4.16 m_current_index

```
int seq64::eventslots::m_current_index [private]
```

This event will also be pointed to by the m_current_event iterator. Do not confuse it with m_top_index, which is relative to the container-beginning, not the frame.

10.13.4.17 m_top_iterator

```
editable_events::iterator seq64::eventslots::m_top_iterator [private]
```

10.13.4.18 m_bottom_iterator

```
editable_events::iterator seq64::eventslots::m_bottom_iterator  [private]
```

10.13.4.19 m_current_iterator

```
editable_events::iterator seq64::eventslots::m_current_iterator  [private]
```

10.13.4.20 m_pager_index

```
int seq64::eventslots::m_pager_index  [private]
```

10.14 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,
  BLACK_ON_CYAN,
  CYAN_ON_BLACK }

    A simple enumeration to describe the basic colors used in writing text.

Public Member Functions

- font ()

    Rote default constructor, except that it does add 1 to the cf_text_h or co_text_h values to use in m_padded_h.
- void init (Glib::RefPtr< Gdk::Window > windo)

    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 > drawable, const char ∗str, font::Color col, bool invert=false) const

    Draws a text string.
- int char_width () const

    'Getter' function for member m_font_w
- int char_height () const

    'Getter' function for member m_font_h
- int padded_height () const

    'Getter' function for member m_padded_h

Private Attributes

- bool m_use_new_font

  If true, use the new font, which is a little bit more modern looking, and is also thicker, and thus a little easier to see.
- int m_cell_w

  Specifies the cell width of the whole character cell.
- int m_cell_h

  Specfies the cell height of the whole character cell.
- int m_font_w

  Specifies the exact width of a character cell, in pixels.
- int m_font_h

  Specifies the exact height of a character cell, in pixels.
- int m_offset

  Provides an ad hoc small horizontal or vertical offset for printing strings.
- int m_padded_h

  Provides a common constant used by much of the drawing code, but only marginally related to the padded character height.
- const 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_w.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::Pixmap > m_b_on_c_pixmap

  The pixmap in the file `src/pixmaps/cyan_wenfont_y.xpm` *is loaded into this object.*
- Glib::RefPtr< Gdk::Pixmap > m_c_on_b_pixmap

  The pixmap in the file `src/pixmaps/cyan_wenfont_yb.xpm` *is loaded into this object.*
- Glib::RefPtr< Gdk::Bitmap > m_clip_mask

  This object is instantiated as a default object.

10.14.1 Member Enumeration Documentation

10.14.1.1 Color

`enum seq64::font::Color`

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). Oh, and couple more for cyan and black text-blitting.

Enumerator

BLACK	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.
BLACK_ON_CYAN	A new color, for drawing black text on a cyan background.
CYAN_ON_BLACK	A new color, for drawing cyan text on a black background.

10.14.2 Constructor & Destructor Documentation

10.14.2.1 font()

```
seq64::font::font ( )
```

10.14.3 Member Function Documentation

10.14.3.1 init()

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

This function loads four pixmaps that contain the characters to be used to draw text strings.

One pixmap has white characters on a black background, one has black characters on a white background, one has yellow characters on a black background, and one has black characters on a yellow background.

Todo Can we scale these images via scale_simple(newwidth, newhight, Gtk::INTERP_BILINEAR)

Parameters

wp	Provides the windows pointer for the window that holds the color map.

10.14.3.2 render_string_on_drawable()

```
void seq64::font::render_string_on_drawable (
            Glib::RefPtr< Gdk::GC > gc,
            int x,
            int y,
            Glib::RefPtr< Gdk::Drawable > adraw,
            const char * str,
            font::Color col,
            bool invert = false ) const
```

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

gc	Provides the graphics context for drawing the text using GTK+.

Parameters

x	The horizontal location of the text.
y	The vertical location of the text.
adraw	The drawable object on which to draw the text.
str	The string to draw. Should use a constant string reference instead.
col	The font color to use to draw the string. The supported values are font::BLACK, font::WHITE, font::BLACK_ON_YELLOW, font::YELLOW_ON_BLACK. The actual correct colors are provided by selecting one of four font pixmaps, as described in the init() function.
invert	If true, apply color inversion, if specified.

10.14.3.3 char_width()

```
int seq64::font::char_width ( ) const  [inline]
```

10.14.3.4 char_height()

```
int seq64::font::char_height ( ) const  [inline]
```

10.14.3.5 padded_height()

```
int seq64::font::padded_height ( ) const  [inline]
```

10.14.4 Field Documentation

10.14.4.1 m_use_new_font

```
bool seq64::font::m_use_new_font  [private]
```

10.14.4.2 m_cell_w

```
int seq64::font::m_cell_w  [private]
```

10.14.4.3 m_cell_h

```
int seq64::font::m_cell_h  [private]
```

10.14.4.4 m_font_w

```
int seq64::font::m_font_w  [private]
```

Currently defaults to cf_text_w = 6. Note that a lot of stuff depends on this being 6 at present, even with our new, slightly wider, font.

10.14.4.5 m_font_h

```
int seq64::font::m_font_h  [private]
```

Currently defaults to cf_text_h = 10. Note that a lot of stuff depends on this being 10 at present, even with our new, slightly wider, font. But some of the drawing code doesn't use the character height, but the padded character height.

10.14.4.6 m_offset

```
int seq64::font::m_offset  [private]
```

10.14.4.7 m_padded_h

```
int seq64::font::m_padded_h  [private]
```

10.14.4.8 m_pixmap

```
const Glib::RefPtr<Gdk::Pixmap>* seq64::font::m_pixmap  [mutable], [private]
```

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

10.14.4.9 m_black_pixmap

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

It contains a black font on a white background. The new-style font, if selected, is in the `resources/pixmaps/wenfont↩ _b.xmp` pixmap.

10.14.4.10 m_white_pixmap

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

It contains a black font on a white background. The new-style font, if selected, is in the `resources/pixmaps/wenfont↩ _w.xmp` pixmap.

10.14.4.11 m_b_on_y_pixmap

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

It contains a black font on a yellow background. The new-style font, if selected, is in the `resources/pixmaps/wenfont↩ _y.xmp` pixmap.

10.14.4.12 m_y_on_b_pixmap

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

It contains a yellow font on a black background. The new-style font, if selected, is `resources/pixmaps/wenfont↩ _yb.xmp` pixmap.

10.14.4.13 m_b_on_c_pixmap

```
Glib::RefPtr<Gdk::Pixmap> seq64::font::m_b_on_c_pixmap  [private]
```

It contains a black font on a cyan background. It is available only for the new font-style.

10.14.4.14 m_c_on_b_pixmap

```
Glib::RefPtr<Gdk::Pixmap> seq64::font::m_c_on_b_pixmap  [private]
```

It contains a cyan font on a black background. It is available only for the new font-style.

10.14.4.15 m_clip_mask

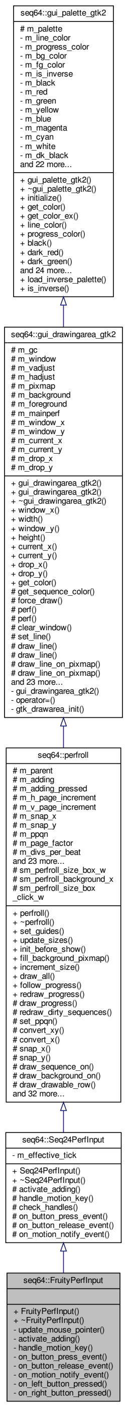
```
Glib::RefPtr<Gdk::Bitmap> seq64::font::m_clip_mask  [private]
```

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

10.15 seq64::FruityPerfInput Class Reference

Implements the performance input of that certain fruity sequencer that people seem to like.

Inheritance diagram for seq64::FruityPerfInput:



Public Member Functions

- FruityPerfInput (perform &perf, perfedit &parent, Gtk::Adjustment &hadjust, Gtk::Adjustment &vadjust, int ppqn=SEQ64_USE_DEFAULT_PPQN)

Principal constructor.

- ∼FruityPerfInput ()

  virtual destructor

Private Member Functions

- void update_mouse_pointer ()

  Updates the mouse pointer, implementing a context-sensitive mouse.
- virtual void activate_adding (bool)
- virtual bool handle_motion_key (bool)
- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Handles a button-press event in the Fruity manner.
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Handles a button-release event.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Handles a Fruity motion-notify event.
- virtual bool on_left_button_pressed (GdkEventButton ∗ev)

  Handles the left button of the mouse.
- virtual bool on_right_button_pressed (GdkEventButton ∗ev)

  Handles the right button of the mouse.

Additional Inherited Members

10.15.1 Constructor & Destructor Documentation

10.15.1.1 FruityPerfInput()

```
seq64::FruityPerfInput::FruityPerfInput (
            perform & p,
            perfedit & parent,
            Gtk::Adjustment & hadjust,
            Gtk::Adjustment & vadjust,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

Parameters

p	The perform object that this class will affect via user interaction.
parent	The perfedit object that holds this user-interface class.
hadjust	A horizontal adjustment object, passed along to the perfroll class.
vadjust	A vertical adjustment object, passed along to the perfroll class.
ppqn	The "resolution" of the MIDI file, used in zooming and scaling.

10.15.1.2 ∼FruityPerfInput()

```
seq64::FruityPerfInput::∼FruityPerfInput ( )  [inline]
```

10.15.2 Member Function Documentation

10.15.2.1 update_mouse_pointer()

```
void seq64::FruityPerfInput::update_mouse_pointer ( )  [private]
```

Note that perform::convert_xy() returns its values via side-effects on the last two parameters.

10.15.2.2 activate_adding()

```
virtual void seq64::FruityPerfInput::activate_adding (
             bool   )  [inline], [private], [virtual]
```

Reimplemented from seq64::Seq24PerfInput.

10.15.2.3 handle_motion_key()

```
virtual bool seq64::FruityPerfInput::handle_motion_key (
             bool   )  [inline], [private], [virtual]
```

Reimplemented from seq64::Seq24PerfInput.

10.15.2.4 on_button_press_event()

```
bool seq64::FruityPerfInput::on_button_press_event (
             GdkEventButton * ev )  [private], [virtual]
```

Parameters

ev	The button-press event to process.

Returns

Returns true if a modification occurred.

Reimplemented from seq64::Seq24PerfInput.

10.15.2.5 on_button_release_event()

```
bool seq64::FruityPerfInput::on_button_release_event (
             GdkEventButton * ev )  [private], [virtual]
```

Why is m_adding_pressed modified conditionally when the same modification is then made unconditionally?

Parameters

ev	The button-release event to process.

Returns

Returns true if a modification occurred.

Reimplemented from seq64::Seq24PerfInput.

10.15.2.6 on_motion_notify_event()

```
bool seq64::FruityPerfInput::on_motion_notify_event (
             GdkEventMotion * ev )  [private], [virtual]
```

Parameters

ev	The motion-notify event to process.

Returns

Returns true if a modification occurred, and sets the perform modified flag based on that result.

Reimplemented from seq64::Seq24PerfInput.

10.15.2.7 on_left_button_pressed()

```
bool seq64::FruityPerfInput::on_left_button_pressed (
             GdkEventButton * ev )  [private], [virtual]
```

It can handle splitting triggers (?), adding notes, and the following clicks to resize the event, or move it, depending on where clicked:

```
-   clicked left side: begin a grow/shrink for the left side
-   clicked right side: grow/shrink the right side
-   clicked in the middle - move it
```

I don't get it, though... all three buttons are handled in the generic button-press callback. Oh, this is just a helper function.

Parameters

ev	The left-button-press event to process.

Returns

Now returns true if a modification occurred.

10.15.2.8 on_right_button_pressed()

```
bool seq64::FruityPerfInput::on_right_button_pressed (
            GdkEventButton * ev )  [private], [virtual]
```

I don't get it, though... all three buttons are handled in the generic button-press callback. Oh, this is a helper function.

Parameters

ev	The right-button-press event to process.

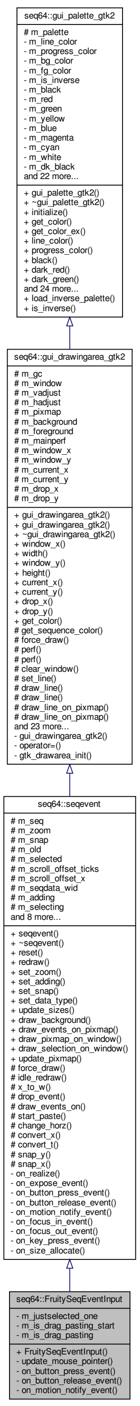
Returns

Returns true if a modification occurred.

10.16 seq64::FruitySeqEventInput Class Reference

This class implements the interaction methods for the "fruity" mode of operation in the event panel of the seqroll.

Inheritance diagram for seq64::FruitySeqEventInput:



Public Member Functions

- FruitySeqEventInput (perform &p, sequence &seq, int zoom, int snap, seqdata &seqdata_wid, Gtk::↩
Adjustment &hadjust)

Private Member Functions

- virtual void update_mouse_pointer ()

Provides support for a context-sensitive mouse.

- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Implements the on-button-press event callback.
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Implements the on-button-release callback.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Implements the on-motion-notify callback.

Private Attributes

- bool m_justselected_one

  Indicates that the left mouse button was click to start a selection.
- bool m_is_drag_pasting_start

  Set to true when the mouse button is pressed and we're starting to drag some notes to move them and paste them to a different location.
- bool m_is_drag_pasting

  Set to true when the left mouse button is pressed for dragging and pasting, set to false when the mouse button is released to drop the pasted items.

Additional Inherited Members

10.16.1 Constructor & Destructor Documentation

10.16.1.1 FruitySeqEventInput()

```
seq64::FruitySeqEventInput::FruitySeqEventInput (
             perform & p,
             sequence & seq,
             int zoom,
             int snap,
             seqdata & seqdata_wid,
             Gtk::Adjustment & hadjust )
```

10.16.2 Member Function Documentation

10.16.2.1 update_mouse_pointer()

```
void seq64::FruitySeqEventInput::update_mouse_pointer ( )  [private], [virtual]
```

10.16.2.2 on_button_press_event()

```
bool seq64::FruitySeqEventInput::on_button_press_event (
            GdkEventButton * ev )  [private], [virtual]
```

Handles dragging and other actions.

The first thing is to set the values for dragging, then reset the box that holds the dirty redraw spot. If pasting, undo the clipboard, and paste the selected events.

Otherwise, process the mouse actions. The current steps shown below are my initial guesses, to be verified at some point.

1. Left button:
   (a) Click:
      i. A click and release without a drag, or without a Ctrl-Shift, deselects the events.
      ii. A direct click on an event selects only that event.
   (b) Click-drag:
      i. If events already selected, adds note and length to the selected notes.
      ii. Otherwise, select the notes and events.
      iii. If no events selected in the end, undo the selection.

- Ctrl-left button:
  - TODO.

The opening part of this function matches that of Seq24SeqEventInput :: on_button_press_event().

Parameters

ev	The button event for the press of a mouse button.

Returns

Returns true if a modification was made. It used to return true all the time.

Reimplemented from seq64::seqevent.

10.16.2.3 on_button_release_event()

```
bool seq64::FruitySeqEventInput::on_button_release_event (
            GdkEventButton * ev )  [private], [virtual]
```

Parameters

ev	The button event for the press of a mouse button.

Returns

Returns true if a modification was made. It used to return true all the time.

Reimplemented from seq64::seqevent.

10.16.2.4 on_motion_notify_event()

```
bool seq64::FruitySeqEventInput::on_motion_notify_event (
            GdkEventMotion * ev ) [private], [virtual]
```

Parameters

ev	The button event for the press of a mouse button.

Returns

Returns true if a modification occurred, and sets the perform modified flag based on that result.

Reimplemented from seq64::seqevent.

10.16.3 Field Documentation

10.16.3.1 m_justselected_one

```
bool seq64::FruitySeqEventInput::m_justselected_one [private]
```

10.16.3.2 m_is_drag_pasting_start

```
bool seq64::FruitySeqEventInput::m_is_drag_pasting_start [private]
```

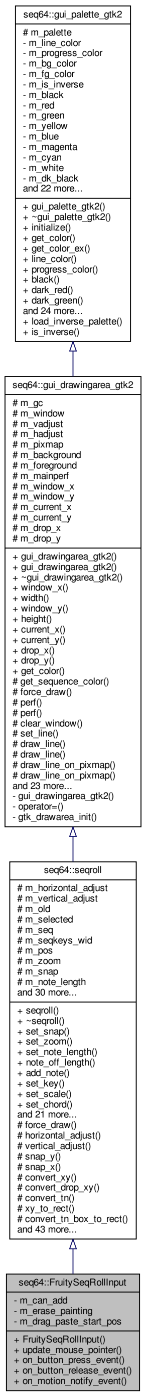
10.16.3.3 m_is_drag_pasting

```
bool seq64::FruitySeqEventInput::m_is_drag_pasting [private]
```

10.17 seq64::FruitySeqRollInput Class Reference

Implements the fruity mouse interaction paradigm for the seqroll.

Inheritance diagram for seq64::FruitySeqRollInput:



Public Member Functions

- FruitySeqRollInput (perform &perf, sequence &seq, int zoom, int snap, seqkeys &seqkeys_wid, int pos, Gtk↩ ::Adjustment &hadjust, Gtk::Adjustment &vadjust)

Default constructor.
- virtual void update_mouse_pointer (bool isadding)

  Updates the mouse pointer, implementing a context-sensitive mouse.
- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Implements the fruity on-button-press callback.
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Implements the fruity handling for the on-button-release event.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Implements the fruity handling for the on-motion-notify event.

Private Attributes

- bool m_can_add

  Indicates adding status peculiar to the fruity mode.
- bool m_erase_painting

  Set to tru if we hold the right mouse button down (in "fruity" mode) and start to drag the mouse around, erasing notes.
- int m_drag_paste_start_pos [2]

  Holds the original position of the mouse when ctrl-left-click-drag is done, and is used to make sure that the action doesn't occur until a movement of at least 6 pixels has occurred, to avoid unintended actions caused by minimal jitter in the user's hands.

Additional Inherited Members

10.17.1 Constructor & Destructor Documentation

10.17.1.1 FruitySeqRollInput()

```
seq64::FruitySeqRollInput::FruitySeqRollInput (
             perform & perf,
             sequence & seq,
             int zoom,
             int snap,
             seqkeys & seqkeys_wid,
             int pos,
             Gtk::Adjustment & hadjust,
             Gtk::Adjustment & vadjust )
```

10.17.2 Member Function Documentation

10.17.2.1 update_mouse_pointer()

```
void seq64::FruitySeqRollInput::update_mouse_pointer (
             bool isadding )  [virtual]
```

This code is very similar to the base class version.

10.17.2.2 on_button_press_event()

```
bool seq64::FruitySeqRollInput::on_button_press_event (
             GdkEventButton * ev )  [virtual]
```

This function now uses the needs_update flag to determine if the perform object should modify().

Parameters

ev	The button event.

Returns

Returns the value of needs_update. It used to return only true.

Reimplemented from seq64::seqroll.

10.17.2.3 on_button_release_event()

```
bool seq64::FruitySeqRollInput::on_button_release_event (
             GdkEventButton * ev )  [virtual]
```

Parameters

ev	The button event.

Returns

Returns the value of needs_update. It used to return only true.

If in moving mode, adjust for snap and convert deltas into screen coordinates. Since delta_note was from delta_y, it will be flipped (delta_y[0] = note[127], etc.), so we have to adjust.

Reimplemented from seq64::seqroll.

10.17.2.4 on_motion_notify_event()

```
bool seq64::FruitySeqRollInput::on_motion_notify_event (
             GdkEventMotion * ev )  [virtual]
```

Why not just inherit and save all these indirect accesses to the seqroll? Well, that would make it more difficult to change the mode of interation, in the Options menu, on the fly. We did it anyway. One will hardly ever change the mouse interaction mode.

Parameters

ev	The motion event.

Returns

Returns the value of needs_update.

In "fruity" interatction mode, ctrl-left-click-drag on selected note(s) starts a copy/unselect/paste. Doesn't begin the paste until the mouse moves a few pixels, to filter out the unsteady hand.

Reimplemented from seq64::seqroll.

10.17.3 Field Documentation

10.17.3.1 m_can_add

```
bool seq64::FruitySeqRollInput::m_can_add  [private]
```

Currently always true.

10.17.3.2 m_erase_painting

```
bool seq64::FruitySeqRollInput::m_erase_painting  [private]
```

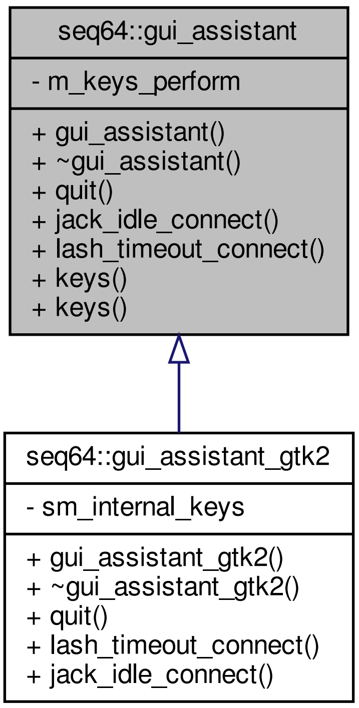
10.17.3.3 m_drag_paste_start_pos

```
int seq64::FruitySeqRollInput::m_drag_paste_start_pos[2]  [private]
```

10.18 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.
- virtual void quit ()

  Handles the GUI's exiting.
- virtual void jack_idle_connect (jack_assistant &)

  Handles connecting the "idle" signal to the session-event function.
- virtual void lash_timeout_connect (lash ∗)

  Handles connecting the "timeout" signal to the process-event function.
- 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.

10.18.1 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).

10.18.2 Constructor & Destructor Documentation

10.18.2.1 gui_assistant()

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

Parameters

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

10.18.2.2 ∼gui_assistant()

```
virtual seq64::gui_assistant::∼gui_assistant ( )  [inline], [virtual]
```

10.18.3 Member Function Documentation

10.18.3.1 quit()

```
virtual void seq64::gui_assistant::quit ( )  [inline], [virtual]
```

However, with the new command-line support, we now need a default implementation that does nothing.

Reimplemented in seq64::gui_assistant_gtk2.

10.18.3.2 jack_idle_connect()

```
virtual void seq64::gui_assistant::jack_idle_connect (
             jack_assistant & )  [inline], [virtual]
```

But we now need a default implementation that does nothing.

Reimplemented in seq64::gui_assistant_gtk2.

10.18.3.3 lash_timeout_connect()

```
virtual void seq64::gui_assistant::lash_timeout_connect (
             lash * )  [inline], [virtual]
```

But we now need a default implementation that does nothing.

Reimplemented in seq64::gui_assistant_gtk2.

10.18.3.4 keys() [1/2]

```
const keys_perform& seq64::gui_assistant::keys ( ) const  [inline]
```

10.18.3.5 keys() [2/2]

```
keys_perform& seq64::gui_assistant::keys ( )  [inline]
```

10.18.4 Field Documentation

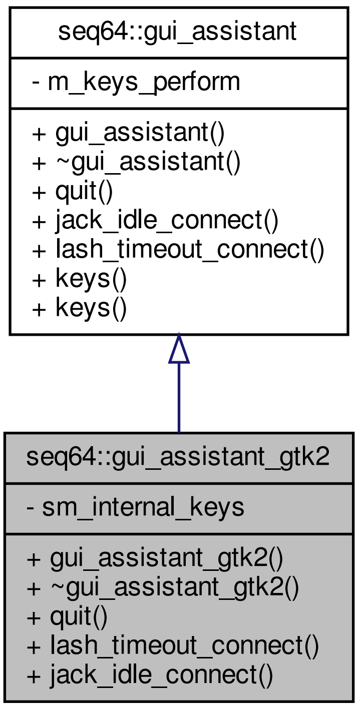
10.18.4.1 m_keys_perform

```
keys_perform& seq64::gui_assistant::m_keys_perform  [private]
```

10.19 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 ∼gui_assistant_gtk2 ()

  Virtual classes require a virtual destructor.
- virtual void quit ()

  Calls the Glib Main object's quit() function.
- virtual void lash_timeout_connect (lash ∗lashobject)

  Connects the LASH timeout-event callback to the Glib timeout object.
- virtual void jack_idle_connect (jack_assistant &jack)

  Connects the JACK session-event callback to the Glib idle object.

Static Private Attributes

- static keys_perform_gtk2 sm_internal_keys

  Provides a pre-made keys_perform object.

10.19.1 Constructor & Destructor Documentation

10.19.1.1 gui_assistant_gtk2()

```
seq64::gui_assistant_gtk2::gui_assistant_gtk2 ( )
```

10.19.1.2 ∼gui_assistant_gtk2()

```
virtual seq64::gui_assistant_gtk2::∼gui_assistant_gtk2 ( )  [inline], [virtual]
```

10.19.2 Member Function Documentation

10.19.2.1 quit()

```
void seq64::gui_assistant_gtk2::quit ( )  [virtual]
```

Reimplemented from seq64::gui_assistant.

10.19.2.2 lash_timeout_connect()

```
void seq64::gui_assistant_gtk2::lash_timeout_connect (
            lash * lashobject )  [virtual]
```

The time-out value is set to 250 ms.

Reimplemented from seq64::gui_assistant.

10.19.2.3 jack_idle_connect()

```
void seq64::gui_assistant_gtk2::jack_idle_connect (
            jack_assistant & jack )  [virtual]
```

If JACK session support is not enabled, we might emit a message. This mainly prevents a compiler warning about an unused parameter.

Reimplemented from seq64::gui_assistant.

10.19.3 Field Documentation

10.19.3.1 sm_internal_keys

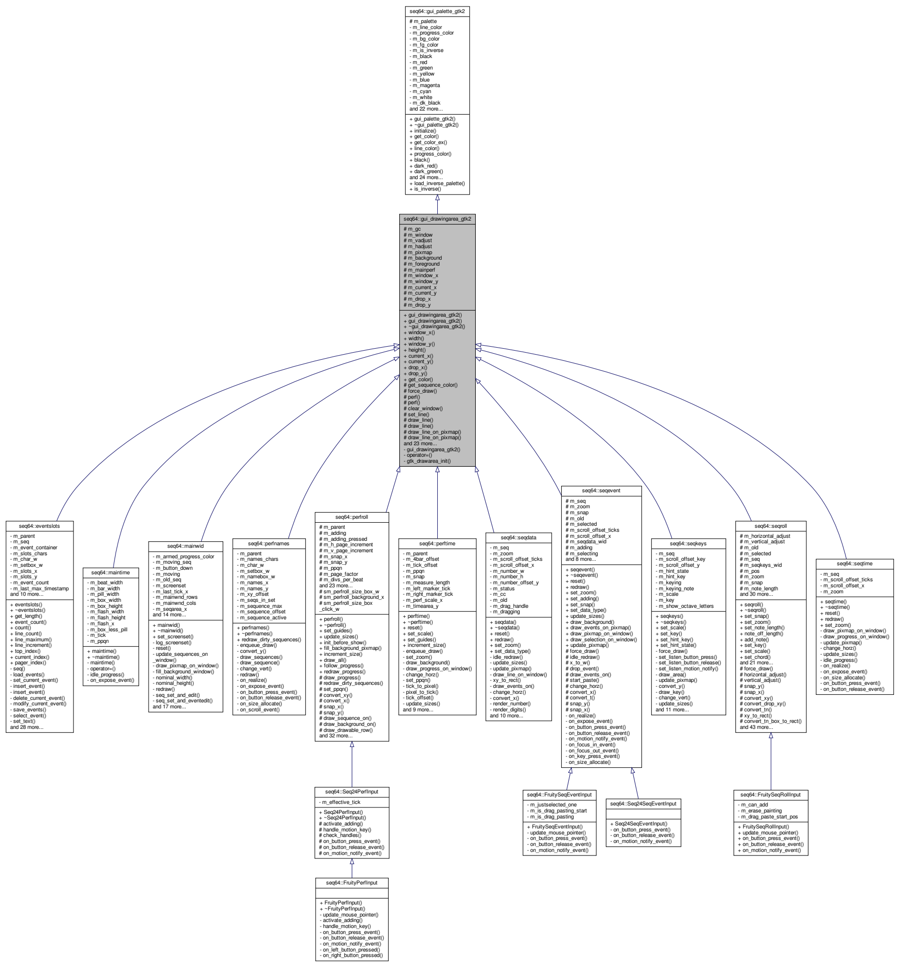
`keys_perform_gtk2 seq64::gui_assistant_gtk2::sm_internal_keys [static], [private]`

This object is set into the reference provided in the gui_assistant base class.

10.20 seq64::gui_drawingarea_gtk2 Class Reference

Implements the basic drawing areas of the application.

Inheritance diagram for seq64::gui_drawingarea_gtk2:



Public Member Functions

- gui_drawingarea_gtk2 (perform &p, int window_x=0, int window_y=0)

  Perform-only constructor.
- gui_drawingarea_gtk2 (perform &a_perf, Gtk::Adjustment &a_hadjust, Gtk::Adjustment &a_vadjust, int window_x=0, int window_y=0)

  Principal constructor.
- virtual ~gui_drawingarea_gtk2 ()

  Provides a destructor to delete allocated objects.
- int window_x () const

  'Getter' function for member m_window_x
- int width () const

  'Getter' function for member m_window_x This one matches what Qt 5 calls it.
- int window_y () const

  'Getter' function for member m_window_y
- int height () const

  'Getter' function for member m_window_y This one matches what Qt 5 calls it.
- 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
- const Color & get_color (PaletteColor c) const

Protected Member Functions

- const gui_palette_gtk2::Color & get_sequence_color (int seqnum) const

  Color get_color (PaletteColor c, double h, double s = 0.65, double v = 1.0) const { return m_palette.get_color(c, h, s, v); }.
- virtual void force_draw ()

  Provides a common function for redrawing.
- perform & perf ()

  'Getter' function for member m_mainperf
- const perform & perf () const

  'Getter' function for member m_mainperf, const version
- void clear_window ()

  Clears the main window.
- void set_line (Gdk::LineStyle ls, int width=1)

  A small wrapper function for readability in line-drawing.
- void draw_line (int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the window.
- void draw_line (const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the window after setting the given foreground color.
- void draw_line_on_pixmap (int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the pixmap.
- void draw_line_on_pixmap (const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the pixmap after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Pixmap > &pixmap, int x1, int y1, int x2, int y2)

A small wrapper function to draw a line on any pixmap (not a drawable, though, due to a compiler error after setting the given foreground color.

- void draw_line (Glib::RefPtr< Gdk::Pixmap > &pixmap, const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the pixmap after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Drawable > &drawable, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on any pixmap (not a drawable, though, due to a compiler error after setting the given foreground color.
- void draw_line (Glib::RefPtr< Gdk::Drawable > &drawable, const Color &c, int x1, int y1, int x2, int y2)

  A small wrapper function to draw a line on the drawable after setting the given foreground color.
- void render_string (int x, int y, const std::string &s, font::Color color, bool invert=false)

  A small wrapper function for readability in string-drawing to the window.
- void render_string_on_pixmap (int x, int y, const std::string &s, font::Color color, bool invert=false)

  A small wrapper function for readability in string-drawing to the pixmap.
- void draw_rectangle (int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the window.
- void draw_rectangle (const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing.
- void draw_rectangle (Glib::RefPtr< Gdk::Drawable > &drawable, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on a "drawable" context, where the foreground color has already been specified.
- void draw_rectangle (Glib::RefPtr< Gdk::Drawable > &drawable, const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on any drawable context.
- void draw_rectangle (Glib::RefPtr< Gdk::Pixmap > &pixmap, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on a "pixmap" context, where the foreground color has already been specified.
- void draw_rectangle (Glib::RefPtr< Gdk::Pixmap > &pixmap, const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on any pixmap context.
- void draw_rectangle_on_pixmap (int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the pixmap.
- void draw_rectangle_on_pixmap (const Color &c, int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the pixmap.
- void draw_normal_rectangle_on_pixmap (int x, int y, int lx, int ly, bool fill=true)

  A small wrapper function for readability in box-drawing on the pixmap.
- void draw_drawable (int xsrc, int ysrc, int xdest, int ydest, int width, int height)

  Provides the most common use case for redrawing.
- void scroll_hadjust (Gtk::Adjustment &hadjust, double step)

  This function provides optimization for the on_scroll_event() functions, and should provide support for having the seqedit/seqroll/seqtime/seqdata panes follow the scrollbar, in a future upgrade (now partly in place).
- void scroll_vadjust (Gtk::Adjustment &vadjust, double step)

  This function is the vertical version of the scroll_hadjust() function, intended for adding keystroke vertical scrolling using the Page-Up and Page-Down keys, as a new feature of Sequencer64.
- void scroll_hset (Gtk::Adjustment &hadjust, double value)
- void scroll_vset (Gtk::Adjustment &vadjust, double value)
- void set_current_drop_x (int x)

  Sets the current x value and the drop x value.
- void set_current_drop_y (int y)

  Sets the current y value and the drop y value.
- void on_realize ()

  For this GTK callback, on realization of window, initialize the shiz.

Protected Attributes

- Glib::RefPtr< Gdk::GC > m_gc

  The graphics context, which is required for ever drawing and rendering operation.
- Glib::RefPtr< Gdk::Window > m_window

  Provides the default "window".
- Gtk::Adjustment & m_vadjust

  Provides an object for vertical "adjustments".
- Gtk::Adjustment & m_hadjust

  Provides an object for horizontal "adjustments".
- Glib::RefPtr< Gdk::Pixmap > m_pixmap

  Provides the default "pixmap".
- Glib::RefPtr< Gdk::Pixmap > m_background

  Another pixmap, used for backgrounds.
- Glib::RefPtr< Gdk::Pixmap > m_foreground

  Another pixmap, used for foregrounds.
- perform & m_mainperf

  A frequent hook into the main perform object.
- int m_window_x

  Window sizes.
- int m_window_y

  Window height value.
- int m_current_x

  The x and y value of the current location of the mouse (during dragging?)
- int m_current_y

  Current mouse y value.
- int m_drop_x

  These values are used when roping and highlighting a bunch of events.
- int m_drop_y

  Current mouse y-drop value.

Private Member Functions

- gui_drawingarea_gtk2 (const gui_drawingarea_gtk2 &)
- gui_drawingarea_gtk2 & operator= (const gui_drawingarea_gtk2 &)
- void gtk_drawarea_init ()

  Does basic initialization for each of the constructors.

Additional Inherited Members

10.20.1 Detailed Description

Note that this class really "isn't" a gui_pallete_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.

10.20.2 Constructor & Destructor Documentation

10.20.2.1 gui_drawingarea_gtk2() [1/3]

```
seq64::gui_drawingarea_gtk2::gui_drawingarea_gtk2 (
            const gui_drawingarea_gtk2 &  )  [private]
```

10.20.2.2 gui_drawingarea_gtk2() [2/3]

```
seq64::gui_drawingarea_gtk2::gui_drawingarea_gtk2 (
            perform & p,
            int window_x = 0,
            int window_y = 0 )
```

10.20.2.3 gui_drawingarea_gtk2() [3/3]

```
seq64::gui_drawingarea_gtk2::gui_drawingarea_gtk2 (
            perform & a_perf,
            Gtk::Adjustment & a_hadjust,
            Gtk::Adjustment & a_vadjust,
            int window_x = 0,
            int window_y = 0 )
```

10.20.2.4 ~gui_drawingarea_gtk2()

```
seq64::gui_drawingarea_gtk2::~gui_drawingarea_gtk2 ( )  [virtual]
```

10.20.3 Member Function Documentation

10.20.3.1 operator=()

```
gui_drawingarea_gtk2& seq64::gui_drawingarea_gtk2::operator= (
            const gui_drawingarea_gtk2 &  )  [private]
```

10.20.3.2 window_x()

```
int seq64::gui_drawingarea_gtk2::window_x ( ) const  [inline]
```

10.20.3.3 width()

```
int seq64::gui_drawingarea_gtk2::width ( ) const  [inline]
```

10.20.3.4 window_y()

```
int seq64::gui_drawingarea_gtk2::window_y ( ) const  [inline]
```

10.20.3.5 height()

```
int seq64::gui_drawingarea_gtk2::height ( ) const  [inline]
```

10.20.3.6 current_x()

```
int seq64::gui_drawingarea_gtk2::current_x ( ) const  [inline]
```

10.20.3.7 current_y()

```
int seq64::gui_drawingarea_gtk2::current_y ( ) const  [inline]
```

10.20.3.8 drop_x()

```
int seq64::gui_drawingarea_gtk2::drop_x ( ) const  [inline]
```

10.20.3.9 drop_y()

```
int seq64::gui_drawingarea_gtk2::drop_y ( ) const  [inline]
```

10.20.3.10 get_color()

```
const Color& seq64::gui_drawingarea_gtk2::get_color (
             PaletteColor c ) const  [inline]
```

10.20.3.11 get_sequence_color()

```
const gui_palette_gtk2::Color & seq64::gui_drawingarea_gtk2::get_sequence_color (
            int seqnum ) const [protected]
```

EXPERIMENTAL.

EXPERIMENTAL

10.20.3.12 force_draw()

```
virtual void seq64::gui_drawingarea_gtk2::force_draw ( ) [inline], [protected], [virtual]
```

This function forces a redraw. Some classes extend this function.

Reimplemented in seq64::seqroll, seq64::seqevent, and seq64::seqkeys.

10.20.3.13 perf() [1/2]

```
perform& seq64::gui_drawingarea_gtk2::perf ( ) [inline], [protected]
```

10.20.3.14 perf() [2/2]

```
const perform& seq64::gui_drawingarea_gtk2::perf ( ) const [inline], [protected]
```

10.20.3.15 clear_window()

```
void seq64::gui_drawingarea_gtk2::clear_window ( ) [inline], [protected]
```

One less need to access m_window directly.

10.20.3.16 set_line()

```
void seq64::gui_drawingarea_gtk2::set_line (
            Gdk::LineStyle ls,
            int width = 1 ) [inline], [protected]
```

Sets the attributes of a line to be drawn.

Parameters

ls	Provides the Gtk-specific line style.
width	Provides the width of the line to be drawn. It defaults to the most common value, 1.

10.20.3.17 draw_line() [1/6]

```
void seq64::gui_drawingarea_gtk2::draw_line (
            int x1,
            int y1,
            int x2,
            int y2 )  [inline], [protected]
```

Parameters

x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.18 draw_line() [2/6]

```
void seq64::gui_drawingarea_gtk2::draw_line (
            const Color & c,
            int x1,
            int y1,
            int x2,
            int y2 )  [protected]
```

Parameters

c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.19 draw_line_on_pixmap() [1/2]

```
void seq64::gui_drawingarea_gtk2::draw_line_on_pixmap (
            int x1,
            int y1,
            int x2,
            int y2 )  [inline], [protected]
```

Parameters

x1	The x coordinate of the starting point.

Parameters

y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.20 draw_line_on_pixmap() [2/2]

```
void seq64::gui_drawingarea_gtk2::draw_line_on_pixmap (
             const Color & c,
             int x1,
             int y1,
             int x2,
             int y2 )  [protected]
```

Parameters

c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.21 draw_line() [3/6]

```
void seq64::gui_drawingarea_gtk2::draw_line (
             Glib::RefPtr< Gdk::Pixmap > & pixmap,
             int x1,
             int y1,
             int x2,
             int y2 )  [inline], [protected]
```

Parameters

pixmap	Provides the Gdk::Pixmap pointer needed to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.22 draw_line() [4/6]

```
void seq64::gui_drawingarea_gtk2::draw_line (
            Glib::RefPtr< Gdk::Pixmap > & pixmap,
            const Color & c,
            int x1,
            int y1,
            int x2,
            int y2 )  [protected]
```

Parameters

pixmap	Provides the Gdk::Drawable pointer needed to draw the line.
c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.23 draw_line() [5/6]

```
void seq64::gui_drawingarea_gtk2::draw_line (
            Glib::RefPtr< Gdk::Drawable > & drawable,
            int x1,
            int y1,
            int x2,
            int y2 )  [inline], [protected]
```

Parameters

drawable	Provides the Gdk::Drawable pointer needed to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.24 draw_line() [6/6]

```
void seq64::gui_drawingarea_gtk2::draw_line (
            Glib::RefPtr< Gdk::Drawable > & drawable,
            const Color & c,
            int x1,
            int y1,
            int x2,
            int y2 )  [protected]
```

Parameters

drawable	Provides the Gdk::Drawable pointer needed to draw the line.
c	The foreground color in which to draw the line.
x1	The x coordinate of the starting point.
y1	The y coordinate of the starting point.
x2	The x coordinate of the ending point.
y2	The y coordinate of the ending point.

10.20.3.25 render_string()

```
void seq64::gui_drawingarea_gtk2::render_string (
            int x,
            int y,
            const std::string & s,
            font::Color color,
            bool invert = false )  [inline], [protected]
```

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
s	The string to be drawn.
color	The color with which to draw the string.
invert	If true, apply color inversion, if active. Defaults to false.

10.20.3.26 render_string_on_pixmap()

```
void seq64::gui_drawingarea_gtk2::render_string_on_pixmap (
            int x,
            int y,
            const std::string & s,
            font::Color color,
            bool invert = false )  [inline], [protected]
```

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
s	The string to be drawn.
color	The color with which to draw the string.
invert	If true, apply color inversion, if active. Defaults to false.

10.20.3.27 draw_rectangle() [1/6]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle (
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [inline], [protected]
```

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.28 draw_rectangle() [2/6]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle (
            const Color & c,
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [protected]
```

It adds setting the foreground color to the draw_rectangle() function.

Parameters

c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.29 draw_rectangle() [3/6]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle (
            Glib::RefPtr< Gdk::Drawable > & drawable,
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [inline], [protected]
```

Parameters

drawable	The object on which to draw the rectangle.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.30 draw_rectangle() [4/6]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle (
            Glib::RefPtr< Gdk::Drawable > & drawable,
            const Color & c,
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [protected]
```

It also supports setting the foreground color to the draw_rectangle() function.

We have a number of such functions: for the main window, for the main pixmap, and for any drawing surface. Is the small bit of conciseness worth it?

Parameters

drawable	The surface on which to draw the box.
c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.31 draw_rectangle() [5/6]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle (
            Glib::RefPtr< Gdk::Pixmap > & pixmap,
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [inline], [protected]
```

Parameters

pixmap	The object on which to draw the rectangle.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.32 draw_rectangle() [6/6]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle (
            Glib::RefPtr< Gdk::Pixmap > & pixmap,
            const Color & c,
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [protected]
```

It also supports setting the foreground color to the draw_rectangle() function.

We have a number of such functions: for the main window, for the main pixmap, and for any drawing surface. Is the small bit of conciseness worth it?

Parameters

pixmap	The surface on which to draw the box.
c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.33 draw_rectangle_on_pixmap() [1/2]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle_on_pixmap (
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [inline], [protected]
```

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.34 draw_rectangle_on_pixmap() [2/2]

```
void seq64::gui_drawingarea_gtk2::draw_rectangle_on_pixmap (
            const Color & c,
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [protected]
```

It adds setting the foreground color to the draw_rectangle() function.

Parameters

c	Provides the foreground color to set.
x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.35 draw_normal_rectangle_on_pixmap()

```
void seq64::gui_drawingarea_gtk2::draw_normal_rectangle_on_pixmap (
            int x,
            int y,
            int lx,
            int ly,
            bool fill = true )  [protected]
```

It uses Gtk to get the proper background styling for the rectangle.

Parameters

x	The x-coordinate of the origin.
y	The y-coordinate of the origin.
lx	The width of the box.
ly	The height of the box.
fill	If true, fill the rectangle with the current foreground color, as set by m_gc->set_foreground(color). Defaults to true.

10.20.3.36 draw_drawable()

```
void seq64::gui_drawingarea_gtk2::draw_drawable (
             int xsrc,
             int ysrc,
             int xdest,
             int ydest,
             int width,
             int height )  [inline], [protected]
```

10.20.3.37 scroll_hadjust()

```
void seq64::gui_drawingarea_gtk2::scroll_hadjust (
             Gtk::Adjustment & hadjust,
             double step )  [protected]
```

This function is currently duplicated in the gui_drawingarea_gtk2 and gui_window_gtk2 modules.

Parameters

hadjust	Provides a reference to the adjustment object to be adjusted. Do we really need this to be a parameter? Why not just use the m_hadjust member? (Note that this member is not present in the similar gui_window_gtk2 class.)
step	Provides the step value to use for adjusting the horizontal scrollbar. If negative, the adjustment is leftward. If positive, the adjustment is rightward. It can be the value of m_hadjust->get_step_increment(), or provided especially to keep up with the progress bar.

10.20.3.38 scroll_vadjust()

```
void seq64::gui_drawingarea_gtk2::scroll_vadjust (
             Gtk::Adjustment & vadjust,
             double step )  [protected]
```

Parameters

vadjust	Provides a reference to the adjustment object to be adjusted.
step	Provides the step value to use for adjusting the vertical scrollbar. If negative, the adjustment is upward. If positive, the adjustment is downward. It can be the value of m_vadjust->get_step_increment().

10.20.3.39 scroll_hset()

```
void seq64::gui_drawingarea_gtk2::scroll_hset (
            Gtk::Adjustment & hadjust,
            double value )  [protected]
```

10.20.3.40 scroll_vset()

```
void seq64::gui_drawingarea_gtk2::scroll_vset (
            Gtk::Adjustment & vadjust,
            double value )  [protected]
```

10.20.3.41 set_current_drop_x()

```
void seq64::gui_drawingarea_gtk2::set_current_drop_x (
            int x )  [inline], [protected]
```

Parameters

x	The x value to be set.

10.20.3.42 set_current_drop_y()

```
void seq64::gui_drawingarea_gtk2::set_current_drop_y (
            int y )  [inline], [protected]
```

Parameters

y	The y value to be set.

10.20.3.43 gtk_drawarea_init()

```
void seq64::gui_drawingarea_gtk2::gtk_drawarea_init ( ) [private]
```

10.20.3.44 on_realize()

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

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

10.20.4 Field Documentation

10.20.4.1 m_gc

```
Glib::RefPtr<Gdk::GC> seq64::gui_drawingarea_gtk2::m_gc [protected]
```

10.20.4.2 m_window

```
Glib::RefPtr<Gdk::Window> seq64::gui_drawingarea_gtk2::m_window [protected]
```

Wrapper functions with undecorated wrapper names are used for accessing this item. We hope to be able to hide this items completely some day.

10.20.4.3 m_vadjust

```
Gtk::Adjustment& seq64::gui_drawingarea_gtk2::m_vadjust [protected]
```

10.20.4.4 m_hadjust

```
Gtk::Adjustment& seq64::gui_drawingarea_gtk2::m_hadjust [protected]
```

10.20.4.5 m_pixmap

```
Glib::RefPtr<Gdk::Pixmap> seq64::gui_drawingarea_gtk2::m_pixmap [protected]
```

Wrapper functions with undecorated wrapper names are used for accessing this item. We hope to be able to hide this items completely some day.

10.20.4.6 m_background

```
Glib::RefPtr<Gdk::Pixmap> seq64::gui_drawingarea_gtk2::m_background  [protected]
```

Our wrappers still leave this member exposed (giggle).

10.20.4.7 m_foreground

```
Glib::RefPtr<Gdk::Pixmap> seq64::gui_drawingarea_gtk2::m_foreground  [protected]
```

Our wrappers still leave this member exposed.

10.20.4.8 m_mainperf

```
perform& seq64::gui_drawingarea_gtk2::m_mainperf  [protected]
```

We could move this into yet another base class, since a number of classes don't need it. Probably not worth the effort at this time.

10.20.4.9 m_window_x

```
int seq64::gui_drawingarea_gtk2::m_window_x  [protected]
```

Could make this constant, but some windows are resizable.Window width value.

10.20.4.10 m_window_y

```
int seq64::gui_drawingarea_gtk2::m_window_y  [protected]
```

10.20.4.11 m_current_x

```
int seq64::gui_drawingarea_gtk2::m_current_x  [protected]
```

Current mouse x value.

10.20.4.12 m_current_y

```
int seq64::gui_drawingarea_gtk2::m_current_y  [protected]
```

10.20.4.13 m_drop_x

```
int seq64::gui_drawingarea_gtk2::m_drop_x  [protected]
```

Provides the x and y value of where the dragging started.Current mouse x-drop value.

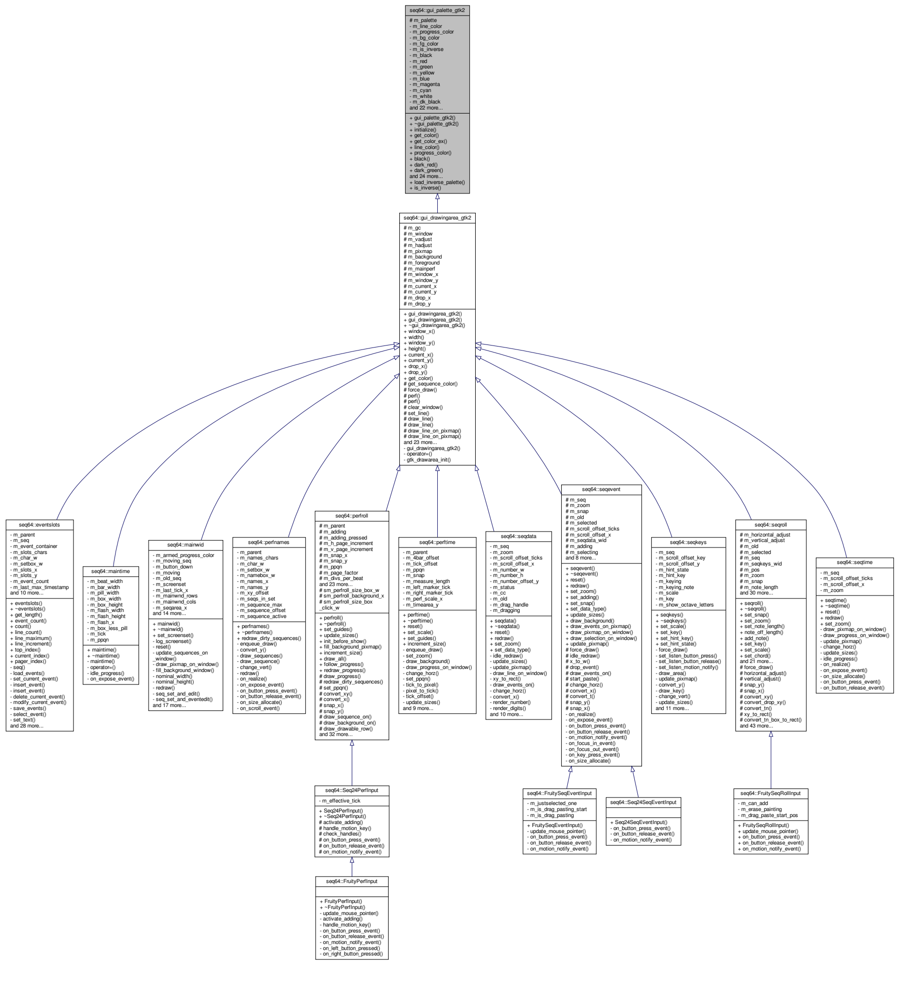
10.20.4.14 m_drop_y

```
int seq64::gui_drawingarea_gtk2::m_drop_y  [protected]
```

10.21 seq64::gui_palette_gtk2 Class Reference

Implements a stock palette of Gdk::Color elements.

Inheritance diagram for seq64::gui_palette_gtk2:



Public Member Functions

- gui_palette_gtk2 ()

  Principal constructor.
- ∼gui_palette_gtk2 ()

  Provides a destructor to delete allocated objects.
- void initialize ()

  Adds all of the main palette colors in the PaletteColor enumeration into the palette contain.
- const Color & get_color (PaletteColor index) const
- Color get_color_ex (PaletteColor index, double h, double s=0.65, double v=1.0) const

  Gets a color, but returns a modified value via the function Gdk::Color::set_hsv(h, s, v).
- const Color & line_color () const

  'Getter' function for member m_line_color Provides an experimental way to change some line colors from black to something else.
- const Color & progress_color () const

  'Getter' function for member m_progress_color Provides an experimental way to change the progress line color from black to something else.
- const Color & black () const

  'Getter' function for member m_black Although these color getters return static values (if so compiled), these colors are used only in the window and drawing-area classes, so no need to make these functions static.
- const Color & dark_red () const

  'Getter' function for member m_dk_red
- const Color & dark_green () const

  'Getter' function for member m_dk_green
- const Color & dark_orange () const

  'Getter' function for member m_dk_orange
- const Color & dark_blue () const

  'Getter' function for member m_dk_blue
- const Color & dark_magenta () const

  'Getter' function for member m_dk_magenta
- const Color & dark_cyan () const

  'Getter' function for member m_dk_cyan
- const Color & white () const

  'Getter' function for member m_white
- const Color & grey_paint () const

  'Getter' function for member m_grey_paint
- const Color & dark_grey_paint () const

  'Getter' function for member m_dk_grey_paint
- const Color & light_grey_paint () const

  'Getter' function for member m_lt_grey_paint
- const Color & red () const

  'Getter' function for member m_red
- const Color & orange () const

  'Getter' function for member m_orange
- const Color & yellow () const

  'Getter' function for member m_yellow
- const Color & green () const

  'Getter' function for member m_green
- const Color & magenta () const

  'Getter' function for member m_magenta
- const Color & blue () const

  'Getter' function for member m_blue

- const Color & black_paint () const

  'Getter' function for member m_blk_paint
- const Color & white_paint () const

  'Getter' function for member m_wht_paint
- const Color & black_key_paint () const

  'Getter' function for member m_blk_key_paint
- const Color & white_key_paint () const

  'Getter' function for member m_wht_key_paint
- const Color & tempo_paint () const

  'Getter' function for member m_tempo_paint
- const Color & sel_paint () const

  'Getter' function for member m_sel_paint
- const Color & bg_color () const

  'Getter' function for member m_bg_color
- void bg_color (const Color &c)

  'Setter' function for member m_bg_color
- const Color & fg_color () const

  'Getter' function for member m_fg_color
- void fg_color (const Color &c)

  'Setter' function for member m_fg_color

Static Public Member Functions

- static void load_inverse_palette (bool inverse=true)

  Provides an alternate color palette, somewhat constrained by the colors in the font bitmaps.
- static bool is_inverse ()

  Indicates if the inverse color palette is loaded.

Protected Types

- typedef Gdk::Color Color

  Provides a type for the color object.

Protected Attributes

- palette< Color > m_palette

Private Attributes

- Color m_line_color

  Provides the line color.
- Color m_progress_color

  Provides the progress bar color.
- Color m_bg_color

  The current background color.
- Color m_fg_color

  The current foreground color.

Static Private Attributes

- static bool m_is_inverse

  Flags the presense of the inverse color palette.
- static const Color m_black

  Provides the black color.
- static const Color m_red

  Provides the red color.
- static const Color m_green

  Provides the green color.
- static const Color m_yellow

  Provides the yellow color.
- static const Color m_blue

  Provides the blue color.
- static const Color m_magenta

  Provides the magenta color.
- static const Color m_cyan

  Provides the cyan color.
- static const Color m_white

  Provides the white color.
- static const Color m_dk_black

  Provides a blood-red color.
- static const Color m_dk_red

  Provides a blood-red color.
- static const Color m_dk_green

  Provides a dark green color.
- static const Color m_dk_yellow

  Provides a dark green color.
- static const Color m_dk_blue

  Provides the dark blue color.
- static const Color m_dk_magenta

  Provides a dark magenta color.
- static const Color m_dk_cyan

  Provides the dark cyan color.
- static const Color m_dk_white

  Provides a greyish color.
- static const Color m_orange

  Provides the orange color.
- static const Color m_pink

  Provides the pink color.
- static const Color m_grey

  Provides the unvarying grey color.
- static const Color m_dk_orange

  Provides a dark orange color.
- static const Color m_dk_pink

  Provides a dark pink color.
- static const Color m_dk_grey

  The unvarying dark grey color.
- static Color m_grey_paint

  Provides the grey color.
- static Color m_dk_grey_paint

Provides the dark grey color.
- static Color m_lt_grey_paint

  Provides the light grey color.
- static Color m_blk_paint

  An invertible black color.
- static Color m_wht_paint

  An invertible white color.
- static Color m_blk_key_paint

  Provides the color of a black key.
- static Color m_wht_key_paint

  Provides the color of a white key.
- static Color m_tempo_paint

  The color of a tempo line.
- static Color m_sel_paint

  The color of a selection box.

10.21.1 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.

10.21.2 Member Typedef Documentation

10.21.2.1 Color

```
typedef Gdk::Color seq64::gui_palette_gtk2::Color  [protected]
```

The following uses are made of each color:

- Black. The background color of armed patterns. The color of most lines in the user interface, including the main grid lines. The default color of progress lines and text.
- White. The default background color of just about everything drawn in the application.
- Grey. The color of minor grid lines and the markers for the currently-selected scale.
- Dark grey. The color of some grid lines, and the background of a queued pattern slot.
- Light grey. The color of some grid lines.
- Red. The optional color of progress bars.
- Orange. The fill-in color for selected notes and events.
- Dark orange. The color of selected event data lines and the color of the selection box for events to be pasted.
- Yellow. The background of the pattern and name slots for empty patterns. The text color for selected empty pattern slots.
- Green. Not yet used.

- Blue. Not yet used.
- Dark cyan. The background color of muted patterns currently in edit, or the pattern that contains the original data for an imported SMF 0 song. The text color of an unmuted pattern currently in edit. These colors apply to the pattern editor and the song editor. The color of the selected background pattern in the song editor.
- Line color. The generic line color, meant for expansion. Currently black.
- Progress color. The progress line color. Black by default, but can be set to red.
- Background color. The currently-in-use background color. Can vary a lot when a pixmap is being redrawn.
- Foreground color. The currently-in-use foreground color. Can vary a lot when a pixmap is being redrawn.

10.21.3 Constructor & Destructor Documentation

10.21.3.1 gui_palette_gtk2()

```
seq64::gui_palette_gtk2::gui_palette_gtk2 ( )
```

In the constructor one can only allocate colors; get_window() returns 0 because this window has not yet been realized. Also note that the possible color names that can be used are found in /usr/share/X11/rgb.txt.

Todo Use an array of colors instead of this switch.

10.21.3.2 ∼gui_palette_gtk2()

```
seq64::gui_palette_gtk2::∼gui_palette_gtk2 ( )
```

10.21.4 Member Function Documentation

10.21.4.1 initialize()

```
void seq64::gui_palette_gtk2::initialize ( )
```

The palette is meant to be used to color sequences differently, though this feature is not yet supported in the Gtkmm-2.4 version of Sequencer64.

10.21.4.2 get_color()

```
const Color& seq64::gui_palette_gtk2::get_color (
            PaletteColor index ) const  [inline]
```

10.21.4.3 get_color_ex()

```
gui_palette_gtk2::Color seq64::gui_palette_gtk2::get_color_ex (
             PaletteColor index,
             double h,
             double s = 0.65,
             double v = 1.0 ) const
```

This function sets the color, by specifying hue, saturation, and value (brightness).

Parameters

h	Hue, in the range 0..360 degrees. Ignored if set to -1.0.
s	Saturation, in the range 0..1, defaults to 0.65.
v	Value (a.k.a. brightness), in the range 0..1, defaults to 1.0.

10.21.4.4 load_inverse_palette()

```
void seq64::gui_palette_gtk2::load_inverse_palette (
            bool inverse = true )  [static]
```

Inverse is not a complete inverse. It is more like a "night" mode. However, there are still some bright colors even in this mode. Some colors, such as the selection color (orange) are the same in either mode.

Parameters

inverse	If true, load the alternate palette. Otherwise, load the default palette.

10.21.4.5 is_inverse()

```
static bool seq64::gui_palette_gtk2::is_inverse ( )  [inline], [static]
```

10.21.4.6 line_color()

```
const Color& seq64::gui_palette_gtk2::line_color ( ) const  [inline]
```

Might eventually be selectable from the "user" configuration file

10.21.4.7 progress_color()

```
const Color& seq64::gui_palette_gtk2::progress_color ( ) const  [inline]
```

Now selectable from the "user" configuration file.

10.21.4.8 black()

```
const Color& seq64::gui_palette_gtk2::black ( ) const  [inline]
```

10.21.4.9 dark_red()

```
const Color& seq64::gui_palette_gtk2::dark_red ( ) const  [inline]
```

10.21.4.10 dark_green()

```
const Color& seq64::gui_palette_gtk2::dark_green ( ) const  [inline]
```

10.21.4.11 dark_orange()

```
const Color& seq64::gui_palette_gtk2::dark_orange ( ) const  [inline]
```

10.21.4.12 dark_blue()

```
const Color& seq64::gui_palette_gtk2::dark_blue ( ) const  [inline]
```

10.21.4.13 dark_magenta()

```
const Color& seq64::gui_palette_gtk2::dark_magenta ( ) const  [inline]
```

10.21.4.14 dark_cyan()

```
const Color& seq64::gui_palette_gtk2::dark_cyan ( ) const  [inline]
```

10.21.4.15 white()

```
const Color& seq64::gui_palette_gtk2::white ( ) const  [inline]
```

10.21.4.16 grey_paint()

```
const Color& seq64::gui_palette_gtk2::grey_paint ( ) const  [inline]
```

10.21.4.17 dark_grey_paint()

```
const Color& seq64::gui_palette_gtk2::dark_grey_paint ( ) const  [inline]
```

10.21.4.18 light_grey_paint()

```
const Color& seq64::gui_palette_gtk2::light_grey_paint ( ) const  [inline]
```

10.21.4.19 red()

```
const Color& seq64::gui_palette_gtk2::red ( ) const  [inline]
```

10.21.4.20 orange()

```
const Color& seq64::gui_palette_gtk2::orange ( ) const  [inline]
```

10.21.4.21 yellow()

```
const Color& seq64::gui_palette_gtk2::yellow ( ) const  [inline]
```

10.21.4.22 green()

```
const Color& seq64::gui_palette_gtk2::green ( ) const  [inline]
```

10.21.4.23 magenta()

```
const Color& seq64::gui_palette_gtk2::magenta ( ) const  [inline]
```

10.21.4.24 blue()

```
const Color& seq64::gui_palette_gtk2::blue ( ) const  [inline]
```

10.21.4.25 black_paint()

```
const Color& seq64::gui_palette_gtk2::black_paint ( ) const  [inline]
```

10.21.4.26 white_paint()

```
const Color& seq64::gui_palette_gtk2::white_paint ( ) const  [inline]
```

10.21.4.27 black_key_paint()

```
const Color& seq64::gui_palette_gtk2::black_key_paint ( ) const  [inline]
```

10.21.4.28 white_key_paint()

```
const Color& seq64::gui_palette_gtk2::white_key_paint ( ) const  [inline]
```

10.21.4.29 tempo_paint()

```
const Color& seq64::gui_palette_gtk2::tempo_paint ( ) const  [inline]
```

10.21.4.30 sel_paint()

```
const Color& seq64::gui_palette_gtk2::sel_paint ( ) const  [inline]
```

10.21.4.31 bg_color() [1/2]

```
const Color& seq64::gui_palette_gtk2::bg_color ( ) const  [inline]
```

10.21.4.32 bg_color() [2/2]

```
void seq64::gui_palette_gtk2::bg_color (
             const Color & c )  [inline]
```

10.21.4.33 fg_color() [1/2]

```
const Color& seq64::gui_palette_gtk2::fg_color ( ) const  [inline]
```

10.21.4.34 fg_color() [2/2]

```
void seq64::gui_palette_gtk2::fg_color (
             const Color & c )  [inline]
```

10.21.5 Field Documentation

10.21.5.1 m_palette

```
palette<Color> seq64::gui_palette_gtk2::m_palette  [protected]
```

10.21.5.2 m_is_inverse

```
bool seq64::gui_palette_gtk2::m_is_inverse  [static], [private]
```

By default, the inverse color palette is not loaded.

10.21.5.3 m_black

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_black  [static], [private]
```

10.21.5.4 m_red

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_red  [static], [private]
```

10.21.5.5 m_green

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_green  [static], [private]
```

10.21.5.6 m_yellow

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_yellow  [static], [private]
```

10.21.5.7 m_blue

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_blue  [static], [private]
```

10.21.5.8 m_magenta

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_magenta  [static], [private]
```

10.21.5.9 m_cyan

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_cyan  [static], [private]
```

10.21.5.10 m_white

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_white  [static], [private]
```

10.21.5.11 m_dk_black

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_black  [static], [private]
```

10.21.5.12 m_dk_red

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_red  [static], [private]
```

10.21.5.13 m_dk_green

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_green  [static], [private]
```

10.21.5.14 m_dk_yellow

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_yellow  [static], [private]
```

10.21.5.15 m_dk_blue

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_blue  [static], [private]
```

10.21.5.16 m_dk_magenta

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_magenta  [static], [private]
```

10.21.5.17 m_dk_cyan

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_cyan  [static], [private]
```

10.21.5.18 m_dk_white

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_white  [static], [private]
```

10.21.5.19 m_orange

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_orange  [static], [private]
```

10.21.5.20 m_pink

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_pink  [static], [private]
```

10.21.5.21 m_grey

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_grey  [static], [private]
```

10.21.5.22 m_dk_orange

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_orange  [static], [private]
```

10.21.5.23 m_dk_pink

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_pink  [static], [private]
```

10.21.5.24 m_dk_grey

```
const STATIC_COLOR seq64::gui_palette_gtk2::m_dk_grey  [static], [private]
```

10.21.5.25 m_grey_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_grey_paint  [static], [private]
```

10.21.5.26 m_dk_grey_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_dk_grey_paint  [static], [private]
```

10.21.5.27 m_lt_grey_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_lt_grey_paint  [static], [private]
```

10.21.5.28 m_blk_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_blk_paint  [static], [private]
```

10.21.5.29 m_wht_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_wht_paint  [static], [private]
```

10.21.5.30 m_blk_key_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_blk_key_paint  [static], [private]
```

10.21.5.31 m_wht_key_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_wht_key_paint  [static], [private]
```

10.21.5.32 m_tempo_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_tempo_paint  [static], [private]
```

10.21.5.33 m_sel_paint

```
STATIC_COLOR seq64::gui_palette_gtk2::m_sel_paint  [static], [private]
```

10.21.5.34 m_line_color

```
Color seq64::gui_palette_gtk2::m_line_color  [private]
```

10.21.5.35 m_progress_color

```
Color seq64::gui_palette_gtk2::m_progress_color  [private]
```

10.21.5.36 m_bg_color

```
Color seq64::gui_palette_gtk2::m_bg_color  [private]
```

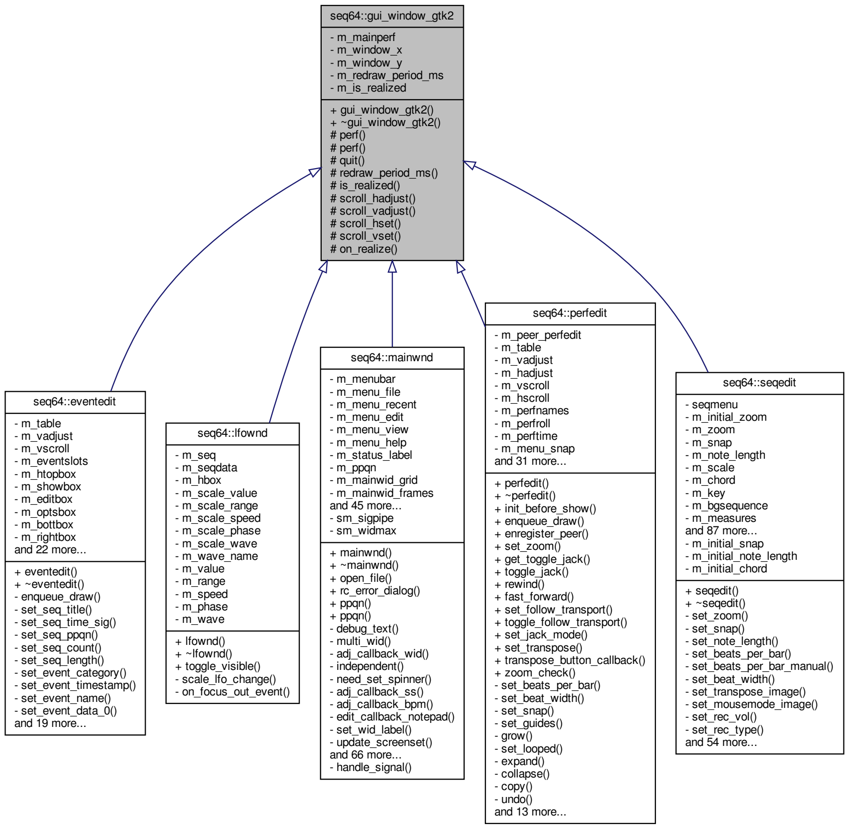
10.21.5.37 m_fg_color

```
Color seq64::gui_palette_gtk2::m_fg_color  [private]
```

10.22 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.
- virtual ~gui_window_gtk2 ()

  This rote constructor does nothing.

Protected Member Functions

- perform & perf ()

  'Getter' function for member m_mainperf
- const perform & perf () const

  'Getter' function for member m_mainperf, const version
- virtual void quit ()

  Provides "quit" functionality that WE HAVE OVERLOOKED!!! At some point we need to rectify this situation, probably for the sake of session support.
- int redraw_period_ms () const

'Getter' function for member m_redraw_period_ms
- bool is_realized () const

  'Getter' function for member m_is_realized
- void scroll_hadjust (Gtk::Adjustment &hadjust, double step)

  This function provides optimization for the on_scroll_event() functions, and should provide support for having the seqedit/seqroll/seqtime/seqdata panes follow the scrollbar, in a future upgrade.
- void scroll_vadjust (Gtk::Adjustment &vadjust, double step)

  This function is the vertical version of scroll_hadjust().
- void scroll_hset (Gtk::Adjustment &hadjust, double value)

  This function is the horizontal scroll setter.
- void scroll_vset (Gtk::Adjustment &vadjust, double value)

  This function is the vertical scroll setter.
- void on_realize ()

  This callback function calls the base-class on_realize() function, and sets the m_is_realized flag.

Private Attributes

- perform & m_mainperf

  The master object, sort of a sequence buss for all of the sequence.
- int m_window_x

  Window sizes.
- int m_window_y

  The height of the window.
- int m_redraw_period_ms

  Provides the timer period for the eventedit timer, used to determine the rate of redrawing.
- bool m_is_realized

  Indicates if on_realize() has been called.

10.22.1 Constructor & Destructor Documentation

10.22.1.1 gui_window_gtk2()

```
seq64::gui_window_gtk2::gui_window_gtk2 (
            perform & p,
            int window_x = 0,
            int window_y = 0 )
```

Note

We've collected the redraw timeouts into a base-class member. Most were valued at c_redraw_ms (40 ms), but mainwnd used 25 ms, so beware. We will eventually make this a user-interface parameter.

Parameters

p	Refers to the main performance object.
window↩_x	The width of the window.
window↩_y	The height of the window.

10.22.1.2 ∼gui_window_gtk2()

```
seq64::gui_window_gtk2::∼gui_window_gtk2 ( )  [virtual]
```

10.22.2 Member Function Documentation

10.22.2.1 perf() [1/2]

```
perform& seq64::gui_window_gtk2::perf ( )  [inline], [protected]
```

10.22.2.2 perf() [2/2]

```
const perform& seq64::gui_window_gtk2::perf ( ) const  [inline], [protected]
```

10.22.2.3 quit()

```
virtual void seq64::gui_window_gtk2::quit ( )  [inline], [protected], [virtual]
```

10.22.2.4 redraw_period_ms()

```
int seq64::gui_window_gtk2::redraw_period_ms ( ) const  [inline], [protected]
```

10.22.2.5 is_realized()

```
bool seq64::gui_window_gtk2::is_realized ( ) const  [inline], [protected]
```

10.22.2.6 scroll_hadjust()

```
void seq64::gui_window_gtk2::scroll_hadjust (
             Gtk::Adjustment & hadjust,
             double step )  [protected]
```

This function is currently duplicated in the gui_drawingarea_gtk2 and gui_window_gtk2 modules.

Parameters

hadjust	Provides a reference to the adjustment object to be adjusted.
step	Provides the step value to use for adjusting the horizontal scrollbar. If negative, the adjustment is leftward. If positive, the adjustment is rightward. It can be the value of m_hadjust->get_step_increment(), or provided especially to keep up with the progress bar.

10.22.2.7 scroll_vadjust()

```
void seq64::gui_window_gtk2::scroll_vadjust (
             Gtk::Adjustment & vadjust,
             double step )  [protected]
```

Parameters

vadjust	Provides a reference to the adjustment object to be adjusted.
step	Provides the step value to use for adjusting the vertical scrollbar. If greater than 0, the movement is downward. If less than zero, the movement is upward.

10.22.2.8 scroll_hset()

```
void seq64::gui_window_gtk2::scroll_hset (
             Gtk::Adjustment & hadjust,
             double value )  [protected]
```

Parameters

hadjust	Provides a reference to the adjustment object to be set. It is clamped as necessary.
value	Provides the value to use for setting the horizontal scrollbar.

10.22.2.9 scroll_vset()

```
void seq64::gui_window_gtk2::scroll_vset (
             Gtk::Adjustment & vadjust,
             double value )  [protected]
```

Parameters

vadjust	Provides a reference to the vertical adjustment object to be set. It is clamped as necessary.
value	Provides the value to use for setting the vertical scrollbar.

10.22.2.10 on_realize()

```
void seq64::gui_window_gtk2::on_realize ( )  [protected]
```

10.22.3 Field Documentation

10.22.3.1 m_mainperf

```
perform& seq64::gui_window_gtk2::m_mainperf  [private]
```

And a whole lot more than that.

10.22.3.2 m_window_x

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

Could make this constant, but some windows are resizable.The width of the window.

10.22.3.3 m_window_y

```
int seq64::gui_window_gtk2::m_window_y  [private]
```

10.22.3.4 m_redraw_period_ms

```
int seq64::gui_window_gtk2::m_redraw_period_ms  [private]
```

This is currently hardwired to 40 ms in Linux, and 20 ms in Windows. Note that mainwnd used 25 ms.

10.22.3.5 m_is_realized

```
bool seq64::gui_window_gtk2::m_is_realized  [private]
```

In some cases, we don't want to draw in objects that haven't yet appeared, otherwise crashes occur.

10.23 seq64::jack_assistant Class Reference

This class provides the performance mode JACK support.

Public Member Functions

- jack_assistant (perform &parent, midibpm bpminute=SEQ64_DEFAULT_BPM, int ppqn=SEQ64_USE_DE↩ FAULT_PPQN, int bpm=SEQ64_DEFAULT_BEATS_PER_MEASURE, int beatwidth=SEQ64_DEFAULT_↩ BEAT_WIDTH)

  This constructor initializes a number of member variables, some of them public!
- ∼jack_assistant ()

  The destructor doesn't need to do anything yet.
- perform & parent ()

  'Getter' function for member m_jack_parent Needed for external callbacks.
- const perform & parent () const

  'Getter' function for member m_jack_parent, const version
- bool is_running () const

  'Getter' function for member m_jack_running
- bool is_master () const

  'Getter' function for member m_jack_master
- int get_ppqn () const

  'Getter' function for member m_ppqn
- int get_beat_width () const

  'Getter' function for member m_beat_width
- void set_beat_width (int bw)

  'Setter' function for member m_beat_width
- int get_beats_per_measure () const

  'Getter' function for member m_beats_per_measure
- void set_beats_per_measure (int bpm)

  'Setter' function for member m_beats_per_measure
- midibpm get_beats_per_minute () const

  'Getter' function for member m_beats_per_minute
- void set_beats_per_minute (midibpm bpminute)

  'Setter' function for member m_beats_per_minute For the future, changing the BPM (beats/minute) internally.
- jack_transport_state_t transport_state () const

  'Getter' function for member m_jack_transport_state
- bool transport_not_starting () const

  Returns true if the JACK transport state is not JackTransportStarting.
- bool init ()

  Initializes JACK support.
- bool deinit ()

  Tears down the JACK infrastructure.
- bool session_event ()

  Writes the MIDI file named "<jack session dir>-file.mid" using a midifile object, quits if told to by JACK, and can free the JACK session event.
- bool activate ()

  Activate JACK here.
- void start ()

  If JACK is supported, starts the JACK transport.
- void stop ()

  If JACK is supported, stops the JACK transport.
- void position (bool state, midipulse tick=0)

  If JACK is supported and running, sets the position of the transport to the new frame number, frame 0.
- bool output (jack_scratchpad &pad)

  Performance output function for JACK, called by the perform function of the same name.

- void set_ppqn (int ppqn)

  'Setter' function for member m_ppqn For the future, changing the PPQN internally.
- double get_jack_tick () const

  'Getter' function for member m_jack_tick
- const jack_position_t & get_jack_pos () const

  'Getter' function for member m_jack_pos
- void toggle_jack_mode ()

  'Setter' function for member m_toggle_jack
- void set_jack_mode (bool mode)

  'Setter' function for member m_toggle_jack
- bool get_jack_mode () const

  'Getter' function for member m_toggle_jack Seems misnamed.
- midipulse get_jack_stop_tick () const

  'Getter' function for member m_jack_stop_tick
- void set_jack_stop_tick (long tick)

  'Setter' function for member m_jack_stop_tick
- jack_nframes_t jack_frame_rate () const

  'Getter' function for member m_jack_frame_rate
- bool get_follow_transport () const

  'Getter' function for member m_follow_transport
- void set_follow_transport (bool aset)

  'Setter' function for member m_follow_transport
- void toggle_follow_transport ()

  'Setter' function for member m_follow_transport
- bool toggle_song_start_mode ()

  'Setter' function for member parent().toggle_song_start_mode()
- bool song_start_mode () const

  'Getter' function for member parent().song_start_mode()
- void set_start_from_perfedit (bool start)

  'Setter' function for member parent().start_from_perfedit()
- jack_client_t ∗ client () const
- const std::string & client_name () const

  'Getter' function for member m_jack_client_name
- const std::string & client_uuid () const

  'Getter' function for member m_jack_client_uuid

Static Public Member Functions

- static void show_position (const jack_position_t &pos)

  Shows a one-line summary of a JACK position structure.
- static std::string get_state_name (const jack_transport_state_t &state)

  Converts a JACK transport value to a human-readable string.

Private Member Functions

- void set_jack_running (bool flag)

  'Setter' function for member m_jack_running
- double tick_multiplier () const

  Convenience function for internal use.
- jack_client_t ∗ client_open (const std::string &clientname)

  A member wrapper function for the new free function create_jack_client().
- void get_jack_client_info ()

  Tries to obtain the best information on the JACK client and the UUID assigned to this client.
- int sync (jack_transport_state_t state=(jack_transport_state_t)(-1))

  A helper function for syncing up with JACK parameters.

Static Private Member Functions

- static bool info_message (const std::string &msg)

  Common-code for console messages.
- static bool error_message (const std::string &msg)

  Common-code for error messages.

Private Attributes

- perform & m_jack_parent

  Provides the perform object that needs this JACK assistant/scratchpad class.
- jack_client_t ∗ m_jack_client

  Provides a handle into JACK, so that the application, as a JACK client, can issue commands and retrieve status information from JACK.
- std::string m_jack_client_name

  A new member to hold the actual name of the client assigned by JACK.
- std::string m_jack_client_uuid

  A new member to hold the actual UUID of the client assigned by JACK.
- jack_nframes_t m_jack_frame_current

  Holds the current frame number obtained from JACK transport, via a call to jack_get_current_transport_frame().
- jack_nframes_t m_jack_frame_last

  Holds the last frame number we got from JACK, so that progress can be tracked.
- jack_position_t m_jack_pos

  Provides positioning information on JACK playback.
- jack_transport_state_t m_jack_transport_state

  Holds the JACK transport state.
- jack_transport_state_t m_jack_transport_state_last

  Holds the last JACK transport state.
- double m_jack_tick

  The tick/pulse value derived from the current frame number, the ticks/beat value, the beats/minute value, and the frame rate.
- jack_session_event_t ∗ m_jsession_ev

  Provides a kind of handle to the JACK session manager.
- bool m_jack_running

  Indicates if JACK Sync has been enabled successfully.
- bool m_jack_master

  Indicates if JACK Sync has been enabled successfully, with the application running as JACK Master.

- jack_nframes_t m_jack_frame_rate

  Holds the current frame rate.
- bool m_toggle_jack

  Ostensibly a toggle, the functions that access this member are called "jack_mode" functions.
- midipulse m_jack_stop_tick

  Used in jack_process_callback() to reposition when JACK transport is not rolling or starting.
- bool m_follow_transport

  TBD.
- int m_ppqn

  Holds the global PPQN value for the Sequencer64 session.
- int m_beats_per_measure

  Holds the song's beats/measure value for using in setting JACK position.
- int m_beat_width

  Holds the song's beat width value (denominator of the time signature) for using in setting JACK position.
- midibpm m_beats_per_minute

  Holds the song's beats/minute (BPM) value for using in setting JACK position.

Static Private Attributes

- static jack_status_pair_t sm_status_pairs [ ]

  Pairs the JACK status bits with human-readable descriptions of each one.

Friends

- int jack_transport_callback (jack_nframes_t nframes, void ∗arg)

  Implemented second patch for JACK Transport from freddix/seq24 GitHub project.
- void jack_shutdown_callback (void ∗arg)

  Global functions for JACK support and JACK sessions.
- void jack_timebase_callback (jack_transport_state_t state, jack_nframes_t nframes, jack_position_t ∗pos, int new_pos, void ∗arg)

  The JACK timebase function defined here sets the JACK position structure.
- long get_current_jack_position (void ∗arg)

  This function gets the current JACK position.
- void jack_session_callback (jack_session_event_t ∗ev, void ∗arg)

  Set the m_jsession_ev (event) value of the perform object.

10.23.1 Constructor & Destructor Documentation

10.23.1.1 jack_assistant()

```
seq64::jack_assistant::jack_assistant (
            perform & parent,
            midibpm bpminute = SEQ64_DEFAULT_BPM,
            int ppqn = SEQ64_USE_DEFAULT_PPQN,
            int bpmeasure = SEQ64_DEFAULT_BEATS_PER_MEASURE,
            int beatwidth = SEQ64_DEFAULT_BEAT_WIDTH )
```

Note that the perform object currently calls jack_assistant::init(), but that call could be made here instead.

Parameters

parent	Provides a reference to the main perform object that needs to control JACK event.
bpminute	The beats/minute to set up JACK to use (applies to Master setup).
ppqn	The parts-per-quarter-note setting in force for the present tune.
bpmeasure	The beats/measure (time signature numerator) in force for the present tune.
beatwidth	The beat-width (time signature denominator) in force for the present tune.

10.23.1.2 ∼jack_assistant()

```
seq64::jack_assistant::∼jack_assistant ( )
```

The perform object currently calls jack_assistant::deinit(), but that call could be made here instead.

10.23.2 Member Function Documentation

10.23.2.1 show_position()

```
void seq64::jack_assistant::show_position (
             const jack_position_t & pos )  [static]
```

This function is meant for experimenting and learning.

The fields of this structure are as follows. Only the fields we care about are shown.

```
    jack_nframes_t      frame_rate:     current frame rate (per second)
    jack_nframes_t      frame:          frame number, always present
    jack_position_bits_t valid:         which other fields are valid

JackPositionBBT:
    int32_t             bar:            current bar
    int32_t             beat:           current beat-within-bar
    int32_t             tick:           current tick-within-beat
    double              bar_start_tick
    float               beats_per_bar:  time signature "numerator"
    float               beat_type:      time signature "denominator"
    double              ticks_per_beat
    double              beats_per_minute

JackBBTFrameOffset:
    jack_nframes_t      bbt_offset;     frame offset for the BBT fields

Only the most "important" and time-varying fields are shown. The format
output is brief and inscrutable unless you read this format example:
    nnnnn frame B:B:T N/D TPB BPM BBT
      ^     ^     ^   ^ ^  ^   ^   ^
      |     |     |   | |  |   |   |
      |     |     |   | |  |   |    -------- bbt_offset (frame), even if invalid
      |     |     |   | |  |    ------------ beats_per_minute
      |     |     |   | |   ---------------- ticks_per_beat (PPQN * 10?)
      |     |     |   |  ------------------- beats_per_bar (denominator)
      |     |     |    --------------------- beats_per_bar (numerator)
      |     |      ------------------------- bar : beat : tick
      |      ------------------------------- frame (number)
       ------------------------------------- the "valid" bits
```

```
The "valid" field is shown as bits in the same bit order as shown here, but
represented as a five-character string, "nnnnn", n = 0 or 1:
```

```
    JackVideoFrameOffset = 0x100
    JackAudioVideoRatio  = 0x080
    JackBBTFrameOffset   = 0x040
    JackPositionTimecode = 0x020
    JackPositionBBT      = 0x010
```

```
We care most about nnnnn = "00101" in our experiments (the most common
output will be "00001"). And we don't worry about non-integer
measurements... we truncate them to integers. Change the output format if
you want to play with non-Western timings.
```

Parameters

pos	The JACK position structure to dump.

10.23.2.2 get_state_name()

```
std::string seq64::jack_assistant::get_state_name (
             const jack_transport_state_t & state )  [static]
```

Parameters

state	Provides the transport state value.

Returns

Returns the state name.

10.23.2.3 parent() [1/2]

```
perform& seq64::jack_assistant::parent ( )  [inline]
```

10.23.2.4 parent() [2/2]

```
const perform& seq64::jack_assistant::parent ( ) const  [inline]
```

10.23.2.5 is_running()

```
bool seq64::jack_assistant::is_running ( ) const  [inline]
```

10.23.2.6 is_master()

```
bool seq64::jack_assistant::is_master ( ) const  [inline]
```

10.23.2.7 get_ppqn()

```
int seq64::jack_assistant::get_ppqn ( ) const  [inline]
```

10.23.2.8 get_beat_width()

```
int seq64::jack_assistant::get_beat_width ( ) const  [inline]
```

10.23.2.9 set_beat_width()

```
void seq64::jack_assistant::set_beat_width (
             int bw )  [inline]
```

Parameters

bw	Provides the beat-width (denominator of the time signature) value to set.

10.23.2.10 get_beats_per_measure()

```
int seq64::jack_assistant::get_beats_per_measure ( ) const  [inline]
```

10.23.2.11 set_beats_per_measure()

```
void seq64::jack_assistant::set_beats_per_measure (
             int bpm )  [inline]
```

Parameters

bpm	Provides the beats/measure (numerator of the time signature) value to set.

10.23.2.12 get_beats_per_minute()

```
midibpm seq64::jack_assistant::get_beats_per_minute ( ) const  [inline]
```

10.23.2.13 set_beats_per_minute()

```
void seq64::jack_assistant::set_beats_per_minute (
             midibpm bpminute )
```

We should consider adding validation. However, perform::set_beats_per_minute() does validate already. Also, since jack_transport_reposition() can be "called at any time by any client", we have removed the check for "is master". We do seem to see more "bad position structure" messages, though.

Parameters

bpminute	Provides the beats/minute value to set.

10.23.2.14 transport_state()

```
jack_transport_state_t seq64::jack_assistant::transport_state ( ) const  [inline]
```

10.23.2.15 transport_not_starting()

```
bool seq64::jack_assistant::transport_not_starting ( ) const  [inline]
```

10.23.2.16 init()

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

Then we become a new client of the JACK server.

A sync callback is needed for polling of slow-sync clients. But seq24/sequencer64 are not slow-sync clients. We don't really need to be a slow-sync client, as far as we can tell. We can't get JACK working exactly the way it does in seq24 without the callback in place. Plus, it does things important to the setup of JACK. So now this setup is permanent.

Jack transport settings:

```
 There are three settings:  On, Master, and Master Conditional.
 Currently, they can all be selected in the user-interface's File /
 Options / JACK/LASH page.  We really want only the proper combinations
 to be set, for clarity (the user-interface now takes care of this.  We
 need to initialize if any of them are set, and the
 rc_settings::with_jack() function tells us that.
```

jack_set_process_callback() patch:

```
 Implemented first patch from freddix/seq24 GitHub project, to fix JACK
 transport.  One line of code.  Well, we added some error-checking. :-)
 Found some old notes on the Web the this patch really only works (to
 prevent seq24 freeze) if seq24 is set as JACK Master, or if another
 client application, such as Qtractor, is running as JACK Master (and
 then seq24 will apparently follow it).
```

STAZED: The call to jack_timebase_callback() to supply jack with BBT, etc. would occasionally fail when the *pos information had zero or some garbage in the pos.frame_rate variable. This would occur when there was a rapid change of frame position by another client... i.e. qjackctl. From the jack API:

```
"pos address of the position structure for the next cycle;
pos->frame will be its frame number. If new_pos is FALSE, this
structure contains extended position information from the current
cycle.  If TRUE, it contains whatever was set by the requester.
The timebase_callback's task is to update the extended information
here."
```

The "If TRUE" line seems to be the issue. It seems that qjackctl does not always set pos.frame_rate so we get garbage and some strange BBT calculations that display in qjackctl. So we need to set it here and just use m_↩ jack_frame_rate for calculations instead of pos.frame_rate.

Returns

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

10.23.2.17 deinit()

```
bool seq64::jack_assistant::deinit ( )
```

Todo Note that we still need a way to call jack_release_timebase() when the user turns off the "JACK Master" status of Sequencer64.

Returns

Returns the value of m_jack_running, which should be false.

10.23.2.18 session_event()

```
bool seq64::jack_assistant::session_event ( )
```

ca 2015-07-24 Just a note: The OMA (OpenMandrivaAssociation) patch was already applied to seq24 v.0.9.2. It put quotes around the –file argument. However, the –file option doesn't work, so let's change that line.

```
sequencer64 --file \"${SESSION_DIR}file.mid\" --jack_session_uuid
```

Why are we using a Glib::ustring here? Convenience. But with C++11, we could use a lexical_cast<>. No more ustring, baby! It doesn't really matter; this function can call Gtk::Main::quit(), via the parent's gui().quit() function.

Returns

Always returns false.

10.23.2.19 activate()

```
bool seq64::jack_assistant::activate ( )
```

This function is called by perform::activate() after the master bus is activated successfully.

Returns

Returns true if the m_jack_client pointer is null, which means only that we're not running JACK. Also returns true if the pointer exists and the jack_active() call succeeds.

Side-effect(s) The m_jack_running and m_jack_master flags are falsified in jack_activate() fails.

10.23.2.20 start()

```
void seq64::jack_assistant::start ( )
```

This function assumes that m_jack_client is not null, if m_jack_running is true.

10.23.2.21 stop()

```
void seq64::jack_assistant::stop ( )
```

This function assumes that m_jack_client is not null, if m_jack_running is true.

10.23.2.22 position()

```
void seq64::jack_assistant::position (
            bool songmode,
            midipulse tick = 0 )
```

This new position takes effect in two process cycles. If there are slow-sync clients and the transport is already rolling, it will enter the JackTransportStarting state and begin invoking their sync_callbacks until ready. This function is realtime-safe.

```
http://jackaudio.org/files/docs/html/transport-design.html
```

This position() function is called via perform::position_jack() in the mainwnd, perfedit, perfroll, and seqroll graphical user-interface support objects.

The code that was disabled sets the current tick to 0 or, if state was true, to the leftmost tick (which is probably the position of the L marker). The current tick is then converted to a frame number, and then we locate the transport to that position. We're going to enable this code, but make it dependent on a new boolean parameter that defaults to false, in anticipation of trying it out later.

Stazed:

```
The jack_frame calculation is all that is needed to change JACK
position. The BBT calculation can be sent, but will be overridden by the
first call to jack_timebase_callback() of any Master set. If no Master
is set, then the BBT will display the new position but will not change
it, even if the transport is rolling. There is no need to send BBT on
position change -- the fact that jack_transport_locate() exists and only
uses the frame position is proof that BBT is not needed! Upon further
reflection, why not send BBT?  Because other programs do not... let's
follow convention.  The calculation for jack_transport_locate(), works,
is simpler, and does not send BBT. The calculation for
jack_transport_reposition() will be commented out again.
jack_BBT_position() is not necessary to change jack position!
```

Note that there are potentially a couple of divide-by-zero opportunities in this function.

Helgrind complains about a possible data race involving jack_transport_locate() when starting playing.

Parameters

songmode	True if the caller wants to position while in Song mode.

Alternate parameter to_left_tick (non-seq32 version):

```
If true, the current tick is set to the leftmost tick, instead of the
0th tick.  Now used, but only if relocate is true.  One question is,
do we want to perform this function if rc().with_jack_transport() is
true?  Seems like we should be able to do it only if m_jack_master is
true.
```

Parameters

tick	If using Song mode for this call then this value is set as the "current tick" value. If it's value is bad (SEQ64_NULL_MIDIPULSE), then this parameter is set to 0 before being used.

10.23.2.23 output()

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

This code comes from perform::output_func() from seq24.

Note

Follow up on this note found "out there": "Maybe I'm wrong but if I understood correctly, recent jack1 transport no longer goes into Jack_Transport_Starting state before going to Jack_Transport_Rolling (this was deliberately dropped), but seq24 currently needs this to start off with JACK transport." On the other hand, some people have no issues. This may have been due to the lack of m_jack_pos initialization.

Stazed:

```
Another note about JACK.  If another JACK client supplies tempo/BBT
different from seq42 (as Master), the perfroll grid will be incorrect.
Perfroll uses internal temp/BBT and cannot update on the fly. Even if
seq42 could support tempo/BBT changes, all info would have to be
available before the transport start, to work.  For this reason, the
tempo/BBT info will be plugged from the seq42 internal settings here,
always. This is the method used by probably all other JACK clients
with some sort of time-line. The JACK API indicates that BBT is
optional and AFIK, other sequencers only use frame & frame_rate from
JACK for internal calculations. The tempo and BBT info is always
internal. Also, if there is no Master set, then we would need to plug
it here to follow the JACK frame anyways.
```

Parameters

pad	Provides a JACK scratchpad for sharing certain items between the perform object and the jack_assistant object.

Returns

Returns true if JACK is running.

10.23.2.24 set_ppqn()

```
void seq64::jack_assistant::set_ppqn (
            int ppqn )  [inline]
```

We should consider adding validation. But it is used by perform.

Parameters

ppqn	Provides the PPQN value to set.

10.23.2.25 get_jack_tick()

```
double seq64::jack_assistant::get_jack_tick ( ) const  [inline]
```

10.23.2.26 get_jack_pos()

```
const jack_position_t& seq64::jack_assistant::get_jack_pos ( ) const  [inline]
```

10.23.2.27 toggle_jack_mode()

```
void seq64::jack_assistant::toggle_jack_mode ( )  [inline]
```

10.23.2.28 set_jack_mode()

```
void seq64::jack_assistant::set_jack_mode (
             bool mode )  [inline]
```

10.23.2.29 get_jack_mode()

```
bool seq64::jack_assistant::get_jack_mode ( ) const  [inline]
```

10.23.2.30 get_jack_stop_tick()

```
midipulse seq64::jack_assistant::get_jack_stop_tick ( ) const  [inline]
```

10.23.2.31 set_jack_stop_tick()

```
void seq64::jack_assistant::set_jack_stop_tick (
             long tick )  [inline]
```

10.23.2.32 jack_frame_rate()

```
jack_nframes_t seq64::jack_assistant::jack_frame_rate ( ) const  [inline]
```

10.23.2.33 get_follow_transport()

```
bool seq64::jack_assistant::get_follow_transport ( ) const  [inline]
```

10.23.2.34 set_follow_transport()

```
void seq64::jack_assistant::set_follow_transport (
             bool aset )  [inline]
```

10.23.2.35 toggle_follow_transport()

```
void seq64::jack_assistant::toggle_follow_transport ( )  [inline]
```

10.23.2.36 toggle_song_start_mode()

```
bool seq64::jack_assistant::toggle_song_start_mode ( )
```

10.23.2.37 song_start_mode()

```
bool seq64::jack_assistant::song_start_mode ( ) const
```

10.23.2.38 set_start_from_perfedit()

```
void seq64::jack_assistant::set_start_from_perfedit (
             bool start )
```

10.23.2.39 client()

```
jack_client_t * seq64::jack_assistant::client ( ) const
```

10.23.2.40 client_name()

```
const std::string& seq64::jack_assistant::client_name ( ) const  [inline]
```

10.23.2.41 client_uuid()

```
const std::string& seq64::jack_assistant::client_uuid ( ) const  [inline]
```

10.23.2.42 set_jack_running()

```
void seq64::jack_assistant::set_jack_running (
             bool flag )  [inline], [private]
```

Parameters

flag	Provides the is-running value to set.

10.23.2.43 tick_multiplier()

```
double seq64::jack_assistant::tick_multiplier ( ) const  [inline], [private]
```

Should we change 4.0 to a member value? What does it mean?

Returns

Returns the multiplier to convert a JACK tick value according to the PPQN, ticks/beat, and beat-type settings.

10.23.2.44 client_open()

```
jack_client_t * seq64::jack_assistant::client_open (
             const std::string & clientname )  [private]
```

Parameters

clientname	Provides the name of the client, used in the call to create_jack_client(). By default, this name is the macro SEQ64_PACKAGE (i.e. "sequencer64").

Returns

Returns a pointer to the JACK client if JACK has opened the client connection successfully. Otherwise, a null pointer is returned.

10.23.2.45 get_jack_client_info()

```
void seq64::jack_assistant::get_jack_client_info ( )  [private]
```

Sets m_jack_client_name and m_jack_client_info as side-effects.

10.23.2.46 sync()

```
int seq64::jack_assistant::sync (
             jack_transport_state_t state = (jack_transport_state_t)(-1) )  [private]
```

Sequencer64 is not a slow-sync client (and Stazed support doesn't use it), so that callback is not really needed, but we probably need this sub-function here to start out with the right values for interacting with JACK.

Note the call to jack_transport_query(). This call is *not* is seq24, but seems to be needed in sequencer64 because we put m_jack_pos in the initializer list, which sets all its fields to 0. Seq24 accesses m_jack_pos before it ever gets set, but its fields have values. These values are bogus, but are consistent from run to run on my computer, and allow seq24 to follow another JACK Master, on some computers. It explains why people had different experiences with JACK sync.

If we explicity call jack_transport_query() here, without changing the *state* parameter, then sequencer64 also can follow another JACK Master. (CURRENTLY BUGGY!)

Note that we should consider massaging the following jack_position_t members to set them to 0 (or 0.0) if less than 1.0 or 0.5:

```
-   bar_start_tick
-   ticks_per_beat
-   beats_per_minute
-   frame_time
-   next_time
-   audio_frames_per_video_frame
```

Also, why does bbt_offset start at 2128362496?

Parameters

state	The JACK transport state to be set.

10.23.2.47 info_message()

```
bool seq64::jack_assistant::info_message (
             const std::string & msg )  [static], [private]
```

Adds markers and a newline.

Parameters

msg	The message to print, sans the newline.

Returns

Returns true.

10.23.2.48 error_message()

```
bool seq64::jack_assistant::error_message (
             const std::string & msg )  [static], [private]
```

Adds markers, and sets m_jack_running to false.

Parameters

msg	The message to print, sans the newline.

Returns

Returns false for convenience/brevity in setting function return values.

10.23.3 Friends And Related Function Documentation

10.23.3.1 jack_transport_callback

```
int jack_transport_callback (
             jack_nframes_t nframes,
             void * arg )  [friend]
```

Added the following function. This function is supposed to allow seq24/sequencer64 to follow JACK transport.

For more advanced ideas, see the MetronomeJack::process_callback() function in the klick project. It plays a metronome tick after calculating if it needs to or not. (Maybe we could use it to provide our own tick for recording patterns.)

If debugging is enabled in the build, then this function outputs the current JACK position information every couple of seconds, which can be useful to examine the interactions with other JACK clients.

The code enabled via USE_JACK_BBT_OFFSET sets the JACK position fieldl bbt_offset to 0. It doesn't seem to have any effect, though it can be seen when calling show_position() in the jack_transport_callback() function.

Stazed:

```
This process callback is called by JACK whether stopped or rolling.
Assuming every JACK cycle...  "...client supplied function that is
called by the engine anytime there is work to be done".  There seems to
be no definition of '...work to be done'.  nframes = buffer_size -- is
not used.
```

Parameters

nframes	Unused.
arg	Used for debug output now. Note that this function will be called very often, and this pointer will currently not be used unless debugging is turned on.

Returns

Returns 0 on success, non-zero on error.

10.23.3.2 jack_shutdown_callback

```
void jack_shutdown_callback (
             void * arg )  [friend]
```

This callback is to shut down JACK by clearing the jack_assistant :: m_jack_running flag.

Parameters

arg	Points to the jack_assistant in charge of JACK support for the perform object.

10.23.3.3 jack_timebase_callback

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

The original version of the function worked properly with Hydrogen, but not with Klick. The new code seems to work with both. More testing and clarification is needed. This new code was "discovered" in the source-code for the "SooperLooper" project:

```
    http://essej.net/sooperlooper/
```

The first difference with the new code is that it handles the case where the JACK position is moved (new_pos == true). If this is true, and the JackPositionBBT bit is off in pos->valid, then the new BBT value is set.

The second set of differences are in the "else" clause. In the new code, it is very simple: calculate the new tick value, back it off by the number of ticks in a beat, and perhaps go to the first beat of the next bar.

In the old code (complex!), the simple BBT adjustment is always made. This changes (perhaps) the beats_per_bar, beat_type, etc. We need to make these settings use the actual global values for beats set for Sequencer64. Then, if transitioning from JackTransportStarting to JackTransportRolling (instead of checking new_pos!), the BBT values (bar, beat, and tick) are finally adjusted. Here are the steps, with old and new steps noted:

```
-#  Calculate the "delta" ticks based on the current frame, the
    ticks_per_beat, the beats_per_minute, and the frame_rate.  The old
    code saves this in a local, the new code assigns it to pos->tick.
-#  Old code: save this delta as a positive value.
-#  Figure out the settings and modify bar, beat, tick, and
    bar_start_tick.  The old and new code seem to have the same intent,
    but it seems like the new code is faster and also correct.
    -   Old code:  Calculations are made by division and mod
        operations.
    -   New code:  Calculations are made by increments and decrements
        in a while loop.
```

Stazed:

The call to jack_timebase_callback() to supply JACK with BBT, etc. would occasionally fail when the pos information had zero or some garbage in the pos.frame_rate variable. This would occur when there was a rapid change of frame position by another client... i.e. qjackctl. From the JACK API:

```
pos address of the position structure for the next cycle; pos->frame
will be its frame number. If new_pos is FALSE, this structure contains
extended position information from the current cycle.  If TRUE, it
contains whatever was set by the requester.  The timebase_callback's
task is to update the extended information here."
```

The "If TRUE" line seems to be the issue. It seems that qjackctl does not always set pos.frame_rate so we get garbage and some strange BBT calculations that display in qjackctl. So we need to set it here and just use m_↩ jack_frame_rate for calculations instead of pos.frame_rate.

Parameters

state	Indicates the current state of JACK transport.
nframes	The number of JACK frames in the current time period.
pos	Provides the position structure to be filled in, the address of the position structure for the next cycle; pos->frame will be its frame number. If new_pos is FALSE, this structure contains extended position information from the current cycle. If TRUE, it contains whatever was set by the requester. The timebase_callback's task is to update the extended information here.
new_pos	TRUE (non-zero) for a newly requested pos, or for the first cycle after the timebase_callback is defined. This is usually 0 in Sequencer64 at present, and 1 if one, say, presses "rewind" in qjackctl.
arg	Provides the jack_assistant pointer, currently unchecked for nullity.

Todo Shouldn't we process the first clause ONLY if new_pos is true?

10.23.3.4 get_current_jack_position

```
long get_current_jack_position (
            void * arg )  [friend]
```

The Seq32 version also uses its tempo map to adjust this, but Sequencer64 currently does not.

Warning

Currently valgrind flags j->client() as uninitialized.

Parameters

arg	Provides the putative jack_assistant pointer, assumed to be not null.

Returns

Returns the calculated tick position if no errors occur. Otherwise, returns 0.

10.23.3.5 jack_session_callback

```
void jack_session_callback (
            jack_session_event_t * ev,
            void * arg )  [friend]
```

Glib is then used to connect in perform::jack_session_event(). However, the perform object's GUI-support interface is used instead of the following, so that the libseq64 library can be independent of a specific GUI framework:

```
Glib::signal_idle().
    connect(sigc::mem_fun(*jack, &jack_assistant::session_event));
```

Parameters

ev	The JACK event to be set.
arg	The pointer to the jack_assistant object. Currently not checked for nullity.

10.23.4 Field Documentation

10.23.4.1 sm_status_pairs

```
jack_status_pair_t seq64::jack_assistant::sm_status_pairs[ ]  [static], [private]
```

10.23.4.2 m_jack_parent

```
perform& seq64::jack_assistant::m_jack_parent  [private]
```

10.23.4.3 m_jack_client

```
jack_client_t* seq64::jack_assistant::m_jack_client  [mutable], [private]
```

10.23.4.4 m_jack_client_name

```
std::string seq64::jack_assistant::m_jack_client_name  [private]
```

We might show this in the user-interface at some point.

10.23.4.5 m_jack_client_uuid

```
std::string seq64::jack_assistant::m_jack_client_uuid  [private]
```

We might show this in the user-interface at some point.

10.23.4.6 m_jack_frame_current

```
jack_nframes_t seq64::jack_assistant::m_jack_frame_current  [private]
```

10.23.4.7 m_jack_frame_last

```
jack_nframes_t seq64::jack_assistant::m_jack_frame_last  [private]
```

Also used in incrementing m_jack_tick.

10.23.4.8 m_jack_pos

```
jack_position_t seq64::jack_assistant::m_jack_pos  [private]
```

This structure is filled via a call to jack_transport_query(). It holds, among other items, the frame rate (often 48000), the ticks/beat, and the beats/minute.

10.23.4.9 m_jack_transport_state

```
jack_transport_state_t seq64::jack_assistant::m_jack_transport_state  [private]
```

Common values are JackTransportStopped, JackTransportRolling, and JackTransportLooping.

10.23.4.10 m_jack_transport_state_last

```
jack_transport_state_t seq64::jack_assistant::m_jack_transport_state_last  [private]
```

10.23.4.11 m_jack_tick

```
double seq64::jack_assistant::m_jack_tick  [private]
```

10.23.4.12 m_jsession_ev

```
jack_session_event_t* seq64::jack_assistant::m_jsession_ev  [private]
```

Used in the session_event() function.

10.23.4.13 m_jack_running

```
bool seq64::jack_assistant::m_jack_running  [private]
```

10.23.4.14 m_jack_master

```
bool seq64::jack_assistant::m_jack_master  [private]
```

10.23.4.15 m_jack_frame_rate

```
jack_nframes_t seq64::jack_assistant::m_jack_frame_rate  [private]
```

Just in case. QJackCtl does not always set pos.frame_rate, so we get garbage and some strange BBT calculations displayed in qjackctl.

10.23.4.16 m_toggle_jack

```
bool seq64::jack_assistant::m_toggle_jack  [private]
```

10.23.4.17 m_jack_stop_tick

```
midipulse seq64::jack_assistant::m_jack_stop_tick  [private]
```

Repositions the transport marker.

10.23.4.18 m_follow_transport

```
bool seq64::jack_assistant::m_follow_transport  [private]
```

10.23.4.19 m_ppqn

```
int seq64::jack_assistant::m_ppqn  [private]
```

It is used for calculating ticks/beat (pulses/beat) and for setting the tick position.

10.23.4.20 m_beats_per_measure

```
int seq64::jack_assistant::m_beats_per_measure  [private]
```

10.23.4.21 m_beat_width

```
int seq64::jack_assistant::m_beat_width  [private]
```

10.23.4.22 m_beats_per_minute

```
midibpm seq64::jack_assistant::m_beats_per_minute  [private]
```

10.24 seq64::jack_scratchpad Class Reference

Provide a temporary structure for passing data and results between a perform and jack_assistant object.

Data Fields

- double js_current_tick

    Holds current location.
- double js_total_tick

    Current location ignoring L/R.
- double js_clock_tick

    Identical to js_total_tick.
- bool js_jack_stopped

    Flags perform::inner_stop().
- bool js_dumping

    Non-JACK playback in progress?
- bool js_init_clock

    We now have a good JACK lock.
- bool js_looping

    seqedit loop button is active.
- bool js_playback_mode

    Song mode (versus live mode).
- double js_ticks_converted

    Keeps track of ...?
- double js_ticks_delta

    Minor difference in tick.
- double js_ticks_converted_last

    Keeps track of position?
- long js_delta_tick_frac

    More precision for seq24 0.9.3.

10.24.1 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(). This scratchpad is useful even if JACK support is not enabled.

10.24.2 Field Documentation

10.24.2.1 js_current_tick

```
double seq64::jack_scratchpad::js_current_tick
```

10.24.2.2 js_total_tick

```
double seq64::jack_scratchpad::js_total_tick
```

10.24.2.3 js_clock_tick

```
double seq64::jack_scratchpad::js_clock_tick
```

10.24.2.4 js_jack_stopped

```
bool seq64::jack_scratchpad::js_jack_stopped
```

10.24.2.5 js_dumping

```
bool seq64::jack_scratchpad::js_dumping
```

10.24.2.6 js_init_clock

```
bool seq64::jack_scratchpad::js_init_clock
```

10.24.2.7 js_looping

```
bool seq64::jack_scratchpad::js_looping
```

10.24.2.8 js_playback_mode

```
bool seq64::jack_scratchpad::js_playback_mode
```

10.24.2.9 js_ticks_converted

```
double seq64::jack_scratchpad::js_ticks_converted
```

10.24.2.10 js_ticks_delta

```
double seq64::jack_scratchpad::js_ticks_delta
```

10.24.2.11 js_ticks_converted_last

```
double seq64::jack_scratchpad::js_ticks_converted_last
```

10.24.2.12 js_delta_tick_frac

```
long seq64::jack_scratchpad::js_delta_tick_frac
```

10.25 seq64::jack_status_pair_t Struct Reference

Provides an internal type to make it easier to display a specific and accurate human-readable message when a JACK operation fails.

Data Fields

- unsigned jf_bit

  Holds one of the bit-values from jack_status_t, which is defined as an "enum JackStatus" type.
- std::string jf_meaning

  Holds a textual description of the corresponding status bit.

10.25.1 Field Documentation

10.25.1.1 jf_bit

```
unsigned seq64::jack_status_pair_t::jf_bit
```

10.25.1.2 jf_meaning

```
std::string seq64::jack_status_pair_t::jf_meaning
```

10.26 seq64::keybindentry Class Reference

Class for management of application key-bindings.

Inherits Entry.

Public Member Functions

- keybindentry (type t, unsigned ∗location_to_write, perform ∗p=nullptr, int s=0)

  This constructor initializes the member with values dependent on the value type provided in the first parameter.
- void set (unsigned 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 }

  Provides the type of keybindings that can be made.

Private Attributes

- unsigned ∗ 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.
- int m_slot

  Provides an index into a set of group-keys or event-keys.

Friends

- class options

10.26.1 Member Enumeration Documentation

10.26.1.1 type

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

Enumerator

location	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.

10.26.2 Constructor & Destructor Documentation

10.26.2.1 keybindentry()

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

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

Parameters

t	Provides the type of key-binding: location, events, or groups.
location_to_write	The location that holds the value of the key associated with the key-binding.
p	Points to the performance object used with this key-binding. The default value of this parameter is the null pointer, but it is needed for the pattern hot-keys frame and the mute-group frame of the Options dialog.
s	Provides the slot value for this key-binding. The default value of this parameter is zero, but it is needed to provide numeric labels for the hot-keys and mute-group frames of the Options dialog.

10.26.3 Member Function Documentation

10.26.3.1 set()

```
void seq64::keybindentry::set (
            unsigned val )
```

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

10.26.3.2 on_key_press_event()

```
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.

Parameters

event	Provides the key-press event.

Returns

Returns the result of the call to Entry::on_key_press_event().

10.26.4 Friends And Related Function Documentation

10.26.4.1 options

```
friend class options  [friend]
```

10.26.5 Field Documentation

10.26.5.1 m_key

```
unsigned* 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.

10.26.5.2 m_type

```
type seq64::keybindentry::m_type  [private]
```

10.26.5.3 m_perf

```
perform* seq64::keybindentry::m_perf  [private]
```

10.26.5.4 m_slot

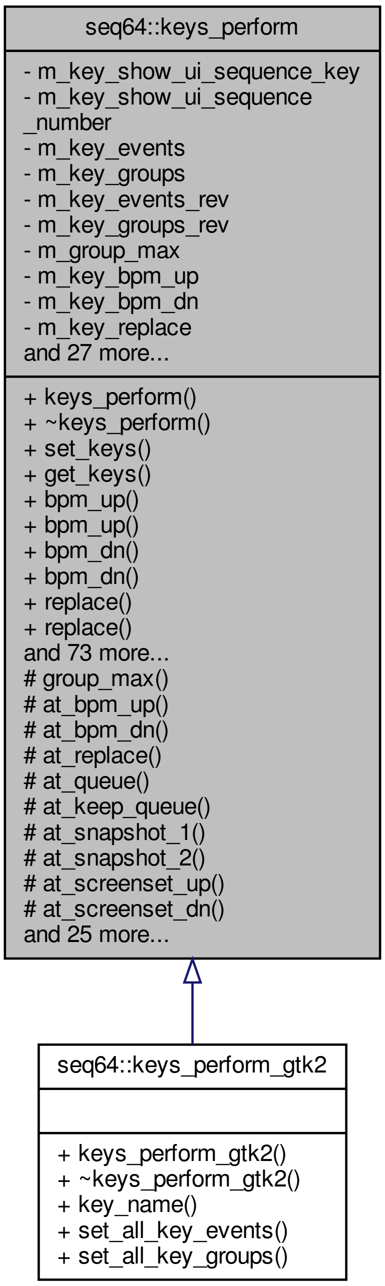
```
int seq64::keybindentry::m_slot  [private]
```

(This item should be changed to unsigned, though.)

10.27 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!
- virtual ∼keys_perform ()

  The destructor is a rote empty virtual destructor.
- 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.
- unsigned bpm_up () const

  'Getter' function for member m_key_bpm_up
- void bpm_up (unsigned x)

  'Setter' function for member m_key_bpm_up
- unsigned bpm_dn () const

  'Getter' function for member m_key_bpm_dn
- void bpm_dn (unsigned x)

  'Setter' function for member m_key_bpm_dn
- unsigned replace () const

  'Getter' function for member m_key_replace
- void replace (unsigned x)

  'Setter' function for member m_key_replace
- unsigned queue () const

  'Getter' function for member m_key_queue
- void queue (unsigned x)

  'Setter' function for member m_key_queue
- unsigned keep_queue () const

  'Getter' function for member m_key_keep_queue
- void keep_queue (unsigned x)

  'Setter' function for member m_key_keep_queue
- unsigned snapshot_1 () const

  'Getter' function for member m_key_snapshot_1
- void snapshot_1 (unsigned x)

  'Setter' function for member m_key_snapshot_1
- unsigned snapshot_2 () const

  'Getter' function for member m_key_snapshot_2
- void snapshot_2 (unsigned x)

  'Setter' function for member m_key_snapshot_2
- unsigned screenset_up () const

  'Getter' function for member m_key_screenset_up
- void screenset_up (unsigned x)

  'Setter' function for member m_key_screenset_up
- unsigned screenset_dn () const

  'Getter' function for member m_key_screenset_dn
- void screenset_dn (unsigned x)

  'Setter' function for member m_key_screenset_dn
- unsigned set_playing_screenset () const

  'Getter' function for member m_key_playing_screenset
- void set_playing_screenset (unsigned x)

  'Setter' function for member m_key_playing_screenset
- unsigned group_on () const

  'Getter' function for member m_key_group_on
- void group_on (unsigned x)

  'Setter' function for member m_key_group_on

- unsigned group_off () const

  'Getter' function for member m_key_group_off
- void group_off (unsigned x)

  'Setter' function for member m_key_group_off
- unsigned group_learn () const

  'Getter' function for member m_key_group_learn
- void group_learn (unsigned x)

  'Setter' function for member m_key_group_learn
- unsigned start () const

  'Getter' function for member m_key_start
- void start (unsigned x)

  'Setter' function for member m_key_start
- unsigned pause () const

  'Getter' function for member m_key_pause
- void pause (unsigned x)

  'Setter' function for member m_key_pause
- unsigned pattern_edit () const

  'Getter' function for member m_key_pattern_edit
- void pattern_edit (unsigned x)

  'Setter' function for member m_key_pattern_edit
- unsigned pattern_shift () const

  'Getter' function for member m_key_pattern_shift
- void pattern_shift (unsigned x)

  'Setter' function for member m_key_pattern_shift
- unsigned event_edit () const

  'Getter' function for member m_key_event_edit
- void event_edit (unsigned x)

  'Setter' function for member m_key_event_edit
- unsigned stop () const

  'Getter' function for member m_key_stop
- void stop (unsigned x)

  'Setter' function for member m_key_stop
- unsigned song_mode () const
- void song_mode (unsigned key)
- unsigned menu_mode () const
- void menu_mode (unsigned key)
- unsigned follow_transport () const
- void follow_transport (unsigned key)
- unsigned fast_forward () const
- void fast_forward (unsigned key)
- unsigned rewind () const
- void rewind (unsigned key)
- unsigned pointer_position () const
- void pointer_position (unsigned key)
- unsigned toggle_mutes () const
- void toggle_mutes (unsigned key)
- unsigned toggle_jack () const
- void toggle_jack (unsigned key)
- unsigned tap_bpm () const
- void tap_bpm (unsigned key)
- unsigned song_record () const
- void song_record (unsigned key)

- unsigned oneshot_queue () const
- void oneshot_queue (unsigned key)
- bool show_ui_sequence_key () const

  'Getter' function for member m_key_show_ui_sequency_key
- void show_ui_sequence_key (bool flag)

  'Setter' function for member m_key_show_ui_sequency_key
- bool show_ui_sequence_number () const

  'Getter' function for member m_key_show_ui_sequence_number
- void show_ui_sequence_number (bool flag)

  'Setter' function for member m_key_show_ui_sequence_key
- SlotMap & get_key_events ()

  'Getter' function for member m_key_events
- int get_key_count (unsigned k) const

  Returns the number of times the given key appears in the SlotMap, either 0 or 1.
- SlotMap & get_key_groups ()

  'Getter' function for member m_key_groups
- RevSlotMap & get_key_events_rev ()

  'Getter' function for member m_key_events_rev
- RevSlotMap & get_key_groups_rev ()

  'Getter' function for member m_key_groups_rev
- unsigned lookup_keyevent_key (int seqnum)

  'Getter' function for member m_key_events_rev[seqnum]
- unsigned lookup_keygroup_key (int groupnum)

  'Getter' function for member m_key_events_rev[groupnum]
- int lookup_keyevent_seq (unsigned keycode)

  'Getter' function for member m_key_events_rev[keycode]
- int lookup_keygroup_group (unsigned keycode)

  'Getter' function for member m_key_events_rev[keycode]
- virtual std::string key_name (unsigned 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 keycode, int sequence_slot)

  At construction time, this function sets up one keycode and one event slot.
- void set_key_group (unsigned keycode, int group_slot)

  At construction time, this function sets up one keycode and one group slot.
- int group_max () const

  'Getter' function for member m_group_max

Protected Types

- typedef std::map< unsigned, int > 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< int, unsigned > RevSlotMap

  This typedef is like SlotMap, but used for lookup in the other direction.

Protected Member Functions

- void group_max (int groupcount)

  'Setter' function for member m_group_max
- unsigned ∗ at_bpm_up ()

  The following are tricky ways to get at address of the key and group operation values so that we don't directly expose the members to manipulation.
- unsigned ∗ at_bpm_dn ()

  'Getter' function for member m_key_bpm_dn Address getter for the bpm_dn operation.
- unsigned ∗ at_replace ()

  'Getter' function for member m_key_replace Address getter for the replace operation.
- unsigned ∗ at_queue ()

  'Getter' function for member m_key_queue Address getter for the queue operation.
- unsigned ∗ at_keep_queue ()

  'Getter' function for member m_key_keep_queue Address getter for the keep_queue operation.
- unsigned ∗ at_snapshot_1 ()

  'Getter' function for member m_key_snapshot_1 Address getter for the snapshot_1 operation.
- unsigned ∗ at_snapshot_2 ()

  'Getter' function for member m_key_snapshot_2 Address getter for the snapshot_2 operation.
- unsigned ∗ at_screenset_up ()

  'Getter' function for member m_key_screenset_up Address getter for the screenset_up operation.
- unsigned ∗ at_screenset_dn ()

  'Getter' function for member m_key_screenset_dn Address getter for the screenset_dn operation.
- unsigned ∗ at_set_playing_screenset ()

  'Getter' function for member m_key_playing_screenset Address getter for the set_playing_screenset operation.
- unsigned ∗ at_group_on ()

  'Getter' function for member m_key_group_on Address getter for the group_on operation.
- unsigned ∗ at_group_off ()

  'Getter' function for member m_key_group_off Address getter for the group_off operation.
- unsigned ∗ at_group_learn ()

  'Getter' function for member m_key_group_learn Address getter for the group_learn operation.
- unsigned ∗ at_start ()

  'Getter' function for member m_key_start Address getter for the start operation.
- unsigned ∗ at_pause ()

  'Getter' function for member m_key_pause Address getter for the pause operation.
- unsigned ∗ at_song_mode ()

  'Getter' function for member m_key_song_mode Address getter for the song-mode operation.
- unsigned ∗ at_toggle_jack ()

  'Getter' function for member m_key_toggle_jack Address getter for the toggle-jack operation.
- unsigned ∗ at_menu_mode ()

  'Getter' function for member m_key_menu_mode Address getter for the menu-mode operation.
- unsigned ∗ at_follow_transport ()

  'Getter' function for member m_key_follow_transport Address getter for the follow-transport operation.
- unsigned ∗ at_fast_forward ()

  'Getter' function for member m_key_fast_forward Address getter for the fast-forward operation.
- unsigned ∗ at_rewind ()

  'Getter' function for member m_key_rewind Address getter for the rewind operation.
- unsigned ∗ at_pointer_position ()

  'Getter' function for member m_key_pointer_position Address getter for the pointer operation.
- unsigned ∗ at_toggle_mutes ()

  'Getter' function for member m_key_toggle_mutes Address getter for the toggle-mutes operation.

- unsigned ∗ at_tap_bpm ()

    'Getter' function for member m_key_tap_bpm Address getter for the tap_bpm operation.
- unsigned ∗ at_song_record ()

    'Getter' function for member m_key_song_record Address getter for the song-record operation.
- unsigned ∗ at_oneshot_queue ()

    'Getter' function for member m_key_oneshot_queue Address getter for the oneshot-record operation.
- unsigned ∗ at_pattern_edit ()

    'Getter' function for member m_key_pattern_edit Address getter for the pattern-edit operation.
- unsigned ∗ at_pattern_shift ()

    'Getter' function for member m_key_pattern_shift Address getter for the pattern-shift operation.
- unsigned ∗ at_event_edit ()

    'Getter' function for member m_key_event_edit Address getter for the event-edit operation.
- unsigned ∗ at_stop ()

    'Getter' function for member m_key_stop Address getter for the stop operation.
- bool ∗ at_show_ui_sequence_key ()

    'Getter' function for member m_key_show_ui_sequence_key Address getter for the show_ui_sequence_key value.
- bool ∗ at_show_ui_sequence_number ()

    'Getter' function for member m_key_show_ui_sequence_number Address getter for the show_ui_sequence_number value.
- virtual void set_basic_key_events ()
- virtual void set_basic_key_groups ()

Private Attributes

- bool m_key_show_ui_sequence_key

    If set, shows the shortcut-keys on each filled pattern slot in the main window.
- bool m_key_show_ui_sequence_number

    If set, shows the sequence number on each filled pattern and empty pattern slot in the main window.
- SlotMap m_key_events

    Holds the mapping of keys to the pattern slots.
- SlotMap m_key_groups

    Holds the mapping of keys to the mute groups.
- RevSlotMap m_key_events_rev

    Holds the reverse mapping of the pattern slots to the keys.
- RevSlotMap m_key_groups_rev

    Holds the reverse mapping of the mute groups to the keys.
- int m_group_max

    With larger set sizes, we have to support fewer mute-groups (unless we decide to allow 32 sets even for larger sets, upping the pattern count from 1024 to 3072 or 4096).
- unsigned m_key_bpm_up

    Provides key assignments for some key sequencer features.
- unsigned m_key_bpm_dn

    BPM down, semicolon.
- unsigned m_key_replace

    Replace, Ctrl-L.
- unsigned m_key_queue

    Queue, Ctrl-R.
- unsigned m_key_keep_queue

    Keep queue, backslash.
- unsigned m_key_snapshot_1

Snapshot 1, Alt-L.
- unsigned m_key_snapshot_2

  Snapshot 1, Alt-R.
- unsigned m_key_screenset_up

  Set up, Right-].
- unsigned m_key_screenset_dn

  Set down, Left-[.
- unsigned m_key_set_playing_screenset

  Set set, Home key.
- unsigned m_key_group_on

  Group on, igrave key.
- unsigned m_key_group_off

  Group off, apostrophe!
- unsigned m_key_group_learn

  Group learn, Insert.
- unsigned m_key_start

  Start play, Space key.
- unsigned m_key_pause

  Pause play, Period.
- unsigned m_key_song_mode

  Song versus Live mode.
- unsigned m_key_toggle_jack

  Toggle JACK connect.
- unsigned m_key_menu_mode

  Menu enabled/disabled.
- unsigned m_key_follow_transport

  Toggle following JACK.
- unsigned m_key_rewind

  Start rewind.
- unsigned m_key_fast_forward

  Start fast-forward.
- unsigned m_key_pointer_position

  Set progress to mouse.
- unsigned m_key_toggle_mutes

  Toggle all patterns.
- unsigned m_key_tap_bpm

  To tap out the BPM.
- unsigned m_key_pattern_edit

  Show pattern editor.
- unsigned m_key_pattern_shift

  Shift pattern hotkey.
- unsigned m_key_event_edit

  Show event editor.
- unsigned m_key_stop

  Stop play, Escape.
- unsigned m_key_song_record

  Turn on song-record.
- unsigned m_key_oneshot_queue

  Turn on 1-shot record.

Friends

- class options
- class perform
- class optionsfile

10.27.1 Detailed Description

It provides a way a mapping keystrokes to sequencer actions and song settings.

10.27.2 Member Typedef Documentation

10.27.2.1 SlotMap

```
typedef std::map<unsigned, int> seq64::keys_perform::SlotMap  [protected]
```

10.27.2.2 RevSlotMap

```
typedef std::map<int, unsigned> seq64::keys_perform::RevSlotMap  [protected]
```

10.27.3 Constructor & Destructor Documentation

10.27.3.1 keys_perform()

```
seq64::keys_perform::keys_perform ( )
```

10.27.3.2 ∼keys_perform()

```
seq64::keys_perform::∼keys_perform ( )  [virtual]
```

10.27.4 Member Function Documentation

10.27.4.1 set_keys()

```
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

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

10.27.4.2 get_keys()

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

Parameters

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

10.27.4.3 bpm_up() [1/2]

```
unsigned seq64::keys_perform::bpm_up ( ) const  [inline]
```

10.27.4.4 bpm_up() [2/2]

```
void seq64::keys_perform::bpm_up (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.5 bpm_dn() [1/2]

```
unsigned seq64::keys_perform::bpm_dn ( ) const  [inline]
```

10.27.4.6 bpm_dn() [2/2]

```
void seq64::keys_perform::bpm_dn (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.7 replace() [1/2]

```
unsigned seq64::keys_perform::replace ( ) const  [inline]
```

10.27.4.8 replace() [2/2]

```
void seq64::keys_perform::replace (
             unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.9 queue() [1/2]

```
unsigned seq64::keys_perform::queue ( ) const  [inline]
```

10.27.4.10 queue() [2/2]

```
void seq64::keys_perform::queue (
             unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.11 keep_queue() [1/2]

```
unsigned seq64::keys_perform::keep_queue ( ) const  [inline]
```

10.27.4.12 keep_queue() [2/2]

```
void seq64::keys_perform::keep_queue (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.13 snapshot_1() [1/2]

```
unsigned seq64::keys_perform::snapshot_1 ( ) const  [inline]
```

10.27.4.14 snapshot_1() [2/2]

```
void seq64::keys_perform::snapshot_1 (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.15 snapshot_2() [1/2]

```
unsigned seq64::keys_perform::snapshot_2 ( ) const  [inline]
```

10.27.4.16 snapshot_2() [2/2]

```
void seq64::keys_perform::snapshot_2 (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.17 screenset_up() [1/2]

```
unsigned seq64::keys_perform::screenset_up ( ) const  [inline]
```

10.27.4.18 screenset_up() [2/2]

```
void seq64::keys_perform::screenset_up (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.19 screenset_dn() [1/2]

```
unsigned seq64::keys_perform::screenset_dn ( ) const  [inline]
```

10.27.4.20 screenset_dn() [2/2]

```
void seq64::keys_perform::screenset_dn (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.21 set_playing_screenset() [1/2]

```
unsigned seq64::keys_perform::set_playing_screenset ( ) const  [inline]
```

10.27.4.22 set_playing_screenset() [2/2]

```
void seq64::keys_perform::set_playing_screenset (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.23 group_on() [1/2]

```
unsigned seq64::keys_perform::group_on ( ) const  [inline]
```

10.27.4.24 group_on() [2/2]

```
void seq64::keys_perform::group_on (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.25 group_off() [1/2]

```
unsigned seq64::keys_perform::group_off ( ) const  [inline]
```

10.27.4.26 group_off() [2/2]

```
void seq64::keys_perform::group_off (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.27 group_learn() [1/2]

```
unsigned seq64::keys_perform::group_learn ( ) const  [inline]
```

10.27.4.28 group_learn() [2/2]

```
void seq64::keys_perform::group_learn (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.29 start() [1/2]

```
unsigned seq64::keys_perform::start ( ) const  [inline]
```

10.27.4.30 start() [2/2]

```
void seq64::keys_perform::start (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.31 pause() [1/2]

```
unsigned seq64::keys_perform::pause ( ) const  [inline]
```

10.27.4.32 pause() [2/2]

```
void seq64::keys_perform::pause (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.33 pattern_edit() [1/2]

```
unsigned seq64::keys_perform::pattern_edit ( ) const  [inline]
```

10.27.4.34 pattern_edit() [2/2]

```
void seq64::keys_perform::pattern_edit (
             unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.35 pattern_shift() [1/2]

```
unsigned seq64::keys_perform::pattern_shift ( ) const  [inline]
```

10.27.4.36 pattern_shift() [2/2]

```
void seq64::keys_perform::pattern_shift (
             unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.37 event_edit() [1/2]

```
unsigned seq64::keys_perform::event_edit ( ) const  [inline]
```

10.27.4.38 event_edit() [2/2]

```
void seq64::keys_perform::event_edit (
             unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.39 stop() [1/2]

```
unsigned seq64::keys_perform::stop ( ) const  [inline]
```

10.27.4.40 stop() [2/2]

```
void seq64::keys_perform::stop (
            unsigned x )  [inline]
```

Parameters

x	The key value to assign to the operation.

10.27.4.41 song_mode() [1/2]

```
unsigned seq64::keys_perform::song_mode ( ) const  [inline]
```

10.27.4.42 song_mode() [2/2]

```
void seq64::keys_perform::song_mode (
            unsigned key )  [inline]
```

10.27.4.43 menu_mode() [1/2]

```
unsigned seq64::keys_perform::menu_mode ( ) const  [inline]
```

10.27.4.44 menu_mode() [2/2]

```
void seq64::keys_perform::menu_mode (
            unsigned key )  [inline]
```

10.27.4.45 follow_transport() [1/2]

```
unsigned seq64::keys_perform::follow_transport ( ) const  [inline]
```

10.27.4.46 follow_transport() [2/2]

```
void seq64::keys_perform::follow_transport (
             unsigned key )  [inline]
```

10.27.4.47 fast_forward() [1/2]

```
unsigned seq64::keys_perform::fast_forward ( ) const  [inline]
```

10.27.4.48 fast_forward() [2/2]

```
void seq64::keys_perform::fast_forward (
             unsigned key )  [inline]
```

10.27.4.49 rewind() [1/2]

```
unsigned seq64::keys_perform::rewind ( ) const  [inline]
```

10.27.4.50 rewind() [2/2]

```
void seq64::keys_perform::rewind (
             unsigned key )  [inline]
```

10.27.4.51 pointer_position() [1/2]

```
unsigned seq64::keys_perform::pointer_position ( ) const  [inline]
```

10.27.4.52 pointer_position() [2/2]

```
void seq64::keys_perform::pointer_position (
             unsigned key )  [inline]
```

10.27.4.53 toggle_mutes() [1/2]

```
unsigned seq64::keys_perform::toggle_mutes ( ) const  [inline]
```

10.27.4.54 toggle_mutes() [2/2]

```
void seq64::keys_perform::toggle_mutes (
             unsigned key )  [inline]
```

10.27.4.55 toggle_jack() [1/2]

```
unsigned seq64::keys_perform::toggle_jack ( ) const  [inline]
```

10.27.4.56 toggle_jack() [2/2]

```
void seq64::keys_perform::toggle_jack (
             unsigned key )  [inline]
```

10.27.4.57 tap_bpm() [1/2]

```
unsigned seq64::keys_perform::tap_bpm ( ) const  [inline]
```

10.27.4.58 tap_bpm() [2/2]

```
void seq64::keys_perform::tap_bpm (
             unsigned key )  [inline]
```

10.27.4.59 song_record() [1/2]

```
unsigned seq64::keys_perform::song_record ( ) const  [inline]
```

10.27.4.60 song_record() [2/2]

```
void seq64::keys_perform::song_record (
             unsigned key )  [inline]
```

10.27.4.61 oneshot_queue() [1/2]

```
unsigned seq64::keys_perform::oneshot_queue ( ) const  [inline]
```

10.27.4.62 oneshot_queue() [2/2]

```
void seq64::keys_perform::oneshot_queue (
             unsigned key )  [inline]
```

10.27.4.63 show_ui_sequence_key() [1/2]

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

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

10.27.4.64 show_ui_sequence_key() [2/2]

```
void seq64::keys_perform::show_ui_sequence_key (
             bool flag )  [inline]
```

Parameters

flag	The flag for showing the sequence key characters in each pattern slot.

10.27.4.65 show_ui_sequence_number() [1/2]

```
bool seq64::keys_perform::show_ui_sequence_number ( ) const  [inline]
```

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

10.27.4.66 show_ui_sequence_number() [2/2]

```
void seq64::keys_perform::show_ui_sequence_number (
             bool flag )  [inline]
```

Parameters

flag	The flag for showing the sequence number in each pattern slot.

10.27.4.67 get_key_events()

```
SlotMap& seq64::keys_perform::get_key_events ( )  [inline]
```

10.27.4.68 get_key_count()

```
int seq64::keys_perform::get_key_count (
             unsigned k ) const  [inline]
```

Parameters

k	The key value to be checked.

10.27.4.69 get_key_groups()

```
SlotMap& seq64::keys_perform::get_key_groups ( )  [inline]
```

10.27.4.70 get_key_events_rev()

```
RevSlotMap& seq64::keys_perform::get_key_events_rev ( )  [inline]
```

10.27.4.71 get_key_groups_rev()

```
RevSlotMap& seq64::keys_perform::get_key_groups_rev ( )  [inline]
```

10.27.4.72 lookup_keyevent_key()

```
unsigned seq64::keys_perform::lookup_keyevent_key (
            int seqnum )
```

Parameters

seqnum	Provides the sequence number to look up in the reverse key map for patterns/sequences. If the count for this value is 0, then a SEQ64_Clear character is returned.

10.27.4.73 lookup_keygroup_key()

```
unsigned seq64::keys_perform::lookup_keygroup_key (
            int groupnum )
```

Parameters

groupnum	Provides the group number to look up in the reverse key map for groups.

Returns

Returns the key for the desired group. If the count for the desired group is 0, then a SEQ64_Clear character is returned.

10.27.4.74 lookup_keyevent_seq()

```
int seq64::keys_perform::lookup_keyevent_seq (
            unsigned keycode )
```

Parameters

keycode	Provides the keycode to look up in the (forward) key map for patterns/sequences. If the count for this value is 0, then a 0 is returned.

10.27.4.75 lookup_keygroup_group()

```
int seq64::keys_perform::lookup_keygroup_group (
            unsigned keycode )
```

Parameters

keycode	Provides the sequence number to look up in the reverse key map for groups. If the count for this value is 0, then a 0 is returned. We might consider returning (-1) as an error code at some point.

10.27.4.76 key_name()

```
std::string seq64::keys_perform::key_name (
            unsigned 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

key	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.

10.27.4.77 set_all_key_events()

```
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.

10.27.4.78 set_all_key_groups()

```
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.

10.27.4.79 set_key_event()

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

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

Parameters

keycode	The key to be assigned.
sequence_slot	The perform event slot into which the keycode will be assigned.

10.27.4.80 set_key_group()

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

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

Parameters

keycode	The key to be assigned.
group_slot	The perform group slot into which the keycode will be assigned.

10.27.4.81 group_max() [1/2]

```
int seq64::keys_perform::group_max ( ) const  [inline]
```

10.27.4.82 group_max() [2/2]

```
void seq64::keys_perform::group_max (
            int groupcount )  [inline], [protected]
```

10.27.4.83 at_bpm_up()

```
unsigned* seq64::keys_perform::at_bpm_up ( )  [inline], [protected]
```

They are used in the options module, and, for brevity, are accessed using the PREFKEY_ADDR() macro. *'Getter' function* for member *m_key_bpm_up* Address getter for the bpm_up operation.

10.27.4.84 at_bpm_dn()

```
unsigned* seq64::keys_perform::at_bpm_dn ( )  [inline], [protected]
```

10.27.4.85 at_replace()

```
unsigned* seq64::keys_perform::at_replace ( )  [inline], [protected]
```

10.27.4.86 at_queue()

```
unsigned* seq64::keys_perform::at_queue ( )  [inline], [protected]
```

10.27.4.87 at_keep_queue()

```
unsigned* seq64::keys_perform::at_keep_queue ( )  [inline], [protected]
```

10.27.4.88 at_snapshot_1()

```
unsigned* seq64::keys_perform::at_snapshot_1 ( )  [inline], [protected]
```

10.27.4.89 at_snapshot_2()

```
unsigned* seq64::keys_perform::at_snapshot_2 ( )  [inline], [protected]
```

10.27.4.90 at_screenset_up()

```
unsigned* seq64::keys_perform::at_screenset_up ( )  [inline], [protected]
```

10.27.4.91 at_screenset_dn()

```
unsigned* seq64::keys_perform::at_screenset_dn ( )  [inline], [protected]
```

10.27.4.92 at_set_playing_screenset()

```
unsigned* seq64::keys_perform::at_set_playing_screenset ( )  [inline], [protected]
```

10.27.4.93 at_group_on()

```
unsigned* seq64::keys_perform::at_group_on ( )  [inline], [protected]
```

10.27.4.94 at_group_off()

```
unsigned* seq64::keys_perform::at_group_off ( )  [inline], [protected]
```

10.27.4.95 at_group_learn()

```
unsigned* seq64::keys_perform::at_group_learn ( )  [inline], [protected]
```

10.27.4.96 at_start()

```
unsigned* seq64::keys_perform::at_start ( )  [inline], [protected]
```

10.27.4.97 at_pause()

```
unsigned* seq64::keys_perform::at_pause ( )  [inline], [protected]
```

10.27.4.98 at_song_mode()

```
unsigned* seq64::keys_perform::at_song_mode ( )  [inline], [protected]
```

10.27.4.99 at_toggle_jack()

```
unsigned* seq64::keys_perform::at_toggle_jack ( )  [inline], [protected]
```

10.27.4.100 at_menu_mode()

```
unsigned* seq64::keys_perform::at_menu_mode ( )  [inline], [protected]
```

10.27.4.101 at_follow_transport()

```
unsigned* seq64::keys_perform::at_follow_transport ( ) [inline], [protected]
```

10.27.4.102 at_fast_forward()

```
unsigned* seq64::keys_perform::at_fast_forward ( ) [inline], [protected]
```

10.27.4.103 at_rewind()

```
unsigned* seq64::keys_perform::at_rewind ( ) [inline], [protected]
```

10.27.4.104 at_pointer_position()

```
unsigned* seq64::keys_perform::at_pointer_position ( ) [inline], [protected]
```

10.27.4.105 at_toggle_mutes()

```
unsigned* seq64::keys_perform::at_toggle_mutes ( ) [inline], [protected]
```

10.27.4.106 at_tap_bpm()

```
unsigned* seq64::keys_perform::at_tap_bpm ( ) [inline], [protected]
```

10.27.4.107 at_song_record()

```
unsigned* seq64::keys_perform::at_song_record ( ) [inline], [protected]
```

10.27.4.108 at_oneshot_queue()

```
unsigned* seq64::keys_perform::at_oneshot_queue ( ) [inline], [protected]
```

10.27.4.109 at_pattern_edit()

```
unsigned* seq64::keys_perform::at_pattern_edit ( ) [inline], [protected]
```

10.27.4.110 at_pattern_shift()

```
unsigned* seq64::keys_perform::at_pattern_shift ( ) [inline], [protected]
```

10.27.4.111 at_event_edit()

```
unsigned* seq64::keys_perform::at_event_edit ( ) [inline], [protected]
```

10.27.4.112 at_stop()

```
unsigned* seq64::keys_perform::at_stop ( ) [inline], [protected]
```

10.27.4.113 at_show_ui_sequence_key()

```
bool* seq64::keys_perform::at_show_ui_sequence_key ( ) [inline], [protected]
```

10.27.4.114 at_show_ui_sequence_number()

```
bool* seq64::keys_perform::at_show_ui_sequence_number ( ) [inline], [protected]
```

10.27.4.115 set_basic_key_events()

```
void seq64::keys_perform::set_basic_key_events ( ) [protected], [virtual]
```

10.27.4.116 set_basic_key_groups()

```
void seq64::keys_perform::set_basic_key_groups ( ) [protected], [virtual]
```

10.27.5 Friends And Related Function Documentation

10.27.5.1 options

```
friend class options  [friend]
```

10.27.5.2 perform

```
friend class perform  [friend]
```

10.27.5.3 optionsfile

```
friend class optionsfile  [friend]
```

10.27.6 Field Documentation

10.27.6.1 m_key_show_ui_sequence_key

```
bool seq64::keys_perform::m_key_show_ui_sequence_key  [private]
```

10.27.6.2 m_key_show_ui_sequence_number

```
bool seq64::keys_perform::m_key_show_ui_sequence_number  [private]
```

Also shows the sequence number as part of the sequence name in the performance window (song editor). Always disabled in legacy mode.

10.27.6.3 m_key_events

```
SlotMap seq64::keys_perform::m_key_events  [private]
```

Do not access directly, use the set/lookup functions declared below.

10.27.6.4 m_key_groups

`SlotMap seq64::keys_perform::m_key_groups [private]`

Do not access directly, use the set/lookup functions declared below.

10.27.6.5 m_key_events_rev

`RevSlotMap seq64::keys_perform::m_key_events_rev [private]`

Do not access directly, use the set/lookup functions declared below.

10.27.6.6 m_key_groups_rev

`RevSlotMap seq64::keys_perform::m_key_groups_rev [private]`

Do not access directly, use the set/lookup functions declared below.

10.27.6.7 m_group_max

`int seq64::keys_perform::m_group_max [private]`

This number is logged by the perform object to allow us to know that we can actually use the desired mute group.

10.27.6.8 m_key_bpm_up

`unsigned seq64::keys_perform::m_key_bpm_up [private]`

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

We could instead use the keys_perform_transfer structure instead of all these individual members.BPM up, apostrophe!!!

10.27.6.9 m_key_bpm_dn

`unsigned seq64::keys_perform::m_key_bpm_dn [private]`

10.27.6.10 m_key_replace

`unsigned seq64::keys_perform::m_key_replace [private]`

10.27.6.11 m_key_queue

```
unsigned seq64::keys_perform::m_key_queue  [private]
```

10.27.6.12 m_key_keep_queue

```
unsigned seq64::keys_perform::m_key_keep_queue  [private]
```

10.27.6.13 m_key_snapshot_1

```
unsigned seq64::keys_perform::m_key_snapshot_1  [private]
```

10.27.6.14 m_key_snapshot_2

```
unsigned seq64::keys_perform::m_key_snapshot_2  [private]
```

10.27.6.15 m_key_screenset_up

```
unsigned seq64::keys_perform::m_key_screenset_up  [private]
```

10.27.6.16 m_key_screenset_dn

```
unsigned seq64::keys_perform::m_key_screenset_dn  [private]
```

10.27.6.17 m_key_set_playing_screenset

```
unsigned seq64::keys_perform::m_key_set_playing_screenset  [private]
```

10.27.6.18 m_key_group_on

```
unsigned seq64::keys_perform::m_key_group_on  [private]
```

10.27.6.19 m_key_group_off

```
unsigned seq64::keys_perform::m_key_group_off  [private]
```

10.27.6.20 m_key_group_learn

```
unsigned seq64::keys_perform::m_key_group_learn  [private]
```

10.27.6.21 m_key_start

```
unsigned seq64::keys_perform::m_key_start  [private]
```

10.27.6.22 m_key_pause

```
unsigned seq64::keys_perform::m_key_pause  [private]
```

10.27.6.23 m_key_song_mode

```
unsigned seq64::keys_perform::m_key_song_mode  [private]
```

10.27.6.24 m_key_toggle_jack

```
unsigned seq64::keys_perform::m_key_toggle_jack  [private]
```

10.27.6.25 m_key_menu_mode

```
unsigned seq64::keys_perform::m_key_menu_mode  [private]
```

10.27.6.26 m_key_follow_transport

```
unsigned seq64::keys_perform::m_key_follow_transport  [private]
```

10.27.6.27 m_key_rewind

```
unsigned seq64::keys_perform::m_key_rewind  [private]
```

10.27.6.28 m_key_fast_forward

```
unsigned seq64::keys_perform::m_key_fast_forward  [private]
```

10.27.6.29 m_key_pointer_position

```
unsigned seq64::keys_perform::m_key_pointer_position  [private]
```

10.27.6.30 m_key_toggle_mutes

```
unsigned seq64::keys_perform::m_key_toggle_mutes  [private]
```

10.27.6.31 m_key_tap_bpm

```
unsigned seq64::keys_perform::m_key_tap_bpm  [private]
```

10.27.6.32 m_key_pattern_edit

```
unsigned seq64::keys_perform::m_key_pattern_edit  [private]
```

10.27.6.33 m_key_pattern_shift

```
unsigned seq64::keys_perform::m_key_pattern_shift  [private]
```

10.27.6.34 m_key_event_edit

```
unsigned seq64::keys_perform::m_key_event_edit  [private]
```

10.27.6.35 m_key_stop

```
unsigned seq64::keys_perform::m_key_stop  [private]
```

10.27.6.36 m_key_song_record

```
unsigned seq64::keys_perform::m_key_song_record  [private]
```

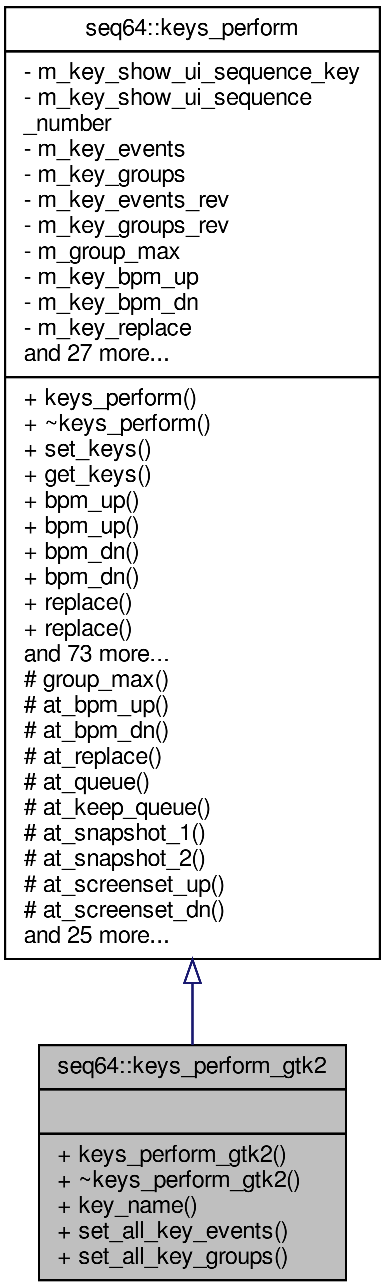
10.27.6.37 m_key_oneshot_queue

```
unsigned seq64::keys_perform::m_key_oneshot_queue  [private]
```

10.28 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 ()

    A rote virtual destructor.
- virtual std::string key_name (unsigned key) const

Converts a key's value to a human-readable string.
- 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

10.28.1 Detailed Description

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

10.28.2 Constructor & Destructor Documentation

10.28.2.1 keys_perform_gtk2()

```
seq64::keys_perform_gtk2::keys_perform_gtk2 ( )
```

10.28.2.2 ∼keys_perform_gtk2()

```
seq64::keys_perform_gtk2::∼keys_perform_gtk2 ( )  [virtual]
```

No action.

10.28.3 Member Function Documentation

10.28.3.1 key_name()

```
virtual std::string seq64::keys_perform_gtk2::key_name (
            unsigned key ) const  [inline], [virtual]
```

Parameters

key	The numerical value of the key.

Returns

Returns the string version of the key.

Reimplemented from seq64::keys_perform.

10.28.3.2 set_all_key_events()

```
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.

The main keys are offloaded to the base class now. Qt and Gdk keys overlap a lot.

Reimplemented from seq64::keys_perform.

10.28.3.3 set_all_key_groups()

```
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.

The main keys are offloaded to the base class now. Qt and Gdk keys overlap a lot.

Reimplemented from seq64::keys_perform.

10.29 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().

Data Fields

- unsigned kpt_bpm_up
- unsigned kpt_bpm_dn
- unsigned kpt_screenset_up
- unsigned kpt_screenset_dn
- unsigned kpt_set_playing_screenset
- unsigned kpt_group_on
- unsigned kpt_group_off
- unsigned kpt_group_learn
- unsigned kpt_replace
- unsigned kpt_queue
- unsigned kpt_keep_queue
- unsigned kpt_snapshot_1
- unsigned kpt_snapshot_2
- unsigned kpt_start

- unsigned kpt_stop
- bool kpt_show_ui_sequence_key
- bool kpt_show_ui_sequence_number
- unsigned kpt_pattern_edit
- unsigned kpt_pattern_shift
- unsigned kpt_event_edit
- unsigned kpt_tap_bpm
- unsigned kpt_pause
- unsigned kpt_song_mode
- unsigned kpt_toggle_jack
- unsigned kpt_menu_mode
- unsigned kpt_follow_transport
- unsigned kpt_fast_forward
- unsigned kpt_rewind
- unsigned kpt_pointer_position
- unsigned kpt_toggle_mutes
- unsigned kpt_song_record
- unsigned kpt_oneshot_queue

10.29.1 Field Documentation

10.29.1.1 kpt_bpm_up

`unsigned seq64::keys_perform_transfer::kpt_bpm_up`

10.29.1.2 kpt_bpm_dn

`unsigned seq64::keys_perform_transfer::kpt_bpm_dn`

10.29.1.3 kpt_screenset_up

`unsigned seq64::keys_perform_transfer::kpt_screenset_up`

10.29.1.4 kpt_screenset_dn

`unsigned seq64::keys_perform_transfer::kpt_screenset_dn`

10.29.1.5 kpt_set_playing_screenset

```
unsigned seq64::keys_perform_transfer::kpt_set_playing_screenset
```

10.29.1.6 kpt_group_on

```
unsigned seq64::keys_perform_transfer::kpt_group_on
```

10.29.1.7 kpt_group_off

```
unsigned seq64::keys_perform_transfer::kpt_group_off
```

10.29.1.8 kpt_group_learn

```
unsigned seq64::keys_perform_transfer::kpt_group_learn
```

10.29.1.9 kpt_replace

```
unsigned seq64::keys_perform_transfer::kpt_replace
```

10.29.1.10 kpt_queue

```
unsigned seq64::keys_perform_transfer::kpt_queue
```

10.29.1.11 kpt_keep_queue

```
unsigned seq64::keys_perform_transfer::kpt_keep_queue
```

10.29.1.12 kpt_snapshot_1

```
unsigned seq64::keys_perform_transfer::kpt_snapshot_1
```

10.29.1.13 kpt_snapshot_2

```
unsigned seq64::keys_perform_transfer::kpt_snapshot_2
```

10.29.1.14 kpt_start

```
unsigned seq64::keys_perform_transfer::kpt_start
```

10.29.1.15 kpt_stop

```
unsigned seq64::keys_perform_transfer::kpt_stop
```

10.29.1.16 kpt_show_ui_sequence_key

```
bool seq64::keys_perform_transfer::kpt_show_ui_sequence_key
```

10.29.1.17 kpt_show_ui_sequence_number

```
bool seq64::keys_perform_transfer::kpt_show_ui_sequence_number
```

10.29.1.18 kpt_pattern_edit

```
unsigned seq64::keys_perform_transfer::kpt_pattern_edit
```

10.29.1.19 kpt_pattern_shift

```
unsigned seq64::keys_perform_transfer::kpt_pattern_shift
```

10.29.1.20 kpt_event_edit

```
unsigned seq64::keys_perform_transfer::kpt_event_edit
```

10.29.1.21 kpt_tap_bpm

```
unsigned seq64::keys_perform_transfer::kpt_tap_bpm
```

10.29.1.22 kpt_pause

```
unsigned seq64::keys_perform_transfer::kpt_pause
```

10.29.1.23 kpt_song_mode

```
unsigned seq64::keys_perform_transfer::kpt_song_mode
```

10.29.1.24 kpt_toggle_jack

```
unsigned seq64::keys_perform_transfer::kpt_toggle_jack
```

10.29.1.25 kpt_menu_mode

```
unsigned seq64::keys_perform_transfer::kpt_menu_mode
```

10.29.1.26 kpt_follow_transport

```
unsigned seq64::keys_perform_transfer::kpt_follow_transport
```

10.29.1.27 kpt_fast_forward

```
unsigned seq64::keys_perform_transfer::kpt_fast_forward
```

10.29.1.28 kpt_rewind

```
unsigned seq64::keys_perform_transfer::kpt_rewind
```

10.29.1.29 kpt_pointer_position

```
unsigned seq64::keys_perform_transfer::kpt_pointer_position
```

10.29.1.30 kpt_toggle_mutes

```
unsigned seq64::keys_perform_transfer::kpt_toggle_mutes
```

10.29.1.31 kpt_song_record

```
unsigned seq64::keys_perform_transfer::kpt_song_record
```

10.29.1.32 kpt_oneshot_queue

```
unsigned seq64::keys_perform_transfer::kpt_oneshot_queue
```

10.30 seq64::keystroke Class Reference

Encapsulates any practical keystroke.

Public Member Functions

- keystroke ()

  The default constructor for class keystroke.
- keystroke (unsigned 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 (unsigned ch=SEQ64_KEYSTROKE_BAD_VALUE) const

  'Getter' function for member m_key to test letters, handles ASCII only.
- bool is (unsigned ch) const

  Tests the key value to see if it matches the given character exactly (no case-insensitivity).
- bool is (unsigned ch1, unsigned ch2) const

  Tests the key value to see if it matches the given character exactly (no case-insensitivity).
- bool is_delete () const

  'Getter' function for member m_key to test for a delete-causing key.

- unsigned key () const

  'Getter' function for member m_key
- void shift_lock ()

  If a lower-case letter, a number, or another character on the "main" part of the keyboard, shift the m_key value to upper-case or the character shifted on a standard American keyboard.
- 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 m_key

  The key that was pressed or released.
- seq_modifier_t m_modifier

  The optional modifier value.

10.30.1 Detailed Description

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

10.30.2 Constructor & Destructor Documentation

10.30.2.1 keystroke() [1/3]

```
seq64::keystroke::keystroke ( )
```

10.30.2.2 keystroke() [2/3]

```
seq64::keystroke::keystroke (
            unsigned key,
            bool press = SEQ64_KEYSTROKE_PRESS,
            int modkey = int(SEQ64_NO_MASK) )
```

Parameters

key	The keystroke number of the key that was pressed or released.
press	If true, the keystroke action was a press, otherwise it was a release.
modkey	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.

10.30.2.3 keystroke() [3/3]

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

Parameters

rhs	The object to be copied.

10.30.3 Member Function Documentation

10.30.3.1 operator=()

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

Parameters

rhs	The object to be assigned.

Returns

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

10.30.3.2 is_press()

```
bool seq64::keystroke::is_press ( ) const  [inline]
```

10.30.3.3 is_letter()

```
bool seq64::keystroke::is_letter (
            unsigned ch = SEQ64_KEYSTROKE_BAD_VALUE ) const
```

Parameters

ch	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

10.30.3.4 is() [1/2]

```
bool seq64::keystroke::is (
            unsigned ch ) const  [inline]
```

Parameters

ch	The character to be tested.

Returns

Returns true if m_key == ch.

10.30.3.5 is() [2/2]

```
bool seq64::keystroke::is (
            unsigned ch1,
            unsigned ch2 ) const  [inline]
```

Parameters

ch1	The first character to be tested.
ch2	The second character to be tested.

Returns

Returns true if m_key == ch1 or ch2.

10.30.3.6 is_delete()

```
bool seq64::keystroke::is_delete ( ) const  [inline]
```

10.30.3.7 key()

```
unsigned seq64::keystroke::key ( ) const [inline]
```

10.30.3.8 shift_lock()

```
void seq64::keystroke::shift_lock ( )
```

Currently also assumes the ASCII character set.

There's an oddity here: the shift of '2' is the '@' character, but seq24 seems to have treated it like the '"' character. Some others were treated the same:

```
    Key:        1 2 3 4 5 6 7 8 9 0
    Shift:      ! @ # $ % ^ & * ( )
    Seq24:      ! " # $ % & ' ( ) space
```

```
This function is meant to avoid using the Caps-Lock when picking a
group-learn character in the group-learn mode.
```

10.30.3.9 modifier()

```
seq_modifier_t seq64::keystroke::modifier ( ) const [inline]
```

10.30.3.10 mod_control()

```
bool seq64::keystroke::mod_control ( ) const [inline]
```

10.30.3.11 mod_control_shift()

```
bool seq64::keystroke::mod_control_shift ( ) const [inline]
```

10.30.3.12 mod_super()

```
bool seq64::keystroke::mod_super ( ) const [inline]
```

10.30.4 Field Documentation

10.30.4.1 m_is_press

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

See the SEQ64_KEYSTROKE_PRESS and SEQ64_KEYSTROKE_RELEASE readability macros.

10.30.4.2 m_key

`unsigned 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.

10.30.4.3 m_modifier

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

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

10.31 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.
- lash_client_t ∗ m_client

  Holds the client "handle" returned by the lash_init() function.
- lash_args_t ∗ m_lash_args

  Holds the command-line arguments used by the lash_init() function.
- bool m_is_lash_supported

  Indicates if LASH support has been compiled into the library.

10.31.1 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.

10.31.2 Constructor & Destructor Documentation

10.31.2.1 lash()

```
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

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

10.31.3 Member Function Documentation

10.31.3.1 set_alsa_client_id()

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

/param id The ALSA client ID to be set.

10.31.3.2 start()

```
void seq64::lash::start ( )
```

10.31.3.3 process_events()

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

Returns

Always returns true.

10.31.3.4 init()

```
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.

10.31.3.5 handle_event()

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

Parameters

ev	Provides the event to be handled.

10.31.3.6 handle_config()

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

Currently incomplete.

Parameters

conf	Provides the configuration item to handle.

10.31.4 Field Documentation

10.31.4.1 m_perform

```
perform& seq64::lash::m_perform  [private]
```

10.31.4.2 m_client

```
lash_client_t* seq64::lash::m_client  [private]
```

10.31.4.3 m_lash_args

```
lash_args_t* seq64::lash::m_lash_args  [private]
```

10.31.4.4 m_is_lash_supported

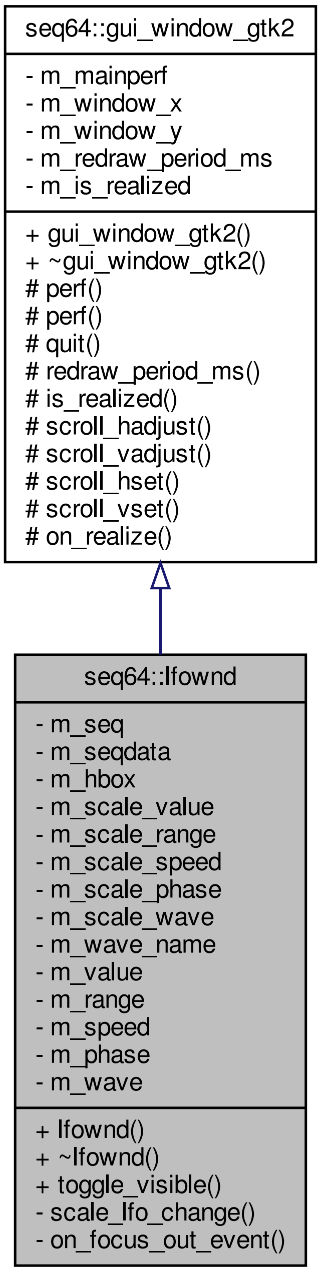
```
bool seq64::lash::m_is_lash_supported  [private]
```

Is set to true if SEQ64_LASH_SUPPORT is defined. This variable is not used, but we will keep it around for the possibility of testing LASH support at run time.

10.32 seq64::lfownd Class Reference

One LFO window class.

Inheritance diagram for seq64::lfownd:



Public Member Functions

- lfownd (perform &p, sequence &seq, seqdata &sdata)

Constructs the LFO window.
- virtual ∼lfownd ()

  Provides a rote destructor.
- void toggle_visible ()

  Toggles the visibility of the LFO window.

Private Member Functions

- void scale_lfo_change ()

  Changes the scaling provided by this window.
- bool on_focus_out_event (GdkEventFocus ∗p0)

  Undoes the LFO changes if there is undo available.

Private Attributes

- sequence & m_seq

  The sequence associated with this window.
- seqdata & m_seqdata

  The seqdata associated with this window.
- Gtk::HBox ∗ m_hbox

  The main horizontal packing box.
- Gtk::VScale ∗ m_scale_value

  Vertical slider for value.
- Gtk::VScale ∗ m_scale_range

  Vertical slider for range.
- Gtk::VScale ∗ m_scale_speed

  Vertical slider for speed.
- Gtk::VScale ∗ m_scale_phase

  Vertical slider for phase.
- Gtk::VScale ∗ m_scale_wave

  Vertical slider for wave type.
- Gtk::Label ∗ m_wave_name

  Human readable name for wave type.
- double m_value

  Value.
- double m_range

  Range.
- double m_speed

  Speed.
- double m_phase

  Phase.
- wave_type_t m_wave

  Wave type.

Additional Inherited Members

10.32.1 Detailed Description

Personally, it seems a bit of a odd duck to be included in Sequencer64, so we're thinking of a better way to manage the data managed by this window.

10.32.2 Constructor & Destructor Documentation

10.32.2.1 lfownd()

```
seq64::lfownd::lfownd (
            perform & p,
            sequence & seq,
            seqdata & sdata )
```

Parameters

p	The performance object, which holds parameters necessary for manipulating events.
seq	The sequence/pattern that is to be affected by the LFO window. It holds the actual MIDI events being modified.
sdata	The data pane/panel of the pattern editor window representing the sequence. We need to tell it to redraw.

10.32.2.2 ∼lfownd()

```
seq64::lfownd::∼lfownd ( )  [virtual]
```

10.32.3 Member Function Documentation

10.32.3.1 toggle_visible()

```
void seq64::lfownd::toggle_visible ( )
```

10.32.3.2 scale_lfo_change()

```
void seq64::lfownd::scale_lfo_change ( )  [private]
```

Changes take place right away in this callback.

10.32.3.3 on_focus_out_event()

```
bool seq64::lfownd::on_focus_out_event (
            GdkEventFocus * p0 )  [private]
```

Returns

Always returns true.

10.32.4 Field Documentation

10.32.4.1 m_seq

```
sequence& seq64::lfownd::m_seq  [private]
```

10.32.4.2 m_seqdata

```
seqdata& seq64::lfownd::m_seqdata  [private]
```

10.32.4.3 m_hbox

```
Gtk::HBox* seq64::lfownd::m_hbox  [private]
```

10.32.4.4 m_scale_value

```
Gtk::VScale* seq64::lfownd::m_scale_value  [private]
```

10.32.4.5 m_scale_range

```
Gtk::VScale* seq64::lfownd::m_scale_range  [private]
```

10.32.4.6 m_scale_speed

```
Gtk::VScale* seq64::lfownd::m_scale_speed  [private]
```

10.32.4.7 m_scale_phase

```
Gtk::VScale* seq64::lfownd::m_scale_phase  [private]
```

10.32.4.8 m_scale_wave

```
Gtk::VScale* seq64::lfownd::m_scale_wave  [private]
```

10.32.4.9 m_wave_name

```
Gtk::Label* seq64::lfownd::m_wave_name  [private]
```

10.32.4.10 m_value

```
double seq64::lfownd::m_value  [private]
```

10.32.4.11 m_range

```
double seq64::lfownd::m_range  [private]
```

10.32.4.12 m_speed

```
double seq64::lfownd::m_speed  [private]
```

10.32.4.13 m_phase

```
double seq64::lfownd::m_phase  [private]
```

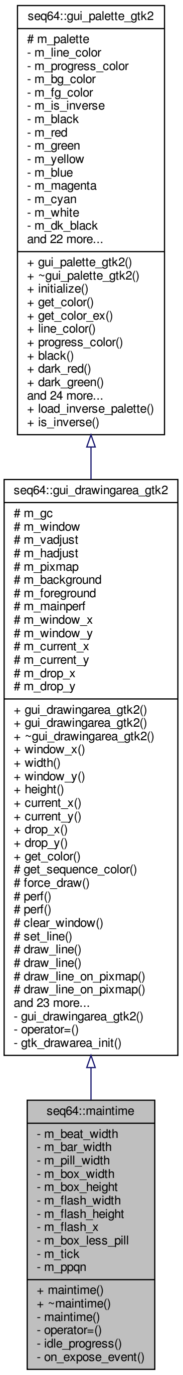
10.32.4.14 m_wave

```
wave_type_t seq64::lfownd::m_wave  [private]
```

10.33 seq64::maintime Class Reference

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

Inheritance diagram for seq64::maintime:



Public Member Functions

- maintime (perform &p, int ppqn=SEQ64_USE_DEFAULT_PPQN)

This constructor sets up the colors black, white, and grey, and then allocates them.
- virtual ∼maintime ()

  Let's provide a do-nothing virtual destructor.

Private Member Functions

- maintime (const maintime &)
- maintime & operator= (const maintime &)
- int idle_progress (midipulse 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.
- bool on_expose_event (GdkEventExpose ∗ev)

  This function merely idles.

Private Attributes

- const int m_beat_width

  Provides the divisor for ticks to produce a beat value.
- const int m_bar_width

  Provides the divisor for ticks to produce a bar value.
- const int m_pill_width

  Provides the width of the pills, little black squares that show the progress of a beat and a bar (measure).
- const int m_box_width

  The width/length of the rectangle to be drawn inside the maintime window.
- const int m_box_height

  The height of the rectangle to be drawn inside the maintime window.
- const int m_flash_width

  The width/length of the flashing rectangle to be drawn inside the maintime window.
- const int m_flash_height

  The height of the flashing rectangle to be drawn inside the maintime window.
- const int m_flash_x

  The x value at which a flash should occur.
- const int m_box_less_pill

  The width/length of the maintime window minus the width of the pill.
- midipulse m_tick

  Saves the tick value for on_expose_event().
- int m_ppqn

  Provides the active PPQN value.

Friends

- class mainwnd

Additional Inherited Members

10.33.1 Detailed Description

We added a lot of members to hold the results of calculations that involve what are essentially constant. This saves CPU time, and maybe a little memory for the code to make those calculations more than once.

10.33.2 Constructor & Destructor Documentation

10.33.2.1 maintime() [1/2]

```
seq64::maintime::maintime (
            const maintime & )  [private]
```

10.33.2.2 maintime() [2/2]

```
seq64::maintime::maintime (
            perform & p,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

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

10.33.2.3 ∼maintime()

```
virtual seq64::maintime::∼maintime ( )  [inline], [virtual]
```

10.33.3 Member Function Documentation

10.33.3.1 operator=()

```
maintime& seq64::maintime::operator= (
            const maintime & )  [private]
```

10.33.3.2 idle_progress()

```
int seq64::maintime::idle_progress (
            midipulse ticks )  [private]
```

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".

Parameters

ticks	Provides the main tick setting. This setting is provided by mainwnd(), in its timer callback.

Returns

Always returns 1 (it used to return "true"!).

10.33.3.3 on_expose_event()

```
bool seq64::maintime::on_expose_event (
            GdkEventExpose * ev )  [private]
```

We don't need the m_tick member, the function works as well if 0 is passed in. We've removed m_tick permanently.

Actually, it might be useful after all, to avoid flickering under JACK transport. Let's put it back for now. (It doesn't help, but we will leave it in, the overhead is small.)

10.33.4 Friends And Related Function Documentation

10.33.4.1 mainwnd

```
friend class mainwnd  [friend]
```

10.33.5 Field Documentation

10.33.5.1 m_beat_width

```
const int seq64::maintime::m_beat_width  [private]
```

Currently, this value is hardwired to 4, but will eventually be wired up as usr().midi_beat_width().

10.33.5.2 m_bar_width

```
const int seq64::maintime::m_bar_width  [private]
```

Currently, this value is hardwired to 16, but will eventually be wired up as usr().midi_beat_width() ∗ usr().midi_↩
beats_per_bar().

10.33.5.3 m_pill_width

```
const int seq64::maintime::m_pill_width  [private]
```

10.33.5.4 m_box_width

```
const int seq64::maintime::m_box_width  [private]
```

This item absolutely depends on the main window being non-resizable.

10.33.5.5 m_box_height

```
const int seq64::maintime::m_box_height  [private]
```

This item absolutely depends on the main window being non-resizable.

10.33.5.6 m_flash_width

```
const int seq64::maintime::m_flash_width  [private]
```

Just a bit smaller than m_box_width.

10.33.5.7 m_flash_height

```
const int seq64::maintime::m_flash_height  [private]
```

Just a bit smaller than m_box_width.

10.33.5.8 m_flash_x

```
const int seq64::maintime::m_flash_x  [private]
```

10.33.5.9 m_box_less_pill

```
const int seq64::maintime::m_box_less_pill  [private]
```

10.33.5.10 m_tick

```
midipulse seq64::maintime::m_tick  [private]
```

It might actually be useful after all. And the overhead is tiny.

10.33.5.11 m_ppqn

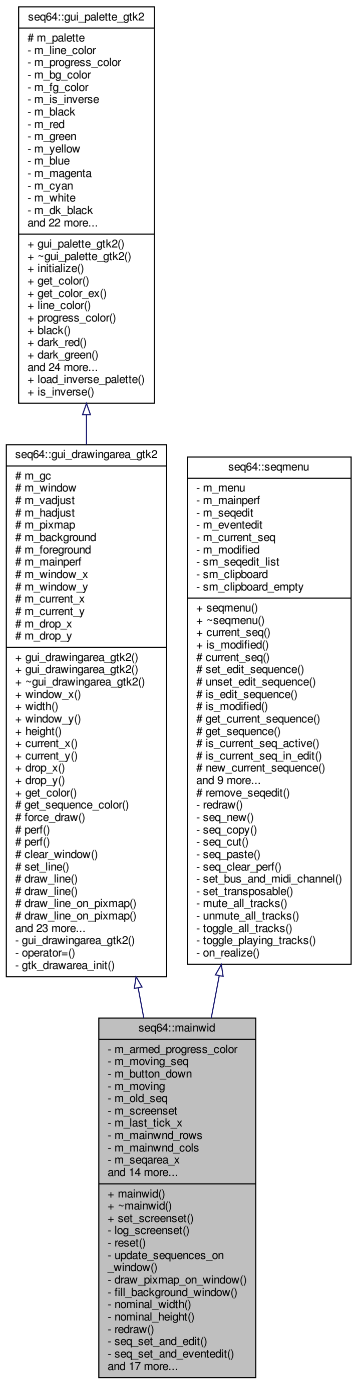
```
int seq64::maintime::m_ppqn  [private]
```

While this is effectively a constant for the duration of a tune, it might change as different tunes are loaded.

10.34 seq64::mainwid Class Reference

This class implements the piano roll area of the application.

Inheritance diagram for seq64::mainwid:



Public Member Functions

- mainwid (perform &p, int ss=0)

This constructor sets all of the members.

- virtual ∼mainwid ()

  A rote destructor.

- int set_screenset (int ss)

  Set the current screen-set.

Private Member Functions

- void log_screenset (int ss)

  'Setter' function for member m_screenset This function is used for altering the current screen-set displayed by a single mainwid in multi-mainwid mode.

- void reset ()

  This function redraws everything and queues up a redraw operation.

- void update_sequences_on_window ()

  Updates the image of multiple sequencer/pattern slots.

- void draw_pixmap_on_window ()

  This function queues the blit of pixmap to window.

- void fill_background_window ()

  This function updates the background window, clearing it.

- int nominal_width () const

  'Getter' function for member m_mainwid_x

- int nominal_height () const

  'Getter' function for member m_mainwid_y

- virtual void redraw (int seq)

  This virtual function, overridden from the seqmenu base class, draws the the given pattern/sequence again.

- virtual void seq_set_and_edit (int seqnum)

  Calculates the sequence number based on the screenset and then calls the base-class function to bring up the pattern/sequence editor.

- virtual void seq_set_and_eventedit (int seqnum)

  Calculates the sequence number based on the screenset and then calls the base-class function to bring up the event editor.

- void draw_marker_on_sequence (int seq, int tick)

  Does the actual drawing of one pattern/sequence position marker, a vertical progress bar.

- 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).

- 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 draw_sequence_pixmap_on_window (int seq)

  This function draws a sequence pixmap 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 ()

  Provides a stock callback, because some kind of callback is needed.

- 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 select_fg_bg_colors (int seqnum)

  Picks the foreground and background colors based on the sequence in edit and the SEQ64_EDIT_SEQUENCE_↩ HIGHLIGHT macro.
- 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 in one of the sequence/pattern slots.
- 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

- Color m_armed_progress_color

  Holds the progress color for armed sequences, which have a black background.
- sequence m_moving_seq

  Holds a partial copy of the sequence we are moving on the patterns panel.
- bool m_button_down

  Indicates that the mouse button is still down.
- bool m_moving

  Indicates that we are still in the middle of a drag-and-drop operation.
- int m_old_seq

  Holds the sequence number of a sequence being drag-and-dropped.
- int m_screenset

  Indicates the current screenset that is visible.
- long m_last_tick_x [c_max_sequence]

  Holds the last active tick for each sequence, used in erasing the progress bar.
- const 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 or user-interface configuration items later.
- const int m_mainwnd_cols

  Number of columns, unused in settings.
- const int m_seqarea_x

  Roughly with width of the main window.
- const int m_seqarea_y

  Roughly with height of the main window.
- const int m_seqarea_seq_x

  To be determined.
- const int m_seqarea_seq_y

  To be determined.
- const int m_mainwid_x

  Horizontal size of the main window grid.
- const int m_mainwid_y

Vertical size of the main window grid.
- const int m_mainwid_border_x

  Border offset fudge factor, x.
- const int m_mainwid_border_y

  Border offset fudge factor, y.
- const int m_mainwid_spacing

  Spacing, untested setting.
- const int m_text_size_x

  Text width, varies with font in use.
- const int m_text_size_y

  Text height, varies with font in use.
- const int m_max_sets

  Maximum number of sets, used all over.
- const int m_screenset_slots

  Provides a convenience variable for avoiding multiplications.
- int m_screenset_offset

  Provides a convenience variable for avoiding multiplications.
- const int m_progress_height

  Provides the height of the progress bar, to save calculations and for consistency between drawing and erasing the progress bar.

Friends

- class mainwnd
- void update_mainwid_sequences ()

  This global function in the seq64 namespace calls mainwid :: update_sequences_on_window(), if the global mainwid object exists.

Additional Inherited Members

10.34.1 Detailed Description

It inherits from gui_drawingarea_gtk2 to support the font, color, and other GUI functionality, and from seqmenu to support the right-click Edit/New/Cut right-click menu. The friend class and function are for updating the current sequence and for control via the mainwnd object.

10.34.2 Constructor & Destructor Documentation

10.34.2.1 mainwid()

```
seq64::mainwid::mainwid (
            perform & p,
            int ss = 0 )
```

And it asks for its size from usr().mainwid_width() and usr().mainwid_height functions. It adds GDK masks for button presses, releases, motion, key presses, and focus changes. Also logs a self-referential singleton pointer to use for the current-edit highlighting support.

Parameters

p	Provides the reference to the all-important perform object.
ss	Indicates the screen we start out at. This is really only useful if SEQ64_MULTI_MAINWND is defined, but doesn't hurt much to have it as a parameter here, and it could be a good feature independent of multi-mainwid support. The default value is 0.

10.34.2.2 ∼mainwid()

```
seq64::mainwid::∼mainwid ( )  [virtual]
```

10.34.3 Member Function Documentation

10.34.3.1 set_screenset()

```
int seq64::mainwid::set_screenset (
            int ss )
```

Note that m_screenset_slots = m_mainwnd_rows ∗ m_mainwnd_cols and this will also match perform::m_seqs_↩ in_set.

This function calls perform::set_screenset(), which recapitulates the old code above completely, whereas perform↩ ::set_offset() recapitulates only the line of code immediately above it. However, note that there is a back-and-forth between setting the screenset via perform (using MIDI control) versus the GUI in the mainwnd class. Probably useful to add a default boolean to prevent circular manipulation.

Parameters

ss	Provides the screen-set number to set.
setperf	If true, then also call perform::set_screenset(), even if multi-wid mode is not in force. Defaults to false. It might be better if it defaults to true.

Returns

Returns the (new) value of m_screenset so that the main window can set the set-number in the Set spinner.

10.34.3.2 log_screenset()

```
void seq64::mainwid::log_screenset (
            int ss )  [private]
```

10.34.3.3 reset()

```
void seq64::mainwid::reset ( )  [inline], [private]
```

10.34.3.4 update_sequences_on_window()

```
void seq64::mainwid::update_sequences_on_window ( )  [inline], [private]
```

Used by the friend class mainwnd, but also useful for our new feature to fully highlight the current sequence. Calls reset() if SEQ64_EDIT_SEQUENCE_HIGHLIGHT is defined.

10.34.3.5 draw_pixmap_on_window()

```
void seq64::mainwid::draw_pixmap_on_window ( )  [inline], [private]
```

10.34.3.6 fill_background_window()

```
void seq64::mainwid::fill_background_window ( )  [inline], [private]
```

10.34.3.7 nominal_width()

```
int seq64::mainwid::nominal_width ( ) const  [inline], [private]
```

10.34.3.8 nominal_height()

```
int seq64::mainwid::nominal_height ( ) const  [inline], [private]
```

10.34.3.9 redraw()

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

Parameters

seqnum	Provides the number of the sequence to draw.

Implements seq64::seqmenu.

10.34.3.10 seq_set_and_edit()

```
void seq64::mainwid::seq_set_and_edit (
             int seqnum )  [private], [virtual]
```

Used with the '=' key selection, by default.

Reimplemented from seq64::seqmenu.

10.34.3.11 seq_set_and_eventedit()

```
void seq64::mainwid::seq_set_and_eventedit (
             int seqnum )  [private], [virtual]
```

Used with the '-' key selection, by default.

Reimplemented from seq64::seqmenu.

10.34.3.12 draw_marker_on_sequence()

```
void seq64::mainwid::draw_marker_on_sequence (
             int seqnum,
             int tick )  [private]
```

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

Note that, when Sequencer64 first comes up, and perform::is_dirty_main() is called, no sequences exist yet. Also, currently the redraw() is hit when seq_edit() is called, but not when seq_event_edit() is called, which makes the latter not paint the in-edit highlight colors (if enabled). Why?

Parameters

seqnum	Provides the number of the sequence to draw.
tick	Provides the location to draw the marker. If pause support is compiled in (i.e. no –disable-pause in the configuration), then this parameter is ignored, and is replaced by the sequences' get_lask_tick() value. This causes correct stop/pause/play progress-bar behavior in each pattern slot. Note: This is now independent of the –disable-pause option!

10.34.3.13 update_markers()

```
void seq64::mainwid::update_markers (
            int tick )  [private]
```

Parameters

tick	Starting point for drawing the markers.

10.34.3.14 valid_sequence()

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

Parameters

seqnum	Provides the number of the sequence to validate.

Returns

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

10.34.3.15 draw_sequence_on_pixmap()

```
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). Also, we ignore the sequence if it does not exist.

Note

If only the main window is up, then the sequences just play (muted by default) – the progress bars move in each pattern. Gaps in the sequence in the Song (performance) Editor don't change the appearance of the patterns if only the main window is up. But, if the Song Editor window is up, and the song is started using the controls in the Song Editor, then the active patterns are black while playing, and white when gaps in the sequence are encountered. The muting status in the main window is ignored. The muting in the Song (performance) windows is in force. This setup holds for ALSA, but not for JACK transport.

Parameters

seqnum	Provides the number of the sequence slot that needs to be drawn. It is checked for validity before usage.

10.34.3.16 draw_sequences_on_pixmap()

```
void seq64::mainwid::draw_sequences_on_pixmap ( )  [private]
```

Please note that draw_sequence_on_pixmap() also draws the empty slots of inactive sequences, so we cannot take shortcuts here.

10.34.3.17 draw_sequence_pixmap_on_window()

```
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. This function is used when dragging a pattern from one pattern-slot to another pattern-slot.

We have to add 1 pixel to the y height in order to avoid leaving behind a line at the bottom of an empty pattern-slot.

Parameters

seqnum	Provides the number of the sequence to draw.

10.34.3.18 seq_from_xy()

```
int seq64::mainwid::seq_from_xy (
             int x,
             int y )  [private]
```

Parameters

x	Provides the x coordinate.
y	Provides the y coordinate.

Returns

Returns -1 if the sequence number cannot be calculated.

10.34.3.19 timeout()

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

Returns

Always returns true.

10.34.3.20 calculate_base_sizes()

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

The values are returned as side-effects.

Parameters

	seqnum	Provides the number of the sequence to calculate.
out	*basex*	A return parameter for the x coordinate of the base size.
out	*basey*	A return parameter for the y coordinate of the base size.

10.34.3.21 select_fg_bg_colors()

```
void seq64::mainwid::select_fg_bg_colors (
             int seqnum )  [private]
```

10.34.3.22 on_realize()

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

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

This function used to call font::init(), and was the only place where the font::init() function was called. The init() function gets a color-map from the window. We need a more fool-proof was to do this!

10.34.3.23 on_expose_event()

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

Parameters

ev	The expose event.

Returns

Always returns true.

10.34.3.24 on_button_press_event()

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

If the press is a single left-click, and no Ctrl key is pressed, then this function 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. In the release event callback, this then causes the sequence arming/muting to be toggled.

If the press is a single Ctrl-left-click, this function brings up the New or Edit menu. The New menu is brought up if the grid slot is empty, and the Edit menu otherwise. Another way to bring up the same functionality is described in the next paragraph.

If the press is a double-click, it first acts just like two single-clicks (which might confuse the user at first, because it toggles the mute state twice). Then it brings up the Edit menu for the sequence. This new behavior is closer to what users have come to expect from a double-click. I miss the double-click when running seq24.

We also try to handle a Ctrl-double-click as a signal to do an event edit, instead of a sequence edit. The event editor provides a way to look at all events in detail, without having to select the type of event to see. However, this doesn't work, the event is treated like a ctrl-single-click. And we use the Alt key to enable window movement or resizing in our window manager, so that's out.

Parameters

ev	Provides the parameters of the button event.

Returns

Always returns true.

10.34.3.25 on_button_release_event()

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

This event is a lot more complex than a press. The left button toggles playback status. The right button brings up a popup menu. If the slot is empty, then a "New" popup is presented, otherwise an "Edit" and selection popup is presented.

Also now implements the new "toggle all other patterns" action, initiated via Shift-Left-Click.

Parameters

ev	Provides the parameters of the button event.

Returns

Always returns true.

Tried disabling the setting of the current sequence; it completely disables drag-n-drop. But leaving it in removes the current-sequence highlighting, which otherwise is fine. So we do it only if moving a pattern (drag-and-drop).

10.34.3.26 on_motion_notify_event()

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

This function moves the selected pattern to another pattern slot. The perform::delete_sequence() function sets the perform modification flag.

Parameters

ev	Provides the parameters of the button event.

Returns

Always returns true.

10.34.3.27 on_focus_in_event()

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

Just sets the Gtk::HAS_FOCUS flag.

Returns

Always returns false.

10.34.3.28 on_focus_out_event()

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

Just unsets the Gtk::HAS_FOCUS flag.

Returns

Always returns false.

10.34.4 Friends And Related Function Documentation

10.34.4.1 mainwnd

```
friend class mainwnd  [friend]
```

10.34.4.2 update_mainwid_sequences

```
void update_mainwid_sequences ( )  [friend]
```

It is used by other objects that can modify the currently-edited sequence shown in the mainwid (main window).

10.34.5 Field Documentation

10.34.5.1 m_armed_progress_color

```
Color seq64::mainwid::m_armed_progress_color  [private]
```

If the progress color is black(), we want to change it to white for unmuted patterns.

10.34.5.2 m_moving_seq

```
sequence seq64::mainwid::m_moving_seq  [private]
```

The assignment is made by sequence::partial_copy(), which behaves like the legacy seq24 code.

10.34.5.3 m_button_down

```
bool seq64::mainwid::m_button_down  [private]
```

Used in the drag-and-drop functionality.

10.34.5.4 m_moving

```
bool seq64::mainwid::m_moving  [private]
```

10.34.5.5 m_old_seq

```
int seq64::mainwid::m_old_seq  [private]
```

10.34.5.6 m_screenset

```
int seq64::mainwid::m_screenset  [private]
```

10.34.5.7 m_last_tick_x

```
long seq64::mainwid::m_last_tick_x[c_max_sequence]  [private]
```

10.34.5.8 m_mainwnd_rows

```
const int seq64::mainwid::m_mainwnd_rows  [private]
```

Some of them already have counterparts in the user_settings class.Number of rows, unused part of settings.

10.34.5.9 m_mainwnd_cols

```
const int seq64::mainwid::m_mainwnd_cols  [private]
```

10.34.5.10 m_seqarea_x

```
const int seq64::mainwid::m_seqarea_x  [private]
```

10.34.5.11 m_seqarea_y

```
const int seq64::mainwid::m_seqarea_y  [private]
```

10.34.5.12 m_seqarea_seq_x

```
const int seq64::mainwid::m_seqarea_seq_x  [private]
```

10.34.5.13 m_seqarea_seq_y

```
const int seq64::mainwid::m_seqarea_seq_y  [private]
```

10.34.5.14 m_mainwid_x

```
const int seq64::mainwid::m_mainwid_x  [private]
```

10.34.5.15 m_mainwid_y

```
const int seq64::mainwid::m_mainwid_y  [private]
```

10.34.5.16 m_mainwid_border_x

```
const int seq64::mainwid::m_mainwid_border_x  [private]
```

10.34.5.17 m_mainwid_border_y

```
const int seq64::mainwid::m_mainwid_border_y  [private]
```

10.34.5.18 m_mainwid_spacing

```
const int seq64::mainwid::m_mainwid_spacing  [private]
```

10.34.5.19 m_text_size_x

```
const int seq64::mainwid::m_text_size_x  [private]
```

10.34.5.20 m_text_size_y

```
const int seq64::mainwid::m_text_size_y  [private]
```

10.34.5.21 m_max_sets

```
const int seq64::mainwid::m_max_sets  [private]
```

10.34.5.22 m_screenset_slots

```
const int seq64::mainwid::m_screenset_slots  [private]
```

It is equal to m_mainwnd_rows $*$ m_mainwnd_cols.

10.34.5.23 m_screenset_offset

```
int seq64::mainwid::m_screenset_offset  [private]
```

It is equal to m_screenset_slots $*$ m_screenset.

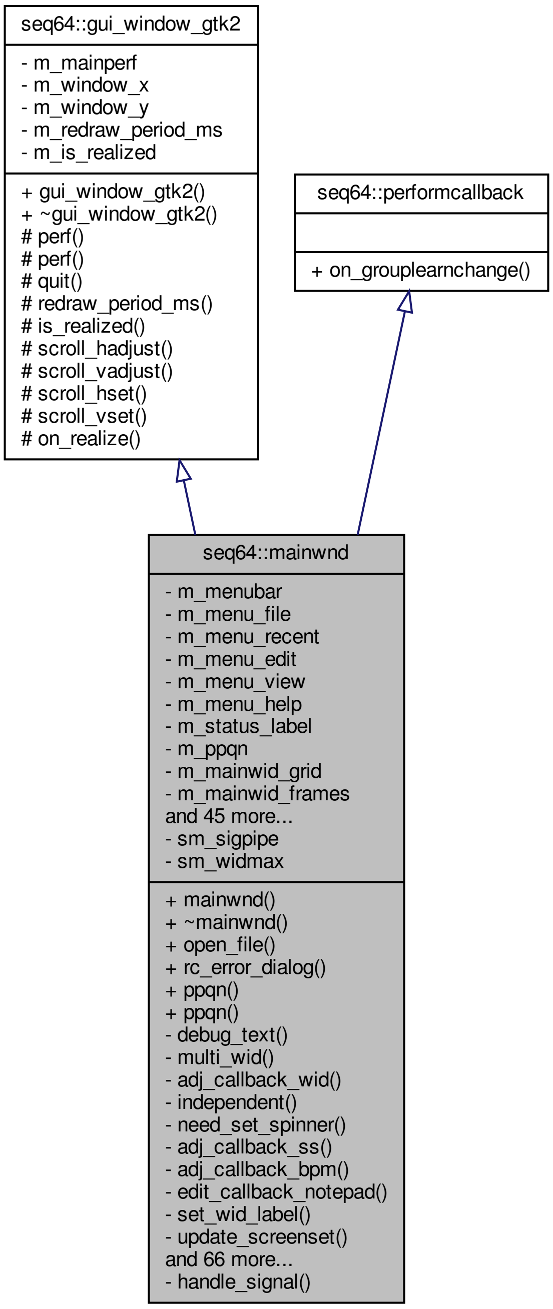
10.34.5.24 m_progress_height

```
const int seq64::mainwid::m_progress_height  [private]
```

10.35 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 &p, bool allowperf2=true, int ppqn=SEQ64_USE_DEFAULT_PPQN, int mainwid_rows=1, int mainwid_cols=1, bool mainwid_indep=false)

  The constructor the main window of the application.
- virtual ~mainwnd ()

  This destructor must explicitly delete some allocated resources.

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

    Opens and parses (reads) a MIDI file or a WRK file.
- void rc_error_dialog (const std::string &message)

    Tells the user that the "rc" file is erroneous.
- 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 Types

- enum SaveOption {
  FILE_SAVE_AS_NORMAL,
  FILE_SAVE_AS_EXPORT_SONG,
  FILE_SAVE_AS_EXPORT_MIDI }

    Instead of having two save options, we now have three.

Private Member Functions

- void debug_text (const std::string &tag, int value)

    Overwrites the text in the set-notes field, for debugging purposes only.
- bool multi_wid () const

    'Getter' function for member m_mainwid_count $>$ 1
- void adj_callback_wid (int mainwid_block)

    This function is the callback for adjusting the screen-set value of a particular mainwid.
- bool independent () const

    'Getter' function for member m_mainwid_independent
- bool need_set_spinner (int block) const

    'Getter' function for member m_mainwid_independent
- void adj_callback_ss ()

    This function is the callback for adjusting the active 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.
- void set_wid_label (int ss, int block=0)

    Sets the frame label for the given mainwid, based on the set number.
- void update_screenset ()

    New function to consolidate screen-set handling and avoid contention between various sources of screen-set changing by letting the timer callback detect screen-set changes that would affect the user-interface.
- void update_markers (midipulse tick)

    Updates the markers on one (or more, if multi-mainwid is enabled) mainwid objects.
- void reset ()

    Resets one (or more, if multi-mainwid is enabled) mainwid objects.
- void reset_window ()

    Resets the following items:
- void set_play_image (bool isrunning)

    Changes the image used for the pause/play button.
- void set_songlive_image (bool issong)

Changes the image used for the song/live mode button.
- void start_playing ()

  Starts playing of the song.
- void pause_playing ()

  Pauses the playing of the song, leaving the progress bar where it stopped.
- void stop_playing ()

  Stops the playing of the song.
- void toggle_playing ()

  Reverses the state of playback.
- bool timer_callback ()

  This function is the GTK timer callback, used to draw our current time and BPM on_events (the main window).
- int set_screenset (int screenset)

  New function to consolidate screen-set handling.
- void tempo_log ()

  Logs the current tempo/tick value as a Set Tempo event.
- void toggle_tempo_record ()

  Toggles the recording of the tempo.
- void toggle_time_format ()

  Toggles the recording of the live song control done by the musician.
- void queue_it ()

  Implements the keep-queue button.
- void set_song_record ()

  Sets the song-recording status.
- void toggle_song_record ()

  Toggles the recording of the live song control done by the musician.
- void toggle_song_snap ()

  Toggles the recording of the live song control done by the musician.
- void set_song_playback (bool playsong)

  Sets the playback mode (Live vs Song).
- void song_record_snap (bool snap)
- void panic ()

  Pushes the panic button.
- void learn_toggle ()

  Toggle the group-learn status.
- void open_performance_edit ()

  Opens the Performance Editor (Song Editor).
- void open_performance_edit_2 ()

  Opens the second Performance Editor (Song Editor).
- void enregister_perfedits ()

  This function brings together the two perfedit objects, so that they can tell each other when to queue up a draw operation.
- void sequence_key (int seq)

  Use the sequence key to toggle the playing of an active pattern in the current screen-set.
- int spinner_max () const

  Returns the maximum value we can allow for a spinner.
- void apply_song_transpose ()

  Apply full song transposition, if enabled.
- void clear_mute_groups ()

  Clear all mute-group settings.
- void reload_mute_groups ()

  Reload all mute-group settings from the "rc" file.

- void update_window_title ()

  Updates the title shown in the title bar of the window.
- void update_recent_files_menu ()
- void load_recent_file (int index)

  Looks up the desired recent MIDI file and opens it.
- 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 set_song_mute (perform::mute_op_t op)

  Sets the song-mute mode.
- int wid_box_to_slot (int col, int row) const
- bool wid_slot_to_box (int slot, int &col, int &row) const
- void file_import_dialog ()

  Presents a file dialog to import a MIDI file.
- void options_dialog ()

  Opens the File / Options dialog.
- void jack_dialog ()

  Opens the File / Options dialog to show only the JACK page.
- void about_dialog ()

  Presents a Help / About dialog.
- void build_info_dialog ()

  Presents a Help / Build Info dialog.
- int query_save_changes ()

  Queries the user to save the changes made while the application was running.
- void new_open_error_dialog ()

  Tells the user to close all the edit windows first.
- void file_save_as (SaveOption option=FILE_SAVE_AS_NORMAL)

  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.
- 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 edit_field_has_focus () const

  Check if one of the edit fields (BPM spinbutton, screenset spinbutton, or the Name field) has focus.
- void populate_menu_file ()

  Populates the File menu: File menu items; their accelerator keys; and their hot keys.

- void populate_menu_edit ()

  Populates the Edit menu: Edit menu items; their accelerator keys; and their hot keys.
- void populate_menu_help ()

  Populates the Help menu.
- void populate_menu_view ()

  Populates the View menu: View menu items and their hot keys.
- void set_status_text (const std::string &text)

  Sets the text on the new status label.
- bool on_delete_event (GdkEventAny ∗ev)

  This callback function handles the user requesting that the main window be closed.
- bool on_key_press_event (GdkEventKey ∗ev)

  Handles a key press event.
- bool on_key_release_event (GdkEventKey ∗ev)

  Handles a key release event.
- void on_realize ()

  We are trying to work around an apparent Gtk+ bug (which occurs on my 64-bit Debian Sid laptop, but not on my 32-bit Debian Jessie laptop) that causes Sequencer64 to freeze, emitting Gtk errors, if one tries to access the main menu via Alt-F, Alt-E, etc.
- 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.
- Gtk::Menu ∗ m_menu_file

  The File menu entry.
- Gtk::Menu ∗ m_menu_recent

  File/Recent menu popup.
- Gtk::Menu ∗ m_menu_edit

  The (new) Edit menu entry.
- Gtk::Menu ∗ m_menu_view

  The View menu entry.
- Gtk::Menu ∗ m_menu_help

  The Help menu entry.
- Gtk::Label ∗ m_status_label

  Seamless status label next to the "ALSA/JACK/Native" button.
- int m_ppqn

  Saves the PPQN value obtained from the MIDI file (or the default value, the global ppqn, if SEQ64_USE_DEFAUL↩ T_PPQN was specified in reading the MIDI file.
- Gtk::Table ∗ m_mainwid_grid

  Provides a place in which to array multiple mainwid objects.
- Gtk::Frame ∗ m_mainwid_frames [SEQ64_MAINWIDS_MAX]

  Holds from 1 x 1 to up to 2 x 3 (1 to 6) pointers for Frame objects.

- Gtk::Adjustment ∗ m_mainwid_adjustors [SEQ64_MAINWIDS_MAX]

  Holds from 1 x 1 to up to 2 x 3 (1 to 6) pointers to spinner adjustment objects.
- Gtk::SpinButton ∗ m_mainwid_spinners [SEQ64_MAINWIDS_MAX]

  Holds from 1 x 1 to up to 2 x 3 (1 to 6) pointers to spinner objects.
- mainwid ∗ m_mainwid_blocks [SEQ64_MAINWIDS_MAX]

  Holds from 1 x 1 to up to 2 x 3 (1 to 6) pointers for mainwid objects.
- int m_mainwid_rows

  The number of mainwids vertically.
- int m_mainwid_columns

  The number of mainwids horizontally.
- int m_mainwid_count

  The number of mainwids.
- bool m_mainwid_independent

  Indicates if we want to control the set-number of each mainwid separately or not.
- mainwid ∗ m_main_wid

  The biggest sub-component of mainwnd is the Patterns Panel, which the mainwid implements.
- Gtk::Adjustment ∗ m_adjust_ss

  The spin/adjustment controls for the screenset value.
- Gtk::SpinButton ∗ m_spinbutton_ss

  Screenset adjustment.
- int m_current_screenset

  Saves the active screenset number so that we can better detect changes from both the perform object and the screenset spinbutton, which updates the peform object.
- maintime ∗ m_main_time

  Is this the bar at the top that shows moving squares, also known as "pills"? Why yes, it is.
- perfedit ∗ m_perf_edit

  A pointer to the first song/performance editor.
- perfedit ∗ m_perf_edit_2

  A pointer to an optional second song/performance editor.
- options ∗ m_options

  A pointer to the program options.
- Gdk::Cursor m_main_cursor

  Mouse cursor?
- Gtk::Image ∗ m_image_play

  Provides a pointer to hold the images for the pause/play button.
- Gtk::Button ∗ m_button_panic

  This button is the panic button, which is adapted from Oli Kester's kepler34 project.
- 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_tempo_log

  Implements the new magenta tempo-log button.
- Gtk::ToggleButton ∗ m_button_tempo_record

  Implements the new tempo-record button.
- bool m_is_tempo_recording

  Indicates if tempo recording is active.
- Gtk::Button ∗ m_button_perfedit

  The button for bringing up the Song Editor (Performance Editor).

- Gtk::Button ∗ m_button_jack

  Sets and indicates the current mode of Sequencer64: JACK, Master, and ALSA.
- Gtk::ToggleButton ∗ m_button_song_record

  Implements Oli Kester's Kepler34 Song-recording feature.
- Gtk::ToggleButton ∗ m_button_song_snap

  Implements Oli Kester's Kepler34 Song-recording snap feature.
- bool m_is_song_recording

  Indicates if song recording is active.
- bool m_is_snap_recording

  Indicates if song-recording snap is active.
- Gtk::Label ∗ m_tick_time

  This new item shows the current time into the song performance.
- Gtk::Button ∗ m_button_time_type

  This button will toggle the m_tick_time_as_bbt member.
- bool m_tick_time_as_bbt

  Indicates whether to show the time as bar:beats:ticks or as hours:minutes:seconds.
- Gtk::Adjustment ∗ m_adjust_bpm

  The spin/adjustment controls for the BPM (beats-per-minute) value.
- Gtk::SpinButton ∗ m_spinbutton_bpm

  BPM spin-button object.
- Gtk::ToggleButton ∗ m_button_queue

  It seems convenient to have a button that can show that status of keep queue.
- Gtk::Adjustment ∗ m_adjust_load_offset

  The spin/adjustment controls for the load offset value.
- Gtk::SpinButton ∗ m_spinbutton_load_offset

  Spin button for import.
- Gtk::Entry ∗ m_entry_notes

  This item provides user-interface access to the screenset notepad editor.
- bool m_is_running

  Holds the current status of running, for use in display the play versus pause icon.
- sigc::connection m_timeout_connect

  Provides a timeout handler.
- bool m_menu_mode

  Indicates if the menu bar is to be greyed out or not.
- bool m_call_seq_edit

  Indicates that this object is in a mode where the usual mute/unmute keystroke will instead bring up the pattern slot for editing.
- int m_call_seq_shift

  A new flag to indicate if the next pattern hot-key will reach into the extended part of the set.
- bool m_call_seq_eventedit

  Indicates that this object is in a mode where the usual mute/unmute keystroke will instead bring up the pattern slot for event-editing.

Static Private Attributes

- static int sm_sigpipe [2]

  This small array holds the "handles" for the pipes need to intercept the system signals SIGINT and SIGUSR1, so that the application shuts down gracefully when aborted.
- static const int sm_widmax

  We iterate through multi-mainwids using a linear array and checking for null pointers.

Additional Inherited Members

10.35.1 Member Enumeration Documentation

10.35.1.1 SaveOption

```
enum seq64::mainwnd::SaveOption  [private]
```

Enumerator

FILE_SAVE_AS_NORMAL	
FILE_SAVE_AS_EXPORT_SONG	
FILE_SAVE_AS_EXPORT_MIDI	

10.35.2 Constructor & Destructor Documentation

10.35.2.1 mainwnd()

```
seq64::mainwnd::mainwnd (
             perform & p,
             bool allowperf2 = true,
             int ppqn = SEQ64_USE_DEFAULT_PPQN,
             int mainwid_rows = 1,
             int mainwid_cols = 1,
             bool mainwid_indep = false )
```

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.
allowperf2	Indicates if a second perfedit window should be created. This is currently a run-time option, selectable in the "user" configuration file.
ppqn	An optional PPQN value to use in the song.
mainwid_rows	The number of rows of mainwids to create vertically. The default value is one. Used only if SEQ64_MULTI_MAINWID is defined.
mainwid_cols	The number of columns of mainwids to create horizontally. The default value is one. Used only if SEQ64_MULTI_MAINWID is defined.
mainwid_indep	If true, indicates that the mainwids in multi-wid mode can have their set-numbers controller independently.

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

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

10.35.2.2 ∼mainwnd()

```
seq64::mainwnd::∼mainwnd ( )  [virtual]
```

10.35.3 Member Function Documentation

10.35.3.1 open_file()

```
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 the global 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 "oldformat" or "global sequence" parameters of the midifile constructor when reading the MIDI file, since reading handles both the old and new formats, dealing with new constructs only if they are present in the file.

Parameters

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

10.35.3.2 rc_error_dialog()

```
void seq64::mainwnd::rc_error_dialog (
             const std::string & message )
```

We can't yet display the specific error, except in a terminal window.

Parameters

message	Provides the error message returned by the configuration file.

10.35.3.3 ppqn() [1/2]

```
int seq64::mainwnd::ppqn ( ) const  [inline]
```

10.35.3.4 ppqn() [2/2]

```
void seq64::mainwnd::ppqn (
            int ppqn )  [inline]
```

m_ppqn = choose_ppqn(ppqn);

10.35.3.5 handle_signal()

```
void seq64::mainwnd::handle_signal (
            int sig )  [static], [private]
```

10.35.3.6 debug_text()

```
void seq64::mainwnd::debug_text (
            const std::string & tag,
            int value )  [private]
```

Parameters

tag	Human-readable text to show the context of the message. Keep it well under 80 characters.
value	An integer value to be shown.

10.35.3.7 multi_wid()

```
bool seq64::mainwnd::multi_wid ( ) const  [inline], [private]
```

10.35.3.8 adj_callback_wid()

```
void seq64::mainwnd::adj_callback_wid (
            int widblock )  [private]
```

Note that we have to actually set the perform object's screen-set, to get its screen-set offsets in place, before logging the changes to the mainwid.

Parameters

widblock	This parameter ranges from 0 to 5, depending on how many mainwids are created. This function operates only when multiple mainwids are active. Just to be clear, index 0 is slot [0, 0], 1 is slot [0, 1], etc. The row index varies fastest, just like the seq-number does in a set.

10.35.3.9 independent()

```
bool seq64::mainwnd::independent ( ) const  [inline], [private]
```

10.35.3.10 need_set_spinner()

```
bool seq64::mainwnd::need_set_spinner (
             int block ) const  [inline], [private]
```

10.35.3.11 adj_callback_ss()

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

Its sets the active 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. We let the perform object keep track of modifications.

Multi-mainwid mode:

This status is flagged by the multi_wid() function. If true, the we want the Set spin-button to affect the active sequence and all sequences. Let's start Seq64 in 2 columns x 3 rows mode. The mainwid slots are set up so that, like the screen-sets, the row index varies fastest. Here is the layout:

```
        Column          0          1
        Row     0     [0,0]      [1,0]
        Row     1     [0,1]      [1,1]
        Row     2     [0,2]      [1,2]


This two-dimensional array can be access by stepping along a
one-dimensional array, with the one-dimensional array having an index we
will call "slot number" for this description:


      1-D index       2-D indices
        [0]             [0,0]
        [1]             [0,1]
        [2]             [0,2]
        [3]             [1,0]
        [4]             [1,1]
        [5]             [1,2]


When the application starts, the "slot numbers" in the left column
correspond exactly to set numbers.  The 0th set is the "active" set.
When the Set spinner is incremented, the 1st set should become the active
one.  As it is incremented, the active slot will move from top-to-bottom
and then left-to-right, until the number of visible mainwids is reached.
In that case, we want to then increment the set number for all of the
mainwids in the matrix, so that they move down one row, and slot 0 now
holds the active set.  Or, for a direct edit, move that set directly to
slot 0.

For now, let's just start from slot 0 and set the values of all slots, and
worry about preserving relative set-numbers later.
```

10.35.3.12 adj_callback_bpm()

```
void seq64::mainwnd::adj_callback_bpm ( )  [private]
```

Let the perform object keep track of modifications.

10.35.3.13 edit_callback_notepad()

```
void seq64::mainwnd::edit_callback_notepad ( )  [private]
```

Let the perform object keep track of modifications.

10.35.3.14 set_wid_label()

```
void seq64::mainwnd::set_wid_label (
            int ss,
            int block = 0 )  [private]
```

Parameters

ss	Provides the number of the screen-set to use to retrieve and show the screen-set label. This value is not sanity-checked.
block	Provides the number of the mainwid block for which the screen-set value applies. Defaults to 0. This value is not checked, but the function is private, so we guarantee its safety.

10.35.3.15 update_screenset()

```
void seq64::mainwnd::update_screenset ( )  [private]
```

Updates the screen-set by comparing the current screen-set to that active in the perform object.

Change Note ca 2018-02-03 Fixed issue #135, was using newset!

10.35.3.16 update_markers()

```
void seq64::mainwnd::update_markers (
            midipulse tick )  [private]
```

Parameters

tick	The current tick number for playback, etc.

10.35.3.17 reset()

```
void seq64::mainwnd::reset ( )  [private]
```

The reset function draws the patterns on the pixmap, and then draws the pixmap on the window.

10.35.3.18 reset_window()

```
void seq64::mainwnd::reset_window ( )  [private]
```

- Active screenset
- Screenset numbers for all of the mainwids
- Screenset labels for all of the mainwids
- The values in all of the spinbuttons/screenset fields TODO TODO

10.35.3.19 set_play_image()

```
void seq64::mainwnd::set_play_image (
            bool isrunning )  [private]
```

Is this a memory leak? Some users report segfaults (all of a sudden) with this setting!

Parameters

isrunning	If true, set the image to the "Pause" icon, since playback is running. Otherwise, set it to the "Play" button, since playback is not running.

10.35.3.20 set_songlive_image()

```
void seq64::mainwnd::set_songlive_image (
            bool issong )  [private]
```

Parameters

issong	If true, set the image to the "Song" icon. Otherwise, set it to the "Live" button.

10.35.3.21 start_playing()

```
void seq64::mainwnd::start_playing ( )  [private]
```

An accessor to perform::start_playing(). This function is actually a callback for the pause/play button. Now very similar to perfedit::start_playing(), except that the implicit songmode == false parameter is used here.

10.35.3.22 pause_playing()

```
void seq64::mainwnd::pause_playing ( )  [private]
```

Currently, it is just the same as stop_playing(), but we will get it to work.

10.35.3.23 stop_playing()

```
void seq64::mainwnd::stop_playing ( )  [private]
```

An accessor to perform's stop_playing() function. Also calls the mainwid::update_sequences_on_window() function. Not sure that we need this call, since the slots seem to update anyway. But we've noticed that, with this call in place, hitting the Stop button causes a subtle change in the appearance of the first non-empty pattern of the "allofarow.mid" file.

After the Stop button is pushed (in ALSA mode), then the Space key ("start") doesn't work properly. The song starts, then quickly stops. It doesn't matter if update_sequences_on_window() is called or not. This happens even in seq24! This bug has proven incredibly difficult to track down, still working on it.

10.35.3.24 toggle_playing()

```
void seq64::mainwnd::toggle_playing ( )  [private]
```

Meant only to be called when the "Play" button is pressed, if the pause feature has been compiled into the application.

10.35.3.25 timer_callback()

```
bool seq64::mainwnd::timer_callback ( )  [private]
```

It also supports the ALSA pause functionality.

Note

When Sequencer64 first starts up, and no MIDI tune is loaded, the call to mainwid::update_markers() leads to trying to do some work on sequences that don't yet exist. Also, if a sequence is changed by the event editor, we get a crash; need to find out how seqedit gets away with the changes.

Returns

Always returns true. This allows the callback to be called repeatedly. If one wants to stop the timeout callback, then return false.

10.35.3.26 set_screenset()

```
int seq64::mainwnd::set_screenset (
            int screenset )  [private]
```

Sets the active screenset to the given value. This is used by the main Set spin-button and by the timer_callback() function if the screen set is changed via the perform object (i.e. via MIDI control).

The perform object's screen-set is modified as well.

Parameters

screenset	The new prospective screen-set value. This will become the active screen-set.
set_adjust_ss	If true (the default), this parameter causes the m_adjust_ss control to be updated. If false, it is not update. A value of false is necessary if the spinbutton was clicked by the user.

10.35.3.27 tempo_log()

```
void seq64::mainwnd::tempo_log ( ) [private]
```

Todo Upgrade this so that a Ctrl-click calls toggle_tempo_record, so that we can eliminate a tempo button; there are too many buttons.

10.35.3.28 toggle_tempo_record()

```
void seq64::mainwnd::toggle_tempo_record ( ) [private]
```

10.35.3.29 toggle_time_format()

```
void seq64::mainwnd::toggle_time_format ( ) [private]
```

This functionality currently does not have a key devoted to it, nor is it a saved setting.

10.35.3.30 queue_it()

```
void seq64::mainwnd::queue_it ( ) [private]
```

10.35.3.31 set_song_record()

```
void seq64::mainwnd::set_song_record ( ) [private]
```

Note that calling this function will trigger the button signal callback.

10.35.3.32 toggle_song_record()

```
void seq64::mainwnd::toggle_song_record ( )  [private]
```

This is not a saved setting at this time.

There is no need to change the button color or the image, as the control itself indicates when song-recording is on.

```
Gtk::Image * image_song = manage(new PIXBUF_IMAGE(song_rec_off_xpm));
m_button_song_record->set_image(*image_song);
```

10.35.3.33 toggle_song_snap()

```
void seq64::mainwnd::toggle_song_snap ( )  [private]
```

This functionality currently does not have a key devoted to it, nor is it a saved setting.

10.35.3.34 set_song_playback()

```
void seq64::mainwnd::set_song_playback (
            bool playsong )  [private]
```

Parameters

playsong	Set to true if playback (Song) mode is to be in force.

10.35.3.35 song_record_snap()

```
void seq64::mainwnd::song_record_snap (
            bool snap )  [inline], [private]
```

10.35.3.36 panic()

```
void seq64::mainwnd::panic ( )  [inline], [private]
```

10.35.3.37 learn_toggle()

```
void seq64::mainwnd::learn_toggle ( )  [inline], [private]
```

Simply forwards the call to perform::learn_toggle().

10.35.3.38 open_performance_edit()

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

We will let perform keep track of modifications, and not just set an is-modified flag just because we opened the song editor. We're going to centralize the modification flag in the perform object, and see if it can work.

10.35.3.39 open_performance_edit_2()

```
void seq64::mainwnd::open_performance_edit_2 ( )  [private]
```

Experiment: open a second one and see what happens. It works, but one needs to tell the other to redraw if a change is made.

10.35.3.40 enregister_perfedits()

```
void seq64::mainwnd::enregister_perfedits ( )  [private]
```

10.35.3.41 sequence_key()

```
void seq64::mainwnd::sequence_key (
            int seq )  [private]
```

Parameters

seq	This is actually the key-number.

10.35.3.42 spinner_max()

```
int seq64::mainwnd::spinner_max ( ) const  [inline], [private]
```

Remember that set numbers go from 0 to 31, both internally and visually, for a total of 32 sets.

10.35.3.43 apply_song_transpose()

```
void seq64::mainwnd::apply_song_transpose ( )  [private]
```

Then reset the perfedit transpose setting to 0.

10.35.3.44 clear_mute_groups()

```
void seq64::mainwnd::clear_mute_groups ( )  [private]
```

Sets all values to false/zero. Also, since the intent might be to clean up the MIDI file, the user is prompted to save.

10.35.3.45 reload_mute_groups()

```
void seq64::mainwnd::reload_mute_groups ( )  [private]
```

10.35.3.46 update_window_title()

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

Note that the name of the application is obtained by the "(SEQ64_PACKAGE)" construction.

The format of the caption bar is the name of the package/application, followed by the file-specification (shortened if necessary so that the name of the file itself can be seen), ending with the PPQN value in parentheses.

10.35.3.47 update_recent_files_menu()

```
void seq64::mainwnd::update_recent_files_menu ( )  [private]
```

10.35.3.48 load_recent_file()

```
void seq64::mainwnd::load_recent_file (
            int index )  [private]
```

This function passes false as the shorten parameter of rc_settings::recent_file().

Parameters

index	Indicates which file in the list to open, ranging from 0 to the number of recent files minus 1. If set to -1, then nothing is done.

10.35.3.49 toLower()

```
void seq64::mainwnd::toLower (
            std::string & s )  [private]
```

10.35.3.50 file_new()

```
void seq64::mainwnd::file_new ( )  [inline], [private]
```

10.35.3.51 file_open()

```
void seq64::mainwnd::file_open ( )  [inline], [private]
```

10.35.3.52 file_save()

```
void seq64::mainwnd::file_save ( )  [inline], [private]
```

10.35.3.53 set_song_mute()

```
void seq64::mainwnd::set_song_mute (
             perform::mute_op_t op )  [inline], [private]
```

10.35.3.54 wid_box_to_slot()

```
int seq64::mainwnd::wid_box_to_slot (
             int col,
             int row ) const  [private]
```

10.35.3.55 wid_slot_to_box()

```
bool seq64::mainwnd::wid_slot_to_box (
             int slot,
             int & col,
             int & row ) const  [private]
```

10.35.3.56 file_import_dialog()

```
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.

The main difference between the Open operation and the Import operation seems to be that the latter can read MIDI files into a screen-set greater than screen-set 0. No, that's not true, so far. No matter what the current screen-set setting, the import is appended after the current data in screen-set 0. Then, if it overflows that screen-set, the overflow goes into the next screen-set.

It might be nice to have the option of importing a MIDI file into a specific screen-set, for better organization, as well as being able to offset the sequence number.

Also, it is important to note that perf().clear_all() is not called by this routine, as we are merely adding to what might already be there.

10.35.3.57 options_dialog()

```
void seq64::mainwnd::options_dialog ( )  [private]
```

10.35.3.58 jack_dialog()

```
void seq64::mainwnd::jack_dialog ( )  [private]
```

10.35.3.59 about_dialog()

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

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

10.35.3.60 build_info_dialog()

```
void seq64::mainwnd::build_info_dialog ( )  [private]
```

It is similar to the "--version" option on the command line. The AboutDialog doesn't seem to have a way to left-align the text, so we're trying the MessageDialog.

10.35.3.61 query_save_changes()

```
int seq64::mainwnd::query_save_changes ( )  [private]
```

10.35.3.62 new_open_error_dialog()

```
void seq64::mainwnd::new_open_error_dialog ( )  [private]
```

10.35.3.63 file_save_as()

```
void seq64::mainwnd::file_save_as (
            SaveOption option = FILE_SAVE_AS_NORMAL )  [private]
```

Please note that Sequencer64 will not adopt the "c_seq32_midi" type of file, because it already saves its files in a format that other sequencers should be able to read.

Stazed on the intent of the export functionality:

```
The original intent was to be able to play an exported song in
something like TiMIDIty. After I completed things I realized that
there could be an editing benefit as well. I like to record from my
MIDI keyboard, improvised to a drum beat, on a long sequence (64
measures). Some is junk, but there are usually parts that I can use.
In original seq24, to cut out the good or bad stuff, you would have to
search the sequence by listening, then cut and move or copy and paste
to a new sequence. It could be done but was always tedious.  The paste
box for the sequence sometimes made it difficult to find the correct
note location, measure, and beat. Also, on a long sequence, you need
to zoom out to see the copy location as it played, but zoom in for the
precise paste location. In addition if you wanted to change the
measure of the notes, it became a trial and error of copy/paste,
listen, move, listen, move....

With the added Song editor feature of split trigger to mouse and copy
paste trigger to mouse, you can now do all the editing from the song
editor. Listen to the sequence, cut out the good or bad parts and
reassemble. Move or copy all good trigger parts to the left start and
delete all the bad stuff. Now you can use the song export to create
the new sequence. Just mute all other tracks and export. Re-import and
the new cleaned sequence is already done. Also I use it for importing
drum beats from a single '32/'42 file that contains dozens of
different styles with intros and endings. I like to sync two instances
of '32 or '42 together with jack, then play/experiment with the
different beats. If I find something I like, create the song trigger
for the part I like in the drum file, export and import.

I actually do not use the song export for anything but editing.
```

Note that the split trigger variant of Stazed, where it doesn't just split the section in half, is not yet implemented (2016-08-05).

Parameters

option	Indicates how to save or export the MIDI sequences. The default value of this parameter is FILE_SAVE_AS_NORMAL. The export options allow one to save the file as if the triggers were employed, or with a lot of the Sequencer64-specific information removed.

10.35.3.64 file_exit()

```
void seq64::mainwnd::file_exit ( )  [private]
```

10.35.3.65 new_file()

```
void seq64::mainwnd::new_file ( )  [private]
```

Not sure that we need to clear the modified flag here, especially since it is now centralizeed in the perform object. Let perf().clear_all() handle it now.

Question Should we do a save check here, a la Kepler34?

10.35.3.66 save_file()

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

Here we specify the current value of m_ppqn, which was set when reading the MIDI file. We also let midifile tell the perform that saving worked, so that the "is modified" flag can be cleared. The midifile class is already a friend of perform.

Note that we do not support saving files in the Cakewalk WRK format.

10.35.3.67 choose_file()

```
void seq64::mainwnd::choose_file ( )  [private]
```

Change Note layk 2016-10-11 Issue #43 Added filters for upper-case MIDI-file extensions.

10.35.3.68 is_save()

```
bool seq64::mainwnd::is_save ( )  [private]
```

10.35.3.69 install_signal_handlers()

```
bool seq64::mainwnd::install_signal_handlers ( )  [private]
```

10.35.3.70 signal_action()

```
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.

10.35.3.71 edit_field_has_focus()

```
bool seq64::mainwnd::edit_field_has_focus ( ) const  [private]
```

Todo We may have to revisit this one to add the Adjustment objects and the extra objects created in multi-wid mode.

Returns

Returns true if one of the three editable/modifiable fields has the keyboard focus.

10.35.3.72 populate_menu_file()

```
void seq64::mainwnd::populate_menu_file ( )  [private]
```

Provided to make the constructor more readable and manageable.

10.35.3.73 populate_menu_edit()

```
void seq64::mainwnd::populate_menu_edit ( )  [private]
```

Provided to make the constructor more readable and manageable.

10.35.3.74 populate_menu_help()

```
void seq64::mainwnd::populate_menu_help ( )  [private]
```

Provided to make the constructor more readable and manageable.

10.35.3.75 populate_menu_view()

```
void seq64::mainwnd::populate_menu_view ( )  [private]
```

It repeats the song editor edit command, just to help those whose muscle memory is already seq32-oriented. Provided to make the constructor more readable and manageable. View menu items and their hot keys.

10.35.3.76 set_status_text()

```
void seq64::mainwnd::set_status_text (
             const std::string & text )  [private]
```

Parameters

text	Provides the short (6 characters in the default state) string to set the label.

10.35.3.77 on_delete_event()

```
bool seq64::mainwnd::on_delete_event (
            GdkEventAny * ev )  [private]
```

Any changed data is saved. If the pattern is playing, then it is stopped. We now use perform::is_pattern_playing().

10.35.3.78 on_key_press_event()

```
bool seq64::mainwnd::on_key_press_event (
            GdkEventKey * ev )  [private]
```

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

Also, we now effectively press the CAPS LOCK key for the user if in group-learn mode, via the keystroke::shift_lock() function. Toggle the sequence mute/unmute setting using keyboard keys. However, do not do this if the Ctrl key is being pressed. Ctrl-E, for example, brings up the Song Editor, and should not toggle the sequence controlled by the "e" key. Will also see if the Alt key could/should be intercepted.

Also, try to avoid using the hotkeys if an editable field has focus.

Also, if the pattern-edit keys (will be minus and equals by default) are enabled and have been pressed, then bring up one of the editors (pattern or event) when the slot shortcut key is pressed.

Finally, as a new feature, if the pattern-shift key (the forward slash by default) is pressed, increment the flag that indicates an extended sequence (value + 32 [c_seqs_in_set] or value + 64) will be toggled, instead of the normal sequence.

10.35.3.79 on_key_release_event()

```
bool seq64::mainwnd::on_key_release_event (
            GdkEventKey * ev )  [private]
```

Is this worth turning into a switch statement? Or offloading to a perform member function? The latter. Also, we now effectively press the CAPS LOCK key for the user if in group-learn mode. The function that does this is keystroke↩
::shift_lock().

Todo Test this functionality in old and new application.

Returns

Always returns false. This matches seq24 behavior.

10.35.3.80 on_realize()

```
void seq64::mainwnd::on_realize ( )  [private]
```

without first moving the mouse to the main window. Weird with a beard! Might be a Fluxbox-related issue.

10.35.3.81 on_grouplearnchange()

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

This handler responds to a learn-mode change from perf().

Reimplemented from seq64::performcallback.

10.35.4 Field Documentation

10.35.4.1 sm_sigpipe

```
int seq64::mainwnd::sm_sigpipe  [static], [private]
```

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

10.35.4.2 sm_widmax

```
const int seq64::mainwnd::sm_widmax  [static], [private]
```

More checks, but less incrementing and array-offset calculations.

10.35.4.3 m_menubar

```
Gtk::MenuBar* seq64::mainwnd::m_menubar  [private]
```

The whole menu bar.

10.35.4.4 m_menu_file

```
Gtk::Menu* seq64::mainwnd::m_menu_file  [private]
```

10.35.4.5 m_menu_recent

```
Gtk::Menu* seq64::mainwnd::m_menu_recent  [private]
```

10.35.4.6 m_menu_edit

```
Gtk::Menu* seq64::mainwnd::m_menu_edit  [private]
```

10.35.4.7 m_menu_view

```
Gtk::Menu* seq64::mainwnd::m_menu_view  [private]
```

10.35.4.8 m_menu_help

```
Gtk::Menu* seq64::mainwnd::m_menu_help  [private]
```

10.35.4.9 m_status_label

```
Gtk::Label* seq64::mainwnd::m_status_label  [private]
```

10.35.4.10 m_ppqn

```
int seq64::mainwnd::m_ppqn  [private]
```

We need it early here to be able to pass it along to child objects.

10.35.4.11 m_mainwid_grid

```
Gtk::Table* seq64::mainwnd::m_mainwid_grid  [private]
```

This item is not used if only one mainwid is configured.

10.35.4.12 m_mainwid_frames

```
Gtk::Frame* seq64::mainwnd::m_mainwid_frames[SEQ64_MAINWIDS_MAX]  [private]
```

Each frame will hold a mainwid object, and the text part of the frame will show the set number for that mainwid. It's only 6 pointers, no need to fret over dynamic allocation.

10.35.4.13 m_mainwid_adjustors

```
Gtk::Adjustment* seq64::mainwnd::m_mainwid_adjustors[SEQ64_MAINWIDS_MAX]  [private]
```

10.35.4.14 m_mainwid_spinners

```
Gtk::SpinButton* seq64::mainwnd::m_mainwid_spinners[SEQ64_MAINWIDS_MAX]  [private]
```

10.35.4.15 m_mainwid_blocks

```
mainwid* seq64::mainwnd::m_mainwid_blocks[SEQ64_MAINWIDS_MAX]  [private]
```

10.35.4.16 m_mainwid_rows

```
int seq64::mainwnd::m_mainwid_rows  [private]
```

Defaults to 1.

10.35.4.17 m_mainwid_columns

```
int seq64::mainwnd::m_mainwid_columns  [private]
```

Defaults to 1.

10.35.4.18 m_mainwid_count

```
int seq64::mainwnd::m_mainwid_count  [private]
```

Saves multiplications and static value checks.

10.35.4.19 m_mainwid_independent

```
bool seq64::mainwnd::m_mainwid_independent  [private]
```

10.35.4.20 m_main_wid

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

We end up sharing this object with perfedit, perfnames, and seqedit in order to allow the seqedit object to notify the mainwid (indirectly) of the currently-edited sequence.

If the SEQ64_MULTI_MAINWID build option is in force, this pointer is used for highlighting and activating the mainwid that was last clicked. It starts out as the upper left mainwid.

10.35.4.21 m_adjust_ss

```
Gtk::Adjustment* seq64::mainwnd::m_adjust_ss  [private]
```

Screenset adjustment.

10.35.4.22 m_spinbutton_ss

```
Gtk::SpinButton* seq64::mainwnd::m_spinbutton_ss  [private]
```

10.35.4.23 m_current_screenset

```
int seq64::mainwnd::m_current_screenset  [private]
```

10.35.4.24 m_main_time

```
maintime* seq64::mainwnd::m_main_time  [private]
```

10.35.4.25 m_perf_edit

```
perfedit* seq64::mainwnd::m_perf_edit  [private]
```

10.35.4.26 m_perf_edit_2

```
perfedit* seq64::mainwnd::m_perf_edit_2  [private]
```

The second makes it easy to line up two different patterns that cannot be seen together on one performance editor.

10.35.4.27 m_options

```
options* seq64::mainwnd::m_options [private]
```

10.35.4.28 m_main_cursor

```
Gdk::Cursor seq64::mainwnd::m_main_cursor [private]
```

10.35.4.29 m_image_play

```
Gtk::Image* seq64::mainwnd::m_image_play [private]
```

10.35.4.30 m_button_panic

```
Gtk::Button* seq64::mainwnd::m_button_panic [private]
```

10.35.4.31 m_button_learn

```
Gtk::Button* seq64::mainwnd::m_button_learn [private]
```

10.35.4.32 m_button_stop

```
Gtk::Button* seq64::mainwnd::m_button_stop [private]
```

10.35.4.33 m_button_play

```
Gtk::Button* seq64::mainwnd::m_button_play [private]
```

If configured to support pause, it also supports the pause pixmap and functionality.

10.35.4.34 m_button_tempo_log

```
Gtk::Button* seq64::mainwnd::m_button_tempo_log [private]
```

The user clicks on it to log the current tempo value at the current time as a Set Tempo event.

10.35.4.35 m_button_tempo_record

```
Gtk::ToggleButton* seq64::mainwnd::m_button_tempo_record  [private]
```

One should be able to left click on it to record the current tempo as a tempo event, and right-click to enable auto-record.

10.35.4.36 m_is_tempo_recording

```
bool seq64::mainwnd::m_is_tempo_recording  [private]
```

10.35.4.37 m_button_perfedit

```
Gtk::Button* seq64::mainwnd::m_button_perfedit  [private]
```

10.35.4.38 m_button_jack

```
Gtk::Button* seq64::mainwnd::m_button_jack  [private]
```

10.35.4.39 m_button_song_record

```
Gtk::ToggleButton* seq64::mainwnd::m_button_song_record  [private]
```

10.35.4.40 m_button_song_snap

```
Gtk::ToggleButton* seq64::mainwnd::m_button_song_snap  [private]
```

10.35.4.41 m_is_song_recording

```
bool seq64::mainwnd::m_is_song_recording  [private]
```

10.35.4.42 m_is_snap_recording

```
bool seq64::mainwnd::m_is_snap_recording  [private]
```

10.35.4.43 m_tick_time

```
Gtk::Label* seq64::mainwnd::m_tick_time  [private]
```

Long overdue, actually!

10.35.4.44 m_button_time_type

```
Gtk::Button* seq64::mainwnd::m_button_time_type  [private]
```

10.35.4.45 m_tick_time_as_bbt

```
bool seq64::mainwnd::m_tick_time_as_bbt  [private]
```

The default is true: bar:beats:ticks.

10.35.4.46 m_adjust_bpm

```
Gtk::Adjustment* seq64::mainwnd::m_adjust_bpm  [private]
```

BPM adjustment object.

10.35.4.47 m_spinbutton_bpm

```
Gtk::SpinButton* seq64::mainwnd::m_spinbutton_bpm  [private]
```

10.35.4.48 m_button_queue

```
Gtk::ToggleButton* seq64::mainwnd::m_button_queue  [private]
```

10.35.4.49 m_adjust_load_offset

```
Gtk::Adjustment* seq64::mainwnd::m_adjust_load_offset  [private]
```

These controls are used in the File / Import dialog to change where the imported file will be loaded in the sequences space, which ranges from 0 to 1024 in blocks of 32 patterns.Load number for import.

10.35.4.50 m_spinbutton_load_offset

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

10.35.4.51 m_entry_notes

```
Gtk::Entry* seq64::mainwnd::m_entry_notes  [private]
```

This is just a long text-edit field that can be used to enter a long name or a short description of the current screenset.

10.35.4.52 m_is_running

```
bool seq64::mainwnd::m_is_running  [private]
```

10.35.4.53 m_timeout_connect

```
sigc::connection seq64::mainwnd::m_timeout_connect  [private]
```

10.35.4.54 m_menu_mode

```
bool seq64::mainwnd::m_menu_mode  [private]
```

This is a "stazed" feature that might be generally useful. This value is true if the menu-bar is to be enabled.

10.35.4.55 m_call_seq_edit

```
bool seq64::mainwnd::m_call_seq_edit  [private]
```

Currently, the hard-wired key for this function is the equals key.

10.35.4.56 m_call_seq_shift

```
int seq64::mainwnd::m_call_seq_shift  [private]
```

It causes 32 (c_seqs_in_set) to be added to the hot key. Actually, let's make it an integer that can range from 0 (off) to 1 to 2 (m_seqs_in_set / c_seqs_in_set).

10.35.4.57 m_call_seq_eventedit

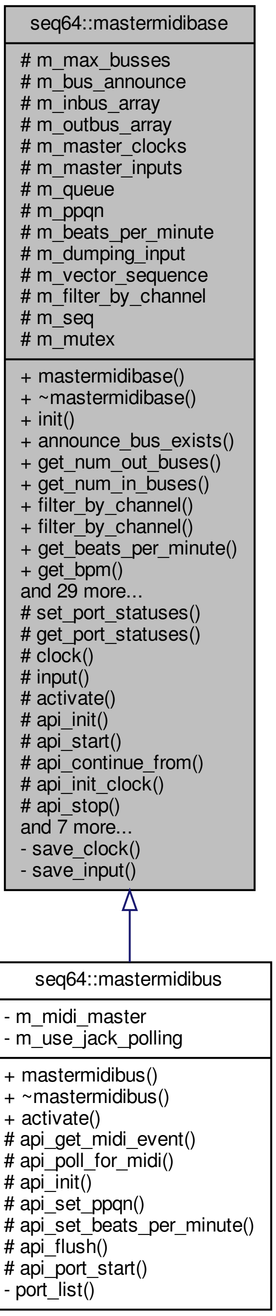
```
bool seq64::mainwnd::m_call_seq_eventedit  [private]
```

Currently, the hard-wired key for this function is the minus key.

10.36 seq64::mastermidibase Class Reference

The class that "supervises" all of the midibus objects?

Inheritance diagram for seq64::mastermidibase:



Public Member Functions

- mastermidibase (int ppqn=SEQ64_USE_DEFAULT_PPQN, midibpm bpm=SEQ64_DEFAULT_BPM)

  The mastermidibase default constructor fills the array with our busses.
- virtual ∼mastermidibase ()

  The virtual destructor deletes all of the output busses, clears out the ALSA events, stops and frees the queue, and closes ALSA for this application.

- virtual void init (int ppqn, midibpm bpm)

  Initialize the mastermidibus using the implementation-specific API function.
- bool announce_bus_exists () const

  Indicates that we have an announce buss entry to skip when filling in the device list with "user" entries.
- int get_num_out_buses () const

  'Getter' function for member m_num_out_buses
- int get_num_in_buses () const

  'Getter' function for member m_num_in_buses
- bool filter_by_channel () const

  'Getter' function for member m_filter_by_channel
- void filter_by_channel (bool flag)

  'Setter' function for member m_filter_by_channel
- midibpm get_beats_per_minute () const

  'Getter' function for member m_beats_per_minute
- midibpm get_bpm () const

  'Getter' function for member m_beats_per_minute This is a second version.
- int get_ppqn () const

  'Getter' function for member m_ppqn
- bool is_dumping () const

  'Getter' function for member m_dumping_input
- sequence ∗ get_sequence () const

  'Getter' function for member m_seq Used only in perform::input_func() when not filtering MIDI input by channel.
- void start ()

  Starts all of the configured output busses up to m_num_out_buses.
- void stop ()

  Stops each of the MIDI output busses.
- void port_start (int client, int port)

  Start the given MIDI port.
- void port_exit (int client, int port)

  Turn off the given port for the given client.
- void play (bussbyte bus, event ∗e24, midibyte channel)

  Handle the playing of MIDI events on the MIDI buss given by the parameter, as long as it is a legal buss number.
- void continue_from (midipulse tick)

  Gets the MIDI output busses running again.
- void init_clock (midipulse tick)

  Initializes the clock of each of the MIDI output busses.
- void emit_clock (midipulse tick)

  Generates the MIDI clock for each of the output busses.
- void sysex (event ∗event)

  Handle the sending of SYSEX events.
- void print () const

  Print some information about the available MIDI input and output busses.
- void flush ()

  Flushes our local queue events out The implementation-specific API function is called.
- void panic ()

  Stops all notes on all channels on all busses.
- void set_sequence_input (bool state, sequence ∗seq)

  Set the input sequence object, and set the m_dumping_input value to the given state.
- void dump_midi_input (event in)

  This function augments the recording functionality by looking for a sequence that has a matching channel number, logging the event to that sequence, and then immediately exiting.

- std::string get_midi_out_bus_name (bussbyte bus)

    Get the MIDI output buss name for the given (legal) buss number.
- std::string get_midi_in_bus_name (bussbyte bus)

    Get the MIDI input buss name for the given (legal) buss number.
- int poll_for_midi ()

    Initiate a poll() on the existing poll descriptors.
- bool is_more_input ()

    Test the sequencer to see if any more input is pending.
- bool get_midi_event (event ∗in)

    Grab a MIDI event via the currently-selected MIDI API.
- bool set_clock (bussbyte bus, clock_e clock_type)

    Set the clock for the given (legal) buss number.
- bool set_input (bussbyte bus, bool inputing)

    Set the status of the given input buss, if a legal buss number.
- bool get_input (bussbyte bus)

    Get the input for the given (legal) buss number.
- bool is_input_system_port (bussbyte bus)

    Get the system-buss status for the given (legal) buss number.
- clock_e get_clock (bussbyte bus)

    Gets the clock setting for the given (legal) buss number.
- void set_ppqn (int ppqn)

    Set the PPQN value (parts per quarter note).
- void set_beats_per_minute (midibpm bpm)

    Set the BPM value (beats per minute).

Protected Member Functions

- void set_port_statuses (const std::vector< clock_e > &clocks, const std::vector< bool > &inputs)

    'Setter' function for member m_master_clocks, m_master_inputs.
- void get_port_statuses (std::vector< clock_e > &clocks, std::vector< bool > &inputs)

    'Getter' function for member m_master_clocks, m_master_inputs.
- clock_e clock (int bus)
- bool input (int bus)
- virtual bool activate ()

    Initializes and ctivates the busses, in a partly API-dependent manner.
- virtual void api_init (int ppqn, midibpm bpm)=0
- virtual void api_start ()

    Provides MIDI API-specific functionality for the start() function.
- virtual void api_continue_from (midipulse)

    Provides MIDI API-specific functionality for the continue_from() function.
- virtual void api_init_clock (midipulse)

    Provides MIDI API-specific functionality for the init_clock() function.
- virtual void api_stop ()

    Provides MIDI API-specific functionality for the stop() function.
- virtual void api_set_ppqn (int)

    Provides MIDI API-specific functionality for the set_ppqn() function.
- virtual void api_set_beats_per_minute (midibpm)

    Provides MIDI API-specific functionality for the set_beats_per_minute() function.
- virtual void api_flush ()

    Provides MIDI API-specific functionality for the flush() function.

- virtual void api_clock ()

  Provides MIDI API-specific functionality for the clock() function.
- virtual void api_port_start (int, int)
- virtual bool api_get_midi_event (event ∗inev)=0
- virtual int api_poll_for_midi ()

  Provides a default implementation of api_poll_for_midi().

Protected Attributes

- int m_max_busses

  The maximum number of busses supported.
- midibus ∗ m_bus_announce

  MIDI buss announcer.
- busarray m_inbus_array

  Encapsulates information about the input busses.
- busarray m_outbus_array

  Encapsulates information about the output busses.
- std::vector< clock_e > m_master_clocks

  Saves the clock settings obtained from the "rc" (options) file so that they can be loaded into the mastermidibus once it is created.
- std::vector< bool > m_master_inputs

  Saves the input settings obtained from the "[midi-input] section of the "rc" (options) file, so that they can be loaded into the mastermidibus once it is created.
- int m_queue

  The ID of the MIDI queue.
- int m_ppqn

  Resolution in parts per quarter note.
- midibpm m_beats_per_minute

  BPM (beats per minute).
- bool m_dumping_input

  For dumping MIDI input to a sequence for recording.
- std::vector< sequence ∗ > m_vector_sequence

  Used for the new "stazed" feature of filtering MIDI channels so that a sequence gets only the channels meant for it.
- bool m_filter_by_channel

  If true, the m_vector_sequence container is used to divert incoming data to the sequence that has the channel it is meant for.
- sequence ∗ m_seq

  Points to the sequence object.
- mutex m_mutex

  The locking mutex.

Private Member Functions

- bool save_clock (bussbyte bus, clock_e clock)

  Saves the given clock value in m_master_clocks[bus].
- bool save_input (bussbyte bus, bool inputing)

  Saves the input status (as selected in the MIDI Input tab).

Friends

- class perform
- class midi_alsa_info

10.36.1 Constructor & Destructor Documentation

10.36.1.1 mastermidibase()

```
seq64::mastermidibase::mastermidibase (
             int ppqn = SEQ64_USE_DEFAULT_PPQN,
             midibpm bpm = SEQ64_DEFAULT_BPM )
```

Parameters

ppqn	Provides the PPQN value for this object. However, in most cases, the default, SEQ64_USE_DEFAULT_PPQN should be specified. Then the caller of this constructor should call mastermidibase::set_ppqn() to set up the proper PPQN value.
bpm	Provides the beats per minute value, which defaults to c_beats_per_minute.

10.36.1.2 ∼mastermidibase()

```
seq64::mastermidibase::∼mastermidibase ( )  [virtual]
```

Valgrind indicates we might have issues caused by the following functions:

```
-    snd_config_hook_load()
-    snd_config_update_r() via snd_seq_open()
-    _dl_init() and other GNU function
-    init_gtkmm_internals() [version 2.4]
```

10.36.2 Member Function Documentation

10.36.2.1 init()

```
virtual void seq64::mastermidibase::init (
             int ppqn,
             midibpm bpm )  [inline], [virtual]
```

A return value would be nice.

Parameters

ppqn	The PPQN value to which to initialize the master MIDI buss.
bpm	The beats/minute value to which to initialize the master MIDI buss.

10.36.2.2 announce_bus_exists()

```
bool seq64::mastermidibase::announce_bus_exists ( ) const  [inline]
```

Another potentially equivalent test is is_input_system_port(bus).

Returns

Returns true if m_bus_announce is not the null pointer.

10.36.2.3 get_num_out_buses()

```
int seq64::mastermidibase::get_num_out_buses ( ) const  [inline]
```

10.36.2.4 get_num_in_buses()

```
int seq64::mastermidibase::get_num_in_buses ( ) const  [inline]
```

10.36.2.5 filter_by_channel() [1/2]

```
bool seq64::mastermidibase::filter_by_channel ( ) const  [inline]
```

10.36.2.6 filter_by_channel() [2/2]

```
void seq64::mastermidibase::filter_by_channel (
             bool flag )  [inline]
```

10.36.2.7 get_beats_per_minute()

```
midibpm seq64::mastermidibase::get_beats_per_minute ( ) const  [inline]
```

10.36.2.8 get_bpm()

```
midibpm seq64::mastermidibase::get_bpm ( ) const  [inline]
```

10.36.2.9 get_ppqn()

```
int seq64::mastermidibase::get_ppqn ( ) const  [inline]
```

10.36.2.10 is_dumping()

```
bool seq64::mastermidibase::is_dumping ( ) const  [inline]
```

10.36.2.11 get_sequence()

```
sequence* seq64::mastermidibase::get_sequence ( ) const  [inline]
```

10.36.2.12 start()

```
void seq64::mastermidibase::start ( )
```

Calls the implementation-specific API function for starting.

Threadsafe

10.36.2.13 stop()

```
void seq64::mastermidibase::stop ( )
```

Then calls the implementation-specific API function to finalize the stoppage. (See the ALSA implementation in the seq_alsamidi library, for example. It is the original Sequencer64 implementation.)

Threadsafe

10.36.2.14 port_start()

```
void seq64::mastermidibase::port_start (
             int client,
             int port )
```

This function is called by api_get_midi_event() when the ALSA event SND_SEQ_EVENT_PORT_START is received. Unlike port_exit(), the port_start() function does rely on API-specific code, so we do need to create a virtual api_port_start() function to implement the port-start event.

Threadsafe Quite a lot is done during the lock for the ALSA implimentation.

Parameters

client	Provides the client number, which is actually an ALSA concept.
port	Provides the client port, which is actually an ALSA concept.

10.36.2.15 port_exit()

```
void seq64::mastermidibase::port_exit (
            int client,
            int port )
```

Both the input and output busses for the given client are stopped: that is, set to inactive.

This function is called by api_get_midi_event() when the ALSA event SND_SEQ_EVENT_PORT_EXIT is received. Since port_exit() has no direct API-specific code in it, we do not need to create a virtual api_port_exit() function to implement the port-exit event.

Threadsafe

Parameters

client	The client to be matched and acted on. This value is actually an ALSA concept.
port	The port to be acted on. Both parameter must be matched before the buss is made inactive. This value is actually an ALSA concept.

10.36.2.16 play()

```
void seq64::mastermidibase::play (
            bussbyte bus,
            event * e24,
            midibyte channel )
```

There's currently no implementation-specific API function here.

Threadsafe

Parameters

bus	The buss to start play on. Ooh, we just noticed that value should be checked before usage!
e24	The seq24 event to play on the buss. For speed, we don't bother to check the pointer.
channel	The channel on which to play the event.

10.36.2.17 continue_from()

```
void seq64::mastermidibase::continue_from (
            midipulse tick )
```

This function calls the implementation-specific API function, and then calls midibus::continue_from() for all of the MIDI output busses.

Threadsafe

Parameters

tick	Provides the tick value to continue from.

10.36.2.18 init_clock()

```
void seq64::mastermidibase::init_clock (
            midipulse tick )
```

Calls the implementation-specific API function, and then calls midibus::init_clock() for each of the MIDI output busses.

Threadsafe

Parameters

tick	Provides the tick value with which to initialize the buss clock.

10.36.2.19 emit_clock()

```
void seq64::mastermidibase::emit_clock (
            midipulse tick )
```

Also calls the api_clock() function, which does nothing for the *original* ALSA implementation and the PortMidi implementation.

Threadsafe

Parameters

tick	Provides the tick value with which to set the buss clock.

10.36.2.20 sysex()

```
void seq64::mastermidibase::sysex (
            event * ev )
```

The event is sent to all MIDI output busses. Then flush() is called.

There's currently no implementation-specific API function for this call.

Threadsafe

Parameters

ev	Provides the event pointer to be set.

10.36.2.21 print()

```
void seq64::mastermidibase::print ( ) const
```

10.36.2.22 flush()

```
void seq64::mastermidibase::flush ( )
```

For example, ALSA provides a function to "drain" the output.

Threadsafe

10.36.2.23 panic()

```
void seq64::mastermidibase::panic ( )
```

Adapted from Oli Kester's Kepler34 project.

10.36.2.24 set_sequence_input()

```
void seq64::mastermidibase::set_sequence_input (
            bool state,
            sequence * seq )
```

The portmidi version only sets m_seq and m_dumping_input, but it seems like all the code below would apply to any mastermidibus.

Threadsafe

Parameters

state	Provides the dumping-input (recording) state to be set. This value, as used in seqedit, can represent the state of the thru button or the record button.
seq	Provides the sequence object to be logged as the mastermidibase's sequence. Can also be used to set a null pointer, to disable the sequence setting.

10.36.2.25 dump_midi_input()

```
void seq64::mastermidibase::dump_midi_input (
            event ev )
```

It should be called only if m_filter_by_channel is set.

If we have more than one sequence recording, and the channel-match feature [the sequence::channels_match() function] is disabled, then only the first sequence will get the events. So now we add an addition call to the new sequence::channel_match() function.

Parameters

ev	The event that was recorded, passed as a copy. (Do we really need a copy?)

10.36.2.26 get_midi_out_bus_name()

```
std::string seq64::mastermidibase::get_midi_out_bus_name (
            bussbyte bus )
```

This function is used for display purposes, and is also written to the options ("rc") file.

This function adds the retrieval of client and port numbers that are not needed in the portmidi implementation, but seem generally useful to support in all implementations.

Also, if the client name is already part of the port name, as in "client:client port 0", then we remove the "client:" portion to make the listing look cleaner.

Parameters

bus	Provides the output buss number. Checked before usage. Actually should now be an index number

Returns

Returns the buss name as a standard C++ string. Also contains an indication that the buss is disconnected or unconnected. If the buss number is illegal, this string is empty.

10.36.2.27 get_midi_in_bus_name()

```
std::string seq64::mastermidibase::get_midi_in_bus_name (
            bussbyte bus )
```

This function adds the retrieval of client and port numbers that are not needed in the portmidi implementation, but seem generally useful to support in all implementations.

Parameters

bus	Provides the input buss number.

Returns

Returns the buss name as a standard C++ string. Also contains an indication that the buss is disconnected or unconnected.

10.36.2.28 poll_for_midi()

```
int seq64::mastermidibase::poll_for_midi ( )
```

This base-class implementation could be made identical to portmidi's poll_for_midi() function, maybe. But currently it is better just call the implementation-specific API function.

Warning

Do we need to use a mutex lock? No! It causes a deadlock!!!

Returns

Returns the result of the poll, or 0 if the API is not supported.

10.36.2.29 is_more_input()

```
bool seq64::mastermidibase::is_more_input ( )
```

Calls the implementation-specific API function.

Note that the ALSA implementation calls a single "input-pending" function, while the PortMidi implementation loops through all of the input midibus objects, calling the poll_for_midi() function of each.

Threadsafe

Returns

Returns true if ALSA is supported, and the returned size is greater than 0, or false otherwise.

10.36.2.30 get_midi_event()

```
bool seq64::mastermidibase::get_midi_event (
            event * ev )
```

Parameters

ev	The event to be set based on the found input event.

10.36.2.31 set_clock()

```
bool seq64::mastermidibase::set_clock (
            bussbyte bus,
            clock_e clocktype )
```

The legality checks are a little loose, however.

There's currently no implementation-specific API function here.

Threadsafe

Parameters

bus	The buss to start play on. Checked before usage.
clocktype	The type of clock to be set, either "off", "pos", or "mod", as noted in the midibus_common module.

10.36.2.32 set_input()

```
bool seq64::mastermidibase::set_input (
            bussbyte bus,
            bool inputing )
```

Why is another buss-count constant, and a global one at that, being used? And I thought there was only one input buss anyway! Well, there is only one ALSA input buss, but more can be used with JACK, apparently.

There's currently no implementation-specific API function here.

Threadsafe

Parameters

bus	Provides the buss number.
inputing	True if the input bus will be inputting MIDI data.

Returns

Returns true if the input buss array item could be set and then saved into the status container.

10.36.2.33 get_input()

```
bool seq64::mastermidibase::get_input (
            bussbyte bus )
```

There's currently no implementation-specific API function here.

Parameters

bus	Provides the buss number.

Returns

Returns the value of the busarray::get_input(bus) call.

10.36.2.34 is_input_system_port()

```
bool seq64::mastermidibase::is_input_system_port (
            bussbyte bus )
```

Parameters

bus	Provides the buss number.

Returns

Returns the value of the busarray::get_input(bus) call.

10.36.2.35 get_clock()

```
clock_e seq64::mastermidibase::get_clock (
            bussbyte bus )
```

There's currently no implementation-specific API function here.

Parameters

bus	Provides the buss number to read. Checked before usage.

Returns

If the buss number is legal, and the buss is active, then its clock setting is returned. Otherwise, e_clock_↩ disabled is returned.

10.36.2.36 set_ppqn()

```
void seq64::mastermidibase::set_ppqn (
            int ppqn )
```

Then call the implementation-specific API function to complete the PPQN setting.

Threadsafe

Parameters

ppqn	The PPQN value to be set.

10.36.2.37 set_beats_per_minute()

```
void seq64::mastermidibase::set_beats_per_minute (
            midibpm bpm )
```

Then call the implementation-specific API function to complete the BPM setting.

Threadsafe

Parameters

bpm	Provides the beats-per-minute value to set.

10.36.2.38 set_port_statuses()

```
void seq64::mastermidibase::set_port_statuses (
            const std::vector< clock_e > & clocks,
            const std::vector< bool > & inputs )  [inline], [protected]
```

Used in the perform class to pass the settings read from the "rc" file to here. There is an converse function defined below.

10.36.2.39 get_port_statuses()

```
void seq64::mastermidibase::get_port_statuses (
            std::vector< clock_e > & clocks,
            std::vector< bool > & inputs )  [inline], [protected]
```

Used in the perform class to pass the settings read from the "rc" file to here. There is an converse function defined above.

10.36.2.40 clock()

```
clock_e seq64::mastermidibase::clock (
            int bus )  [inline], [protected]
```

10.36.2.41 input()

```
bool seq64::mastermidibase::input (
            int bus )  [inline], [protected]
```

10.36.2.42 activate()

```
virtual bool seq64::mastermidibase::activate ( )  [inline], [protected], [virtual]
```

Currently re-implemented only in the rtmidi JACK API.

Reimplemented in seq64::mastermidibus.

10.36.2.43 api_init()

```
virtual void seq64::mastermidibase::api_init (
            int ppqn,
            midibpm bpm )  [protected], [pure virtual]
```

Implemented in seq64::mastermidibus.

10.36.2.44 api_start()

```
virtual void seq64::mastermidibase::api_start ( )  [inline], [protected], [virtual]
```

10.36.2.45 api_continue_from()

```
virtual void seq64::mastermidibase::api_continue_from (
            midipulse  )  [inline], [protected], [virtual]
```

10.36.2.46 api_init_clock()

```
virtual void seq64::mastermidibase::api_init_clock (
             midipulse  )  [inline], [protected], [virtual]
```

10.36.2.47 api_stop()

```
virtual void seq64::mastermidibase::api_stop ( )  [inline], [protected], [virtual]
```

10.36.2.48 api_set_ppqn()

```
virtual void seq64::mastermidibase::api_set_ppqn (
             int  )  [inline], [protected], [virtual]
```

Reimplemented in seq64::mastermidibus.

10.36.2.49 api_set_beats_per_minute()

```
virtual void seq64::mastermidibase::api_set_beats_per_minute (
             midibpm  )  [inline], [protected], [virtual]
```

Reimplemented in seq64::mastermidibus.

10.36.2.50 api_flush()

```
virtual void seq64::mastermidibase::api_flush ( )  [inline], [protected], [virtual]
```

Reimplemented in seq64::mastermidibus.

10.36.2.51 api_clock()

```
virtual void seq64::mastermidibase::api_clock ( )  [inline], [protected], [virtual]
```

10.36.2.52 api_port_start()

```
virtual void seq64::mastermidibase::api_port_start (
            int ,
            int  )  [inline], [protected], [virtual]
```

10.36.2.53 api_get_midi_event()

```
virtual bool seq64::mastermidibase::api_get_midi_event (
            event * inev )  [protected], [pure virtual]
```

Implemented in seq64::mastermidibus.

10.36.2.54 api_poll_for_midi()

```
int seq64::mastermidibase::api_poll_for_midi ( )  [protected], [virtual]
```

This implementation adds a millisecond of sleep time unless more than two events are pending. Some input devices may need to override this function.

For a quick threadsafe check, call is_more_input() instead. But see the warning in the non-API poll_for_midi() function.

Returns

Returns the number of events found by the first successful poll of the array of input busses (m_inbus_array).

Reimplemented in seq64::mastermidibus.

10.36.2.55 save_clock()

```
bool seq64::mastermidibase::save_clock (
            bussbyte bus,
            clock_e clock )  [private]
```

Parameters

bus	Provides the desired buss to be set.
clock	Provides the clocking value to set.

Returns

Returns true if the buss value is valid.

10.36.2.56 save_input()

```
bool seq64::mastermidibase::save_input (
            bussbyte bus,
            bool inputing )  [private]
```

Now, we were checking this bus number against the size of the vector as gotten from the perform object, which it got the from the "rc" file's [midi-input] section. However, the "rc" file won't necessarily match what is on the system now. So we might have to adjust.

Do we also have to adjust the perform's vector?

Parameters

bus	Provides the buss number.
inputing	True if the input bus will be inputting MIDI data.

Returns

Returns true, always.

10.36.3 Friends And Related Function Documentation

10.36.3.1 perform

```
friend class perform  [friend]
```

10.36.3.2 midi_alsa_info

```
friend class midi_alsa_info  [friend]
```

10.36.4 Field Documentation

10.36.4.1 m_max_busses

```
int seq64::mastermidibase::m_max_busses  [protected]
```

Set to c_max_busses (SEQ64_DEFAULT_BUSS_MAX = 32) for now.

10.36.4.2 m_bus_announce

```
midibus* seq64::mastermidibase::m_bus_announce [protected]
```

10.36.4.3 m_inbus_array

```
busarray seq64::mastermidibase::m_inbus_array [protected]
```

10.36.4.4 m_outbus_array

```
busarray seq64::mastermidibase::m_outbus_array [protected]
```

10.36.4.5 m_master_clocks

```
std::vector<clock_e> seq64::mastermidibase::m_master_clocks [protected]
```

10.36.4.6 m_master_inputs

```
std::vector<bool> seq64::mastermidibase::m_master_inputs [protected]
```

However, these items will be modified if the actual enumerated input ports do not match the port read from the "rc" file.

10.36.4.7 m_queue

```
int seq64::mastermidibase::m_queue [protected]
```

10.36.4.8 m_ppqn

```
int seq64::mastermidibase::m_ppqn [protected]
```

10.36.4.9 m_beats_per_minute

```
midibpm seq64::mastermidibase::m_beats_per_minute  [protected]
```

We had to lengthen this name; way too easy to confuse it with "bpm" for "beats per measure".

10.36.4.10 m_dumping_input

```
bool seq64::mastermidibase::m_dumping_input  [protected]
```

This value is set to true when a sequence editor window is open and the user has clicked the "record MIDI" or "thru MIDI" button.

10.36.4.11 m_vector_sequence

```
std::vector<sequence *> seq64::mastermidibase::m_vector_sequence  [protected]
```

We want to make this a run-time, non-legacy option.

10.36.4.12 m_filter_by_channel

```
bool seq64::mastermidibase::m_filter_by_channel  [protected]
```

10.36.4.13 m_seq

```
sequence* seq64::mastermidibase::m_seq  [protected]
```

10.36.4.14 m_mutex

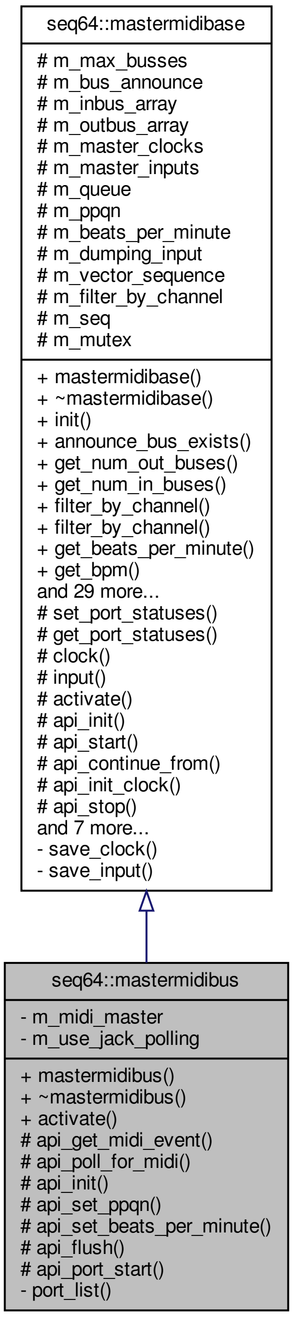
```
mutex seq64::mastermidibase::m_mutex  [protected]
```

This object is passed to an automutex object that lends exception-safety to the mutex locking.

10.37 seq64::mastermidibus Class Reference

The class that "supervises" all of the midibus objects.

Inheritance diagram for seq64::mastermidibus:



Public Member Functions

- mastermidibus (int ppqn=SEQ64_USE_DEFAULT_PPQN, midibpm bpm=SEQ64_DEFAULT_BPM)
- virtual ~mastermidibus ()
- virtual bool activate ()

Protected Member Functions

- virtual bool api_get_midi_event (event ∗in)
- virtual int api_poll_for_midi ()
- virtual void api_init (int ppqn, midibpm bpm)
- virtual void api_set_ppqn (int p)

  Provides MIDI API-specific functionality for the set_ppqn() function.
- virtual void api_set_beats_per_minute (midibpm b)

  Provides MIDI API-specific functionality for the set_beats_per_minute() function.
- virtual void api_flush ()
- virtual void api_port_start (mastermidibus &masterbus, int bus, int port)

Private Member Functions

- void port_list (const std::string &tag)

Private Attributes

- rtmidi_info m_midi_master

  Holds the basic MIDI input and output information for later re-use in the construction of midibus objects.
- bool m_use_jack_polling

  Indicates we are running with JACK MIDI enabled, and need to use each port's ability to poll for and get MIDI events, rather than use ALSA's method of calling functions from the "MIDI master" object.

Friends

- class midi_alsa_info
- class midi_jack_info

Additional Inherited Members

10.37.1 Detailed Description

This implementation uses the PortMidi library, which supports Linux and Windows, but not JACK or Mac OSX.

10.37.2 Constructor & Destructor Documentation

10.37.2.1 mastermidibus()

```
seq64::mastermidibus::mastermidibus (
            int ppqn = SEQ64_USE_DEFAULT_PPQN,
            midibpm bpm = SEQ64_DEFAULT_BPM )
```

10.37.2.2 ∼mastermidibus()

```
virtual seq64::mastermidibus::∼mastermidibus ( )  [virtual]
```

10.37.3 Member Function Documentation

10.37.3.1 activate()

```
virtual bool seq64::mastermidibus::activate ( )  [virtual]
```

Reimplemented from seq64::mastermidibase.

10.37.3.2 api_get_midi_event()

```
virtual bool seq64::mastermidibus::api_get_midi_event (
             event * in )  [protected], [virtual]
```

Implements seq64::mastermidibase.

10.37.3.3 api_poll_for_midi()

```
virtual int seq64::mastermidibus::api_poll_for_midi ( )  [protected], [virtual]
```

Reimplemented from seq64::mastermidibase.

10.37.3.4 api_init()

```
virtual void seq64::mastermidibus::api_init (
             int ppqn,
             midibpm bpm )  [protected], [virtual]
```

Implements seq64::mastermidibase.

10.37.3.5 api_set_ppqn()

```
virtual void seq64::mastermidibus::api_set_ppqn (
            int p )  [inline], [protected], [virtual]
```

Reimplemented from seq64::mastermidibase.

10.37.3.6 api_set_beats_per_minute()

```
virtual void seq64::mastermidibus::api_set_beats_per_minute (
            midibpm b )  [inline], [protected], [virtual]
```

Reimplemented from seq64::mastermidibase.

10.37.3.7 api_flush()

```
virtual void seq64::mastermidibus::api_flush ( )  [inline], [protected], [virtual]
```

Reimplemented from seq64::mastermidibase.

10.37.3.8 api_port_start()

```
virtual void seq64::mastermidibus::api_port_start (
            mastermidibus & masterbus,
            int bus,
            int port )  [inline], [protected], [virtual]
```

10.37.3.9 port_list()

```
void seq64::mastermidibus::port_list (
            const std::string & tag )  [private]
```

10.37.4 Friends And Related Function Documentation

10.37.4.1 midi_alsa_info

```
friend class midi_alsa_info  [friend]
```

10.37.4.2 midi_jack_info

```
friend class midi_jack_info  [friend]
```

10.37.5 Field Documentation

10.37.5.1 m_midi_master

```
rtmidi_info seq64::mastermidibus::m_midi_master  [private]
```

10.37.5.2 m_use_jack_polling

```
bool seq64::mastermidibus::m_use_jack_polling  [private]
```

10.38 seq64::editable_event::meta_length_t Struct Reference

Provides a type that contains the pair of values needed to get the Meta event's data length.

Data Fields

- unsigned short event_value

  Holds a midibyte value (0x00 to 0xFF) or SEQ64_END_OF_MIDIBYTE_TABLE to indicate the end of an array of name_value_t items.
- unsigned short event_length

  Holds the length expected for the Meta event, or 0 if it does not apply to the Meta event.

10.38.1 Field Documentation

10.38.1.1 event_value

```
unsigned short seq64::editable_event::meta_length_t::event_value
```

This field has the same meaning as the event_value of the name_value_t type.

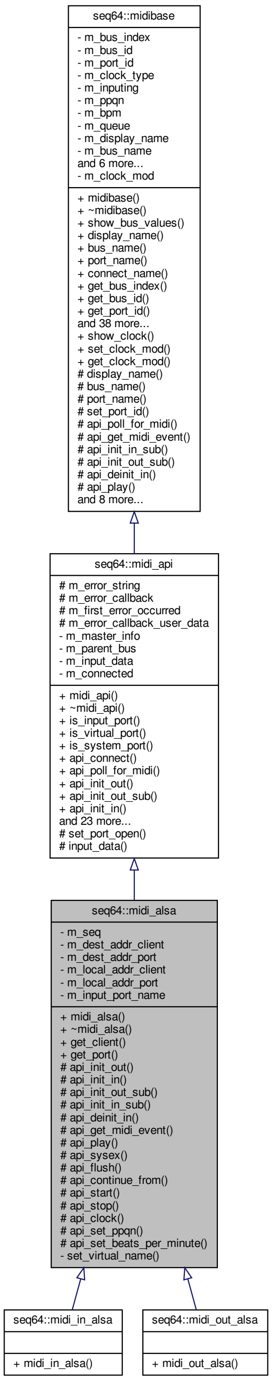
10.38.1.2 event_length

```
unsigned short seq64::editable_event::meta_length_t::event_length
```

10.39 seq64::midi_alsa Class Reference

This class implements the ALSA version of the midi_api.

Inheritance diagram for seq64::midi_alsa:



Public Member Functions

- midi_alsa (midibus &parentbus, midi_info &masterinfo)

- virtual ∼midi_alsa ()
- virtual int get_client () const

  'Getter' function for member m_dest_addr_client The address of client.
- virtual int get_port () const

  'Getter' function for member m_dest_addr_port Can we replace it with get_port_id()?

Protected Member Functions

- virtual bool api_init_out ()
- virtual bool api_init_in ()
- virtual bool api_init_out_sub ()
- virtual bool api_init_in_sub ()
- virtual bool api_deinit_in ()
- virtual bool api_get_midi_event (event ∗)

  ALSA get MIDI events via the midi_alsa_info object at present.
- virtual void api_play (event ∗e24, midibyte channel)
- virtual void api_sysex (event ∗e24)
- virtual void api_flush ()
- virtual void api_continue_from (midipulse tick, midipulse beats)
- virtual void api_start ()
- virtual void api_stop ()
- virtual void api_clock (midipulse tick)
- virtual void api_set_ppqn (int ppqn)
- virtual void api_set_beats_per_minute (midibpm bpm)

Private Member Functions

- bool set_virtual_name (int portid, const std::string &portname)

Private Attributes

- snd_seq_t ∗const m_seq

  ALSA sequencer client handle.
- const int m_dest_addr_client

  Destination address of client.
- const int m_dest_addr_port

  Destination port of client.
- const int m_local_addr_client

  Local address of client.
- int m_local_addr_port

  Local port of client.
- const std::string m_input_port_name

  Holds the port name for the ALSA MIDI input port.

Additional Inherited Members

10.39.1 Constructor & Destructor Documentation

10.39.1.1 midi_alsa()

```
seq64::midi_alsa::midi_alsa (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.39.1.2 ∼midi_alsa()

```
virtual seq64::midi_alsa::∼midi_alsa ( )  [virtual]
```

10.39.2 Member Function Documentation

10.39.2.1 get_client()

```
virtual int seq64::midi_alsa::get_client ( ) const  [inline], [virtual]
```

Can we replace it with get_client_id()?

10.39.2.2 get_port()

```
virtual int seq64::midi_alsa::get_port ( ) const  [inline], [virtual]
```

10.39.2.3 api_init_out()

```
virtual bool seq64::midi_alsa::api_init_out ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.4 api_init_in()

```
virtual bool seq64::midi_alsa::api_init_in ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.5 api_init_out_sub()

```
virtual bool seq64::midi_alsa::api_init_out_sub ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.6 api_init_in_sub()

```
virtual bool seq64::midi_alsa::api_init_in_sub ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.7 api_deinit_in()

```
virtual bool seq64::midi_alsa::api_deinit_in ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.8 api_get_midi_event()

```
virtual bool seq64::midi_alsa::api_get_midi_event (
             event * )  [inline], [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.9 api_play()

```
virtual void seq64::midi_alsa::api_play (
             event * e24,
             midibyte channel )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.10 api_sysex()

```
virtual void seq64::midi_alsa::api_sysex (
             event * e24 )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.11 api_flush()

```
virtual void seq64::midi_alsa::api_flush ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.12 api_continue_from()

```
virtual void seq64::midi_alsa::api_continue_from (
             midipulse tick,
             midipulse beats )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.13 api_start()

```
virtual void seq64::midi_alsa::api_start ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.14 api_stop()

```
virtual void seq64::midi_alsa::api_stop ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.15 api_clock()

```
virtual void seq64::midi_alsa::api_clock (
             midipulse tick )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.16 api_set_ppqn()

```
virtual void seq64::midi_alsa::api_set_ppqn (
             int ppqn )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.17 api_set_beats_per_minute()

```
virtual void seq64::midi_alsa::api_set_beats_per_minute (
            midibpm bpm )  [protected], [virtual]
```

Implements seq64::midi_api.

10.39.2.18 set_virtual_name()

```
bool seq64::midi_alsa::set_virtual_name (
            int portid,
            const std::string & portname )  [private]
```

10.39.3 Field Documentation

10.39.3.1 m_seq

```
snd_seq_t* const seq64::midi_alsa::m_seq  [private]
```

10.39.3.2 m_dest_addr_client

```
const int seq64::midi_alsa::m_dest_addr_client  [private]
```

Could potentially be replaced by midibase::m_bus_id.

10.39.3.3 m_dest_addr_port

```
const int seq64::midi_alsa::m_dest_addr_port  [private]
```

Could potentially be replaced by midibase::m_port_id.

10.39.3.4 m_local_addr_client

```
const int seq64::midi_alsa::m_local_addr_client  [private]
```

10.39.3.5 m_local_addr_port

```
int seq64::midi_alsa::m_local_addr_port  [private]
```

10.39.3.6 m_input_port_name

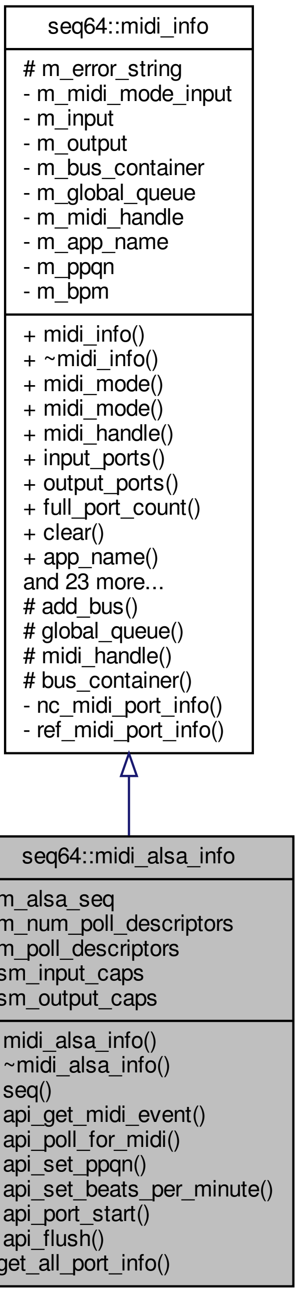
```
const std::string seq64::midi_alsa::m_input_port_name  [private]
```

It is derived from the (optionally configured) official client name for the application with the word "in" appended.

10.40 seq64::midi_alsa_info Class Reference

The class for handling ALSA MIDI input.

Inheritance diagram for seq64::midi_alsa_info:



Public Member Functions

- midi_alsa_info (const std::string &appname, int ppqn=SEQ64_DEFAULT_PPQN, midibpm bpm=SEQ64_↩ DEFAULT_BPM)
- virtual ∼midi_alsa_info ()
- snd_seq_t ∗ seq ()

  'Getter' function for member m_alsa_seq This is the platform-specific version of midi_handle().

- virtual bool api_get_midi_event (event ∗inev)
- virtual int api_poll_for_midi ()
- virtual void api_set_ppqn (int p)
- virtual void api_set_beats_per_minute (midibpm b)
- virtual void api_port_start (mastermidibus &masterbus, int bus, int port)
- virtual void api_flush ()

Private Member Functions

- virtual int get_all_port_info ()

Private Attributes

- snd_seq_t ∗ m_alsa_seq

    Holds the ALSA sequencer client pointer so that it can be used by the midibus objects.
- int m_num_poll_descriptors

    The number of descriptors for polling.
- struct pollfd ∗ m_poll_descriptors

    Points to the list of descriptors for polling.

Static Private Attributes

- static unsigned sm_input_caps

    Flags that denote queries for input (read) ports.
- static unsigned sm_output_caps

    Flags that denote queries for output (write) ports.

Additional Inherited Members

10.40.1 Constructor & Destructor Documentation

10.40.1.1 midi_alsa_info()

```
seq64::midi_alsa_info::midi_alsa_info (
            const std::string & appname,
            int ppqn = SEQ64_DEFAULT_PPQN,
            midibpm bpm = SEQ64_DEFAULT_BPM )
```

10.40.1.2 ∼midi_alsa_info()

```
virtual seq64::midi_alsa_info::∼midi_alsa_info ( )  [virtual]
```

10.40.2 Member Function Documentation

10.40.2.1 seq()

```
snd_seq_t* seq64::midi_alsa_info::seq ( )  [inline]
```

10.40.2.2 api_get_midi_event()

```
virtual bool seq64::midi_alsa_info::api_get_midi_event (
              event * inev )  [virtual]
```

Implements seq64::midi_info.

10.40.2.3 api_poll_for_midi()

```
virtual int seq64::midi_alsa_info::api_poll_for_midi ( )  [virtual]
```

Implements seq64::midi_info.

10.40.2.4 api_set_ppqn()

```
virtual void seq64::midi_alsa_info::api_set_ppqn (
              int p )  [virtual]
```

Reimplemented from seq64::midi_info.

10.40.2.5 api_set_beats_per_minute()

```
virtual void seq64::midi_alsa_info::api_set_beats_per_minute (
              midibpm b )  [virtual]
```

Reimplemented from seq64::midi_info.

10.40.2.6 api_port_start()

```
virtual void seq64::midi_alsa_info::api_port_start (
            mastermidibus & masterbus,
            int bus,
            int port )  [virtual]
```

Reimplemented from seq64::midi_info.

10.40.2.7 api_flush()

```
virtual void seq64::midi_alsa_info::api_flush ( )  [virtual]
```

Implements seq64::midi_info.

10.40.2.8 get_all_port_info()

```
virtual int seq64::midi_alsa_info::get_all_port_info ( )  [private], [virtual]
```

Implements seq64::midi_info.

10.40.3 Field Documentation

10.40.3.1 sm_input_caps

```
unsigned seq64::midi_alsa_info::sm_input_caps  [static], [private]
```

10.40.3.2 sm_output_caps

```
unsigned seq64::midi_alsa_info::sm_output_caps  [static], [private]
```

10.40.3.3 m_alsa_seq

```
snd_seq_t* seq64::midi_alsa_info::m_alsa_seq  [private]
```

This is actually an opaque pointer; there is no way to get the actual fields in this structure; they can only be accessed through functions in the ALSA API.

10.40.3.4 m_num_poll_descriptors

```
int seq64::midi_alsa_info::m_num_poll_descriptors  [private]
```

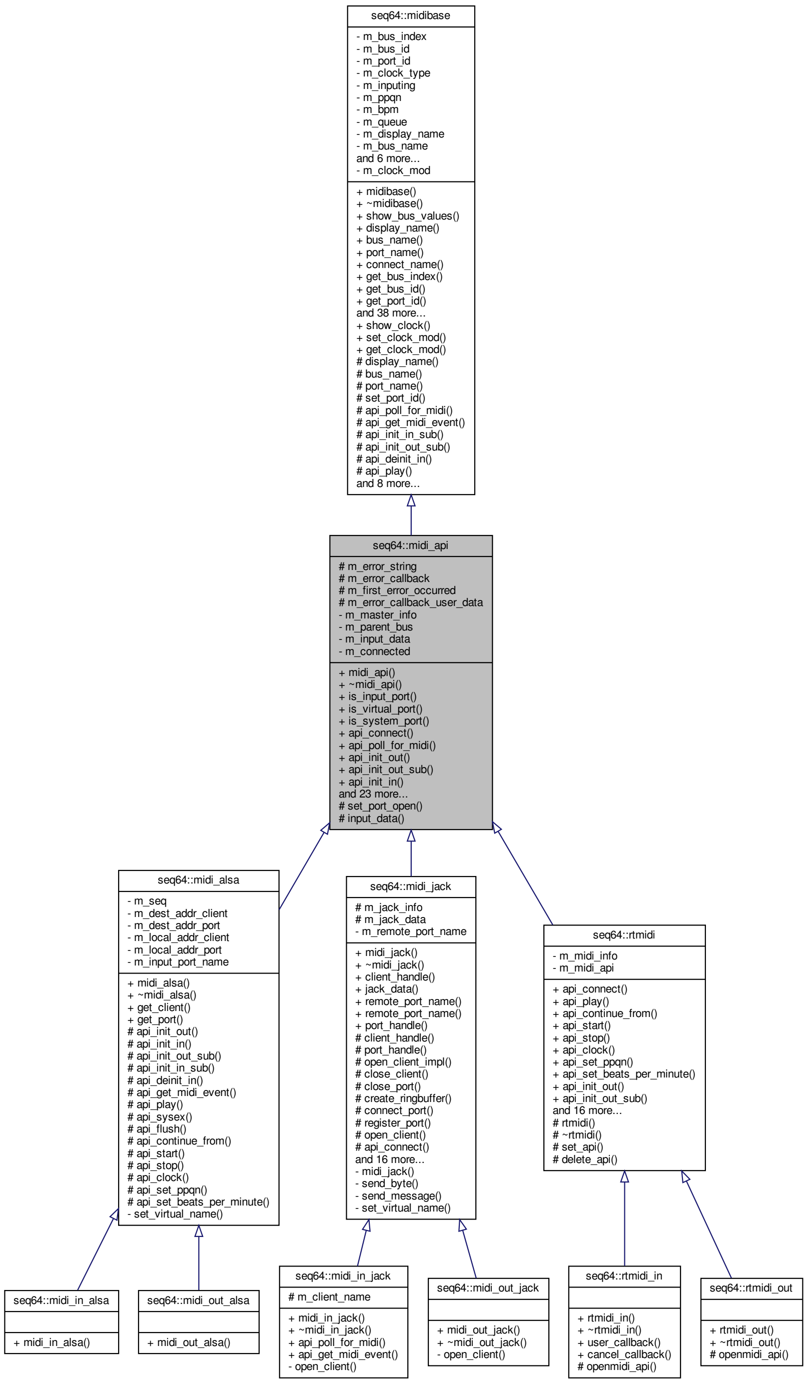
10.40.3.5 m_poll_descriptors

```
struct pollfd* seq64::midi_alsa_info::m_poll_descriptors  [private]
```

10.41 seq64::midi_api Class Reference

Subclasses of midi_in_api and midi_out_api contain all API- and OS-specific code necessary to fully implement the rtmidi API.

Inheritance diagram for seq64::midi_api:



Public Member Functions

- midi_api (midibus &parentbus, midi_info &masterinfo)
- virtual ∼midi_api ()
- bool is_input_port () const
- bool is_virtual_port () const
- bool is_system_port () const

- virtual bool api_connect ()

  No code; only midi_jack overrides this function at present.
- virtual int api_poll_for_midi ()
- virtual bool api_init_out ()=0
- virtual bool api_init_out_sub ()=0
- virtual bool api_init_in ()=0
- virtual bool api_init_in_sub ()=0
- virtual bool api_deinit_in ()=0
- virtual bool api_get_midi_event (event ∗)=0
- virtual void api_play (event ∗e24, midibyte channel)=0
- virtual void api_sysex (event ∗e24)=0
- virtual void api_continue_from (midipulse tick, midipulse beats)=0
- virtual void api_start ()=0
- virtual void api_stop ()=0
- virtual void api_flush ()=0
- virtual void api_clock (midipulse tick)=0
- virtual void api_set_ppqn (int ppqn)=0
- virtual void api_set_beats_per_minute (midibpm bpm)=0
- virtual std::string api_get_bus_name ()
- virtual std::string api_get_port_name ()
- bool is_port_open () const

  'Getter' function for member m_connected
- midi_info & master_info ()

  'Getter' function for member m_master_info
- const midi_info & master_info () const

  'Getter' function for member m_master_info The const version.
- midibus & parent_bus ()

  'Getter' function for member m_parent_bus
- const midibus & parent_bus () const

  'Getter' function for member m_parent_bus The const version.
- void master_midi_mode (bool input)
- void error (rterror::Type type, const std::string &errorstring)
- void user_callback (rtmidi_callback_t callback, void ∗userdata)
- void cancel_callback ()

Protected Member Functions

- void set_port_open ()

  'Setter' function for member m_connected
- rtmidi_in_data ∗ input_data ()

  'Getter' function for member &m_input_data

Protected Attributes

- std::string m_error_string

  Holds the last error message, if in force.
- rterror_callback m_error_callback

  Holds the error callback function pointer, if any.
- bool m_first_error_occurred

  Indicates that the first error has happened.
- void ∗ m_error_callback_user_data

  Holds data needed by the error-callback.

Private Attributes

- midi_info & m_master_info

  Contains information about the ports (system or client) enumerated by the API.
- midibus & m_parent_bus

  Contains a reference to the parent midibus/midibase object.
- rtmidi_in_data m_input_data

  Although this really is useful only for MIDI input objects, the split of the midi_api is not as convenient for re-use as is the split for derived classes like midi_in_jack/midi_out_jack.
- bool m_connected

  Set to true if the port was opened, activated, and connected without issue.

Additional Inherited Members

10.41.1 Detailed Description

Note that midi_in_api and midi_out_api are abstract base classes and cannot be explicitly instantiated. rtmidi_in and rtmidi_out will create instances of a midi_in_api or midi_out_api subclass.

10.41.2 Constructor & Destructor Documentation

10.41.2.1 midi_api()

```
seq64::midi_api::midi_api (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.41.2.2 ∼midi_api()

```
virtual seq64::midi_api::∼midi_api ( )  [virtual]
```

10.41.3 Member Function Documentation

10.41.3.1 is_input_port()

```
bool seq64::midi_api::is_input_port ( ) const
```

10.41.3.2 is_virtual_port()

```
bool seq64::midi_api::is_virtual_port ( ) const
```

10.41.3.3 is_system_port()

```
bool seq64::midi_api::is_system_port ( ) const
```

10.41.3.4 api_connect()

```
virtual bool seq64::midi_api::api_connect ( )  [inline], [virtual]
```

Reimplemented in seq64::midi_jack, and seq64::rtmidi.

10.41.3.5 api_poll_for_midi()

```
virtual int seq64::midi_api::api_poll_for_midi ( )  [virtual]
```

Reimplemented from seq64::midibase.

Reimplemented in seq64::midi_in_jack, and seq64::rtmidi.

10.41.3.6 api_init_out()

```
virtual bool seq64::midi_api::api_init_out ( )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.7 api_init_out_sub()

```
virtual bool seq64::midi_api::api_init_out_sub ( )  [pure virtual]
```

Reimplemented from seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.8 api_init_in()

```
virtual bool seq64::midi_api::api_init_in ( )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.9 api_init_in_sub()

```
virtual bool seq64::midi_api::api_init_in_sub ( )  [pure virtual]
```

Reimplemented from seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.10 api_deinit_in()

```
virtual bool seq64::midi_api::api_deinit_in ( )  [pure virtual]
```

Reimplemented from seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.11 api_get_midi_event()

```
virtual bool seq64::midi_api::api_get_midi_event (
             event * )  [pure virtual]
```

Reimplemented from seq64::midibase.

Implemented in seq64::midi_in_jack, seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.12 api_play()

```
virtual void seq64::midi_api::api_play (
             event * e24,
             midibyte channel )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.13 api_sysex()

```
virtual void seq64::midi_api::api_sysex (
            event * e24 )  [pure virtual]
```

Reimplemented from seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.14 api_continue_from()

```
virtual void seq64::midi_api::api_continue_from (
            midipulse tick,
            midipulse beats )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.15 api_start()

```
virtual void seq64::midi_api::api_start ( )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.16 api_stop()

```
virtual void seq64::midi_api::api_stop ( )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.17 api_flush()

```
virtual void seq64::midi_api::api_flush ( )  [pure virtual]
```

Reimplemented from seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.18 api_clock()

```
virtual void seq64::midi_api::api_clock (
             midipulse tick )  [pure virtual]
```

Implements seq64::midibase.

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.19 api_set_ppqn()

```
virtual void seq64::midi_api::api_set_ppqn (
             int ppqn )  [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.20 api_set_beats_per_minute()

```
virtual void seq64::midi_api::api_set_beats_per_minute (
             midibpm bpm )  [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, and seq64::rtmidi.

10.41.3.21 api_get_bus_name()

```
virtual std::string seq64::midi_api::api_get_bus_name ( )  [inline], [virtual]
```

10.41.3.22 api_get_port_name()

```
virtual std::string seq64::midi_api::api_get_port_name ( )  [inline], [virtual]
```

Reimplemented in seq64::midi_jack.

10.41.3.23 is_port_open()

```
bool seq64::midi_api::is_port_open ( ) const  [inline]
```

10.41.3.24 master_info() [1/2]

```
midi_info& seq64::midi_api::master_info ( )  [inline]
```

10.41.3.25 master_info() [2/2]

```
const midi_info& seq64::midi_api::master_info ( ) const  [inline]
```

10.41.3.26 parent_bus() [1/2]

```
midibus& seq64::midi_api::parent_bus ( )  [inline]
```

10.41.3.27 parent_bus() [2/2]

```
const midibus& seq64::midi_api::parent_bus ( ) const  [inline]
```

10.41.3.28 master_midi_mode()

```
void seq64::midi_api::master_midi_mode (
             bool input )
```

10.41.3.29 error()

```
void seq64::midi_api::error (
             rterror::Type type,
             const std::string & errorstring )
```

10.41.3.30 user_callback()

```
void seq64::midi_api::user_callback (
             rtmidi_callback_t callback,
             void * userdata )
```

10.41.3.31 cancel_callback()

```
void seq64::midi_api::cancel_callback ( )
```

10.41.3.32 set_port_open()

```
void seq64::midi_api::set_port_open ( )  [inline], [protected]
```

10.41.3.33 input_data()

```
rtmidi_in_data* seq64::midi_api::input_data ( )  [inline], [protected]
```

10.41.4 Field Documentation

10.41.4.1 m_master_info

```
midi_info& seq64::midi_api::m_master_info  [private]
```

10.41.4.2 m_parent_bus

```
midibus& seq64::midi_api::m_parent_bus  [private]
```

This object is needed to get parameters that are peculiar to the port as it is actually set up, rather than information from the midi_info object.

10.41.4.3 m_input_data

```
rtmidi_in_data seq64::midi_api::m_input_data  [private]
```

10.41.4.4 m_connected

```
bool seq64::midi_api::m_connected  [private]
```

10.41.4.5 m_error_string

```
std::string seq64::midi_api::m_error_string  [protected]
```

This is an original RtMidi concept.

10.41.4.6 m_error_callback

```
rterror_callback seq64::midi_api::m_error_callback  [protected]
```

This is an original RtMidi concept.

10.41.4.7 m_first_error_occurred

```
bool seq64::midi_api::m_first_error_occurred  [protected]
```

This is an original RtMidi concept. I have to confess I am not sure how it is/should be used, yet.

10.41.4.8 m_error_callback_user_data

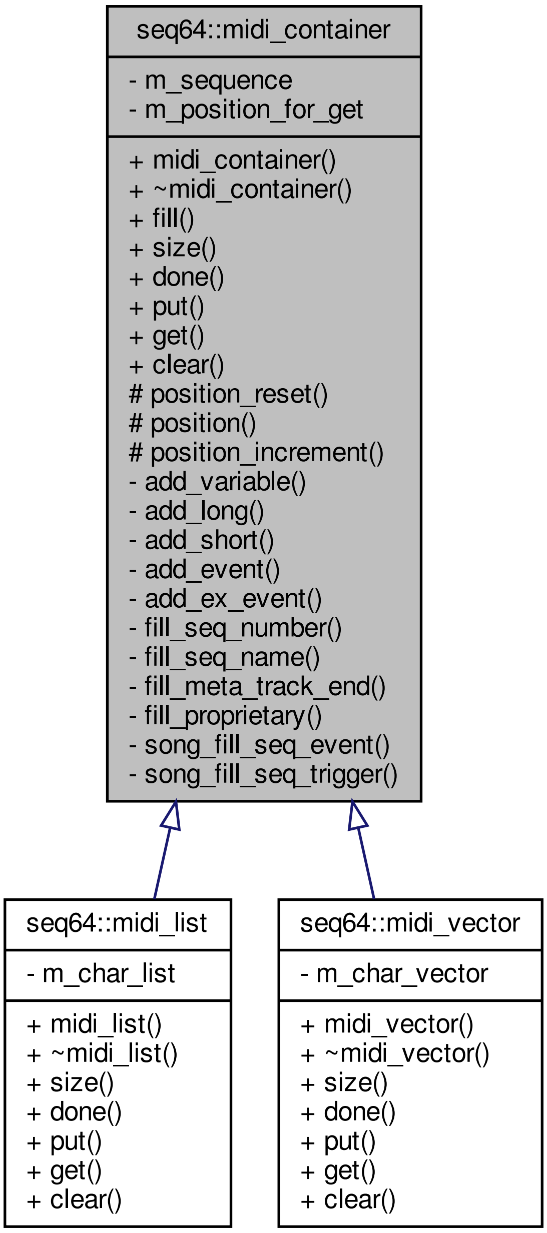
```
void* seq64::midi_api::m_error_callback_user_data  [protected]
```

This is an original RtMidi concept. I have to confess I am not sure how it is/should be used, yet.

10.42 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, const perform &p, bool doseqspec=true)

This function fills the given track (sequence) 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 () const =0

  Provide a way to get the next byte from the container.
- virtual void clear ()=0

  Provides a way to clear the container.

Protected Member Functions

- unsigned position_reset () const

  'Setter' function for member m_position_for_get Sets the position to 0 and then returns that value.
- unsigned position () const

  'Getter' function for member m_position_for_get Returns the current position.
- void position_increment () const

  'Getter' function for member m_position_for_get Increments the current position.

Private Member Functions

- void add_variable (midipulse 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 (midipulse x)

  Adds a long value (a MIDI pulse/tick value) to the container.
- void add_short (midishort x)

  Adds a short value (two bytes) to the container.
- void add_event (const event &e, midipulse deltatime)

  Adds an event to the container.
- void add_ex_event (const event &e, midipulse deltatime)

  Adds the bytes of a SysEx or Meta MIDI event.
- void fill_seq_number (int seq)

  Fills in the sequence number.
- void fill_seq_name (const std::string &name)

  Fills in the sequence name.
- void fill_meta_track_end (midipulse deltatime)
- void fill_proprietary ()

  Fills in the Sequencer64-specific information for the current sequence: The MIDI buss number, the time-signature, and the MIDI channel.
- midipulse song_fill_seq_event (const trigger &trig, midipulse prev_timestamp)

  Fills in sequence events based on the trigger and events in the sequence associated with this midi_container.
- void song_fill_seq_trigger (const trigger &trig, midipulse len, midipulse prev_timestamp)

  Fills in the trigger for the whole sequence.

Private Attributes

- sequence & m_sequence

  Provide a hook into a sequence so that we can exchange data with a sequence object.
- unsigned m_position_for_get

  Provides the position in the container when making a series of get() calls on the container.

Friends

- class midifile

10.42.1 Detailed Description

It is the base class for midi_list and midi_vector.

10.42.2 Constructor & Destructor Documentation

10.42.2.1 midi_container()

```
seq64::midi_container::midi_container (
            sequence & seq )
```

Parameters

seq	Provides a reference to the sequence/track for which this container holds MIDI data.

10.42.2.2 ∼midi_container()

```
virtual seq64::midi_container::∼midi_container ( )  [inline], [virtual]
```

10.42.3 Member Function Documentation

10.42.3.1 fill()

```
void seq64::midi_container::fill (
            int track,
            const perform & p,
            bool doseqspec = true )
```

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_list().

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 assumed to increment. This application doesn't use that shortcut.

We have noticed differences in saving files in sets=4x8 versus sets=8x8, and pre-sorting the event list gets rid of some of the differences, except for the last, multi-line SeqSpec. Some event-reordering still seems to occur, though.

Stazed:

```
The "stazed" (seq32) code implements a function like this one
using a function sequence::fill_proprietary_list() that we
don't need for our implementation... it is part of our
midi_container::fill() function.
```

Triggers:

```
Triggers are added by first calling add_variable(0), which is needed
because why?

Then 0xFF 0x7F is written, followed by the length value, which is the
number of triggers at 3 long integers per trigger, plus the 4-byte
code for triggers, c_triggers_new = 0x24240008.
```

Meta and SysEx Events:

```
These events can now be detected and added to the list of bytes to
dump.  However, historically Seq24 has forced Time Signature and Set
Tempo events to be written to the container, and has ignored these
events (after the first occurrence).  So we need to figure out what to
do here yet; we need to distinguish between forcing these events and
them being part of the edit.
```

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

Parameters

track	Provides the track number, re 0. This number is masked into the track information.
p	The performance object that will hold some of the parameters needed when filling the MIDI container.
doseqspec	If true (the default), writes out the SeqSpec information. If false, we want to write out a regular MIDI track without this information; it writes a smaller file.

To allow other sequencers to read Seq24/Sequencer64 files, we should provide the Time Signature and Tempo meta events, in the 0th (first) track (sequence). These events must precede any "real" MIDI events. They are not included if the legacy-format option is in force. We also need to skip this if tempo track support is in force.

10.42.3.2 size()

```
virtual std::size_t seq64::midi_container::size ( ) const  [inline], [virtual]
```

Must be overridden in the derived class, though not pure.

Reimplemented in seq64::midi_list, and seq64::midi_vector.

10.42.3.3 done()

```
virtual bool seq64::midi_container::done ( ) const  [inline], [virtual]
```

Reimplemented in seq64::midi_vector, and seq64::midi_list.

10.42.3.4 put()

```
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_vector, and seq64::midi_list.

10.42.3.5 get()

```
virtual midibyte seq64::midi_container::get ( ) const  [pure virtual]
```

It also increments m_position_for_get.

Implemented in seq64::midi_vector, and seq64::midi_list.

10.42.3.6 clear()

```
virtual void seq64::midi_container::clear ( )  [pure virtual]
```

Implemented in seq64::midi_vector, and seq64::midi_list.

10.42.3.7 position_reset()

```
unsigned seq64::midi_container::position_reset ( ) const  [inline], [protected]
```

10.42.3.8 position()

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

10.42.3.9 position_increment()

```
void seq64::midi_container::position_increment ( ) const  [inline], [protected]
```

10.42.3.10 add_variable()

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

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

Parameters

v	The data value to be added to the current event in the MIDI container.

10.42.3.11 add_long()

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

What is the difference between this function and add_list_var()? 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.

Parameters

x	Provides the timestamp (pulse value) to be added to the container.

10.42.3.12 add_short()

```
void seq64::midi_container::add_short (
            midishort x )  [private]
```

Parameters

x	Provides the timestamp (pulse value) to be added to the container.

10.42.3.13 add_event()

```
void seq64::midi_container::add_event (
            const event & e,
            midipulse deltatime )  [private]
```

It handles regular MIDI events separately from "extended" (our term) MIDI events (SysEx and Meta events).

For normal MIDI events, if the sequence's MIDI channel is EVENT_NULL_CHANNEL == 0xFF, then it is the copy of an SMF 0 sequence that the midi_splitter created. We want to be able to save it along with the other tracks, but won't be able to read it back if all the channels are bad. So we just use the channel from the event.

SysEx and Meta events are detected and passed to the new add_ex_event() function for proper dumping.

Parameters

e	Provides the event to be added to the container.
deltatime	Provides the time-location of the event.

10.42.3.14 add_ex_event()

```
void seq64::midi_container::add_ex_event (
            const event & e,
            midipulse deltatime )  [private]
```

Parameters

e	Provides the MIDI event to add. The caller must ensure that this is either SysEx or Meta event, using the event::is_ex_data() function.
deltatime	Provides the time of the event, which is encoded into the event.

10.42.3.15 fill_seq_number()

```
void seq64::midi_container::fill_seq_number (
            int seq )  [private]
```

Writes 0xFF 0x00 0x02 ss ss, where ss ss is the variable-length value for the sequence number. This function is used in the new midifile::write_song() function, which should be ready to go by the time you're reading this. Compare this function to the beginning of midi_container::fill().

Warning

This is an optional event, which must occur only at the start of a track, before any non-zero delta-time. For Format 2 MIDI files, this is used to identify each track. If omitted, the sequences are numbered sequentially in the order the tracks appear. For Format 1 files, this event should occur on the first track only. So, are we writing a hybrid format?

Parameters

seq	The sequence/track number to write.

10.42.3.16 fill_seq_name()

```
void seq64::midi_container::fill_seq_name (
            const std::string & name )  [private]
```

Writes 0xFF 0x03, and then the track name. This function is used in the new midifile::write_song() function, which should be ready to go by the time you're reading this.

Compare this function to the beginning of midi_container::fill().

Parameters

name	The sequence/track name to set. We could get this item from m_sequence, but the parameter allows the flexibility to change the name.

10.42.3.17 fill_meta_track_end()

```
void seq64::midi_container::fill_meta_track_end (
            midipulse deltatime )  [private]
```

10.42.3.18 fill_proprietary()

```
void seq64::midi_container::fill_proprietary ( )  [private]
```

Then, if we're not using the legacy output format, we add the "events" for the musical key, musical scale, and the background sequence for the current sequence. Finally, if tranpose support has been compiled into the program, we add that information as well. New feature: save more sequence-specific values, if not legacy format and not saved globally. We use a single byte for the key and scale, and a long for the background sequence. We save these values only if they are different from the defaults; in most cases they will have been left alone by the user. We save per-sequence values here only if the global-background-sequence feature is not in force.

For the new "transposable" flag (tagged by the value c_transpose) we really only care about saving the value of "false", because otherwise we can assume the value is true for the given sequence, and save space by not saving it... generally only drum patterns will not be transposable.

However, for now, write it anyway for consistency with Seq32.

10.42.3.19 song_fill_seq_event()

```
midipulse seq64::midi_container::song_fill_seq_event (
             const trigger & trig,
             midipulse prev_timestamp )  [private]
```

Parameters

trig	The current trigger to be processed.
prev_timestamp	The time-stamp of the previous event.

Returns

The next time-stamp value is returned.

10.42.3.20 song_fill_seq_trigger()

```
void seq64::midi_container::song_fill_seq_trigger (
             const trigger & trig,
             midipulse length,
             midipulse prev_timestamp )  [private]
```

For a song-performance, there will be only one trigger, covering the beginning to the end of the fully unlooped track.

Parameters

trig	The current trigger to be processed.
length	Provides the total length of the sequence.
prev_timestamp	The time-stamp of the previous event, which is actually the first event.

10.42.4 Friends And Related Function Documentation

10.42.4.1 midifile

```
friend class midifile  [friend]
```

10.42.5 Field Documentation

10.42.5.1 m_sequence

```
sequence& seq64::midi_container::m_sequence  [private]
```

10.42.5.2 m_position_for_get

```
unsigned seq64::midi_container::m_position_for_get  [mutable], [private]
```

10.43 seq64::midi_control Class Reference

This class (formerly a struct) contains the control information for sequences that make up a live set.

Public Types

- enum action {
  action_toggle,
  action_on,
  action_off }

Public Member Functions

- midi_control ()

  This default constructor creates a "zero" object.
- bool active () const
- bool inverse_active () const
- int status () const
- int data () const
- int min_value () const
- int max_value () const
- void set (int values[6])

  Not so sure if this really saves trouble for the caller.
- void set (midibyte values[6])

  Not so sure if this really saves trouble for the caller.
- bool match (midibyte status, midibyte data) const

  Handles a common check in the perform module.
- bool in_range (midibyte data) const

  Handles a common check in the perform module.

Private Attributes

- bool m_active

  Provides the value for active.
- bool m_inverse_active

  Provides the value for inverse-active.
- int m_status

  Provides the value for the status.
- int m_data

  Provides the value for the data.
- int m_min_value

  Provides the minimum value for the controller.
- int m_max_value

  Provides the value for the controller.

10.43.1 Detailed Description

Note that, although we've converted this to a full-fledged class, the ordering of variables and the data arrays used to fill them is very signifcant. See the midifile and optionsfile modules.

The perform module sets up the three following arrays for each of the MIDI controls that can be defined in the "rc" file:

```
    m_midi_cc_toggle[]
    m_midi_cc_on[]
    m_midi_cc_off[]
```

```
These three arrays are specified in the "rc" by a line like the following:

    n [0 0    0    0    0    0] [0 0    0    0    0    0] [0 0    0    0    0    0]

where n ranges from 0 to 73 or 83.  Lines 0 to 31 provide controller
values for the "pattern group", one line for each of the 32 pattern slots.
Lines 32 to 63 provide controller values for the "mute in group", one line
for each of the 32 pattern slots.  The rest of the lines provide entries
for control of: BPM up, BPM down, Screen-set up, Screen-set down, Mod
Replaces, Mod Snapshot, Mod Queue, Mod gmute (group mute), Mod glearn
(group learn), and Screen-set Play.  Additional controls are currently in
the works.

In each of the bracketed sections, the values correspond to the members in
this order: m_active, m_inverse_active, m_status, m_data, m_min_value, and
m_max_value.

Why are the status, data, and min/max values long?  A character or
midibyte would be enough.  We'll fix that later, once we have tested this
stuff.  We do need to convert them from long to int, though, and do that
in the scanning and output done by optionsfile.
```

10.43.2 Member Enumeration Documentation

10.43.2.1 action

```
enum seq64::midi_control::action
```

Enumerator

action_toggle	Provides the kind of MIDI control event found, used in the new perform::handle_midi_control_ex() function. Toggles the status of the given control. For the "playback" status, indicates the "pause" functionality.
action_on	Turns on the status of the given control. For the "playback" status, indicates the "start" functionality.
action_off	Turns off the status of the given control. For the "playback" status, indicates the "stop" functionality.

10.43.3 Constructor & Destructor Documentation

10.43.3.1 midi_control()

```
seq64::midi_control::midi_control ( )  [inline]
```

Every member is either false or zero.

10.43.4 Member Function Documentation

10.43.4.1 active()

```
bool seq64::midi_control::active ( ) const  [inline]
```

10.43.4.2 inverse_active()

```
bool seq64::midi_control::inverse_active ( ) const  [inline]
```

10.43.4.3 status()

```
int seq64::midi_control::status ( ) const  [inline]
```

10.43.4.4 data()

```
int seq64::midi_control::data ( ) const  [inline]
```

10.43.4.5 min_value()

```
int seq64::midi_control::min_value ( ) const  [inline]
```

10.43.4.6 max_value()

```
int seq64::midi_control::max_value ( ) const  [inline]
```

10.43.4.7 set() [1/2]

```
void seq64::midi_control::set (
            int values[6] )  [inline]
```

It fits in with the big-ass sscanf() call in optionsfile.

Parameters

values	Provides the six values, in an integer array, to set into the members in this order: m_active, m_inverse_active, m_status, m_data, m_min_value, and m_max_value.

10.43.4.8 set() [2/2]

```
void seq64::midi_control::set (
            midibyte values[6] )  [inline]
```

It fits in with the usage in midifile.

Parameters

values	Provides the six values, in a byte array, to set into the members in this order: m_active, m_inverse_active, m_status, m_data, m_min_value, and m_max_value.

10.43.4.9 match()

```
bool seq64::midi_control::match (
            midibyte status,
            midibyte data ) const  [inline]
```

Parameters

status	Provides the status byte, which is checked against m_status.
data	Provides the data byte, which is checked against m_data.

10.43.4.10 in_range()

```
bool seq64::midi_control::in_range (
            midibyte data ) const  [inline]
```

10.43.5 Field Documentation

10.43.5.1 m_active

```
bool seq64::midi_control::m_active  [private]
```

10.43.5.2 m_inverse_active

```
bool seq64::midi_control::m_inverse_active  [private]
```

10.43.5.3 m_status

```
int seq64::midi_control::m_status  [private]
```

Big question is, is the channel included here? Yes. So the next question is, is it ignored? We don't think so.

10.43.5.4 m_data

```
int seq64::midi_control::m_data  [private]
```

10.43.5.5 m_min_value

```
int seq64::midi_control::m_min_value  [private]
```

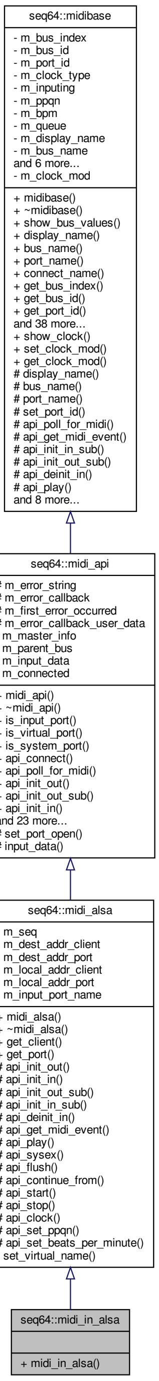
10.43.5.6 m_max_value

```
int seq64::midi_control::m_max_value  [private]
```

10.44 seq64::midi_in_alsa Class Reference

This class implements the ALSA version of a MIDI input object.

Inheritance diagram for seq64::midi_in_alsa:



Public Member Functions

- midi_in_alsa (midibus &parentbus, midi_info &masterinfo)

Additional Inherited Members

10.44.1 Constructor & Destructor Documentation

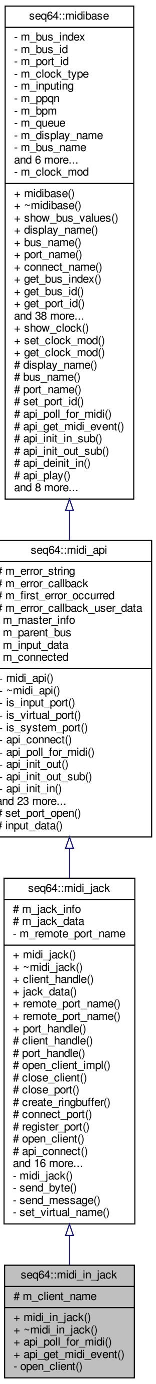
10.44.1.1 midi_in_alsa()

```
seq64::midi_in_alsa::midi_in_alsa (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.45 seq64::midi_in_jack Class Reference

The class for handling JACK MIDI input.

Inheritance diagram for seq64::midi_in_jack:



Public Member Functions

- midi_in_jack (midibus &parentbus, midi_info &masterinfo)
- virtual ∼midi_in_jack ()
- virtual int api_poll_for_midi ()
- virtual bool api_get_midi_event (event ∗)

Protected Attributes

- std::string m_client_name

Private Member Functions

- virtual bool open_client ()

  This function is virtual, so we don't call it in the constructor, using open_client_impl() directly instead.

Additional Inherited Members

10.45.1 Constructor & Destructor Documentation

10.45.1.1 midi_in_jack()

```
seq64::midi_in_jack::midi_in_jack (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.45.1.2 ∼midi_in_jack()

```
virtual seq64::midi_in_jack::∼midi_in_jack ( )  [virtual]
```

10.45.2 Member Function Documentation

10.45.2.1 api_poll_for_midi()

```
virtual int seq64::midi_in_jack::api_poll_for_midi ( )  [virtual]
```

Reimplemented from seq64::midi_api.

10.45.2.2 api_get_midi_event()

```
virtual bool seq64::midi_in_jack::api_get_midi_event (
            event * )  [virtual]
```

Reimplemented from seq64::midi_jack.

10.45.2.3 open_client()

```
virtual bool seq64::midi_in_jack::open_client ( )  [inline], [private], [virtual]
```

This function replaces the RtMidi function "connect()".

Implements seq64::midi_jack.

10.45.3 Field Documentation

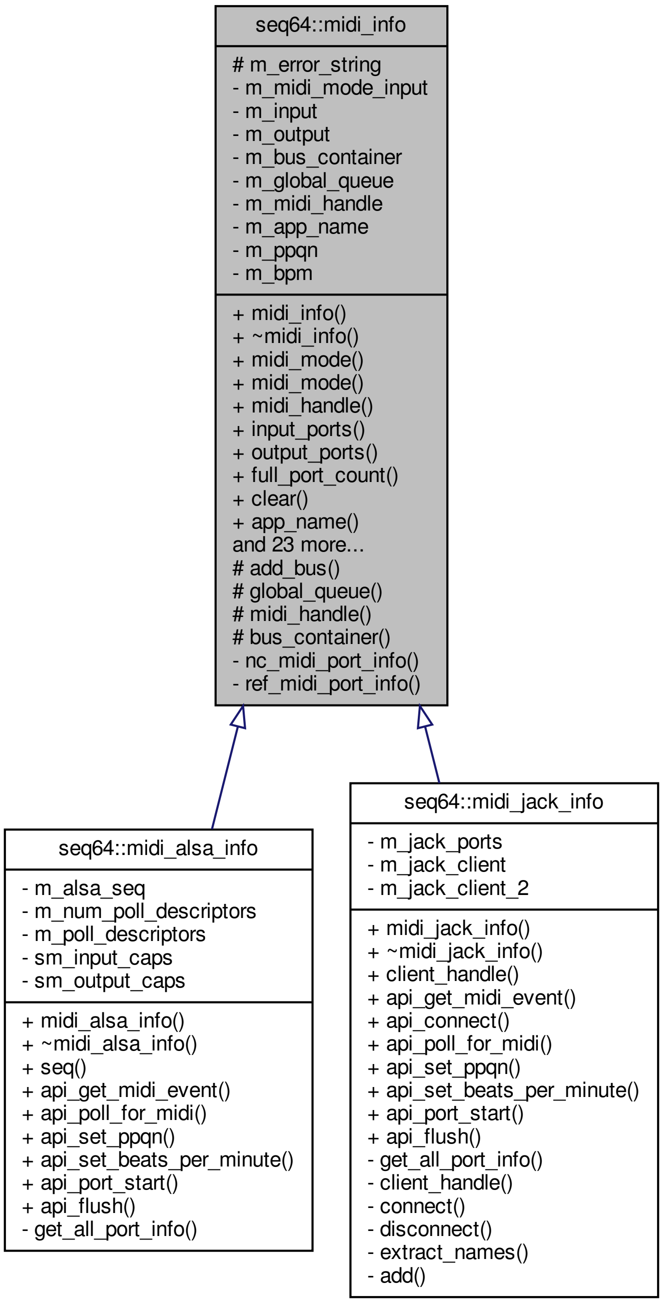
10.45.3.1 m_client_name

```
std::string seq64::midi_in_jack::m_client_name  [protected]
```

10.46 seq64::midi_info Class Reference

The class for holding basic information on the MIDI input and output ports currently present in the system.

Inheritance diagram for seq64::midi_info:



Public Member Functions

- midi_info (const std::string &appname, int ppqn=SEQ64_DEFAULT_PPQN, midibpm bpm=SEQ64_DEFA←ULT_BPM)
- virtual ~midi_info ()
- bool midi_mode () const

  'Getter' function for member m_midi_mode_input

- void midi_mode (bool flag)

  'Setter' function for member m_midi_mode_input
- void ∗ midi_handle ()

  'Getter' function for member m_midi_handle
- midi_port_info & input_ports ()

  'Getter' function for member m_input
- midi_port_info & output_ports ()

  'Getter' function for member m_output
- int full_port_count () const

  'Getter' function for member Total port count.
- void clear ()
- const std::string & app_name () const

  'Getter' function for member m_app_name
- int ppqn () const

  'Getter' function for member m_ppqn, simple version, also see api_set_ppqn().
- midibpm bpm () const

  'Getter' function for member m_bpm, simple version, also see api_set_beats_per_minute().
- virtual void api_set_ppqn (int p)

  Special setter.
- virtual void api_set_beats_per_minute (midibpm b)

  Special setter.
- virtual void api_port_start (mastermidibus &, int, int)

  An ALSA-specific function at the moment.
- virtual bool api_get_midi_event (event ∗inev)=0
- virtual int api_poll_for_midi ()=0
- virtual void api_flush ()=0
- virtual bool api_connect ()

  Used only in the midi_jack_info class.
- virtual int get_port_count () const
- virtual int get_bus_id (int index) const
- virtual std::string get_bus_name (int index) const
- virtual int get_port_id (int index) const
- virtual std::string get_port_name (int index) const
- virtual bool get_input (int index) const
- virtual bool get_virtual (int index) const
- virtual bool get_system (int index) const
- virtual int queue_number (int index) const
- std::string connect_name (int index) const
- std::string port_list () const
- int global_queue () const
- void error (rterror::Type type, const std::string &errorstring)

  A basic error reporting function for midi_info classes.
- virtual int get_all_port_info ()=0

Protected Member Functions

- void add_bus (const midibus ∗m)

  Adds the midibus to a quick list of all ports for use in the api_connect() call in mastermidibus.
- void global_queue (int q)

  'Setter' function for member m_global_queue
- void midi_handle (void ∗h)

  'Setter' function for member m_midi_handle
- std::vector< midibus ∗ > & bus_container ()

  'Getter' function for member m_bus_container

Protected Attributes

- std::string m_error_string

  Error string for the midi_info interface.

Private Member Functions

- const midi_port_info & nc_midi_port_info () const

  'Getter' function for member m_input or m_output Used for retrieving values from the input or output containers.
- midi_port_info & ref_midi_port_info ()

  'Getter' function for member m_input or m_output

Private Attributes

- bool m_midi_mode_input

  Indicates which mode we're in, input or output.
- midi_port_info m_input

  Holds data on the ALSA/JACK/Core/WinMM inputs.
- midi_port_info m_output

  Holds data on the ALSA/JACK/Core/WinMM outputs.
- std::vector< midibus * > m_bus_container

  Holds pointers to the ports that were created, so that, after activation, we can call the connect_port() function on those that are not virtual.
- int m_global_queue

  The ID of the ALSA MIDI queue.
- void * m_midi_handle

  Provides a handle to the main ALSA or JACK implementation object.
- const std::string m_app_name

  Holds this value for passing along, to reduce the number of arguments needed.
- int m_ppqn

  Hold this value for passing along to some ports that get created.
- midibpm m_bpm

  Hold this value for passing along to some ports that get created.

Friends

- class rtmidi_info

10.46.1 Constructor & Destructor Documentation

10.46.1.1 midi_info()

```
seq64::midi_info::midi_info (
            const std::string & appname,
            int ppqn = SEQ64_DEFAULT_PPQN,
            midibpm bpm = SEQ64_DEFAULT_BPM )
```

10.46.1.2 ∼midi_info()

```
virtual seq64::midi_info::∼midi_info ( )  [inline], [virtual]
```

10.46.2 Member Function Documentation

10.46.2.1 midi_mode() [1/2]

```
bool seq64::midi_info::midi_mode ( ) const  [inline]
```

10.46.2.2 midi_mode() [2/2]

```
void seq64::midi_info::midi_mode (
             bool flag )  [inline]
```

10.46.2.3 midi_handle() [1/2]

```
void* seq64::midi_info::midi_handle ( )  [inline]
```

10.46.2.4 input_ports()

```
midi_port_info& seq64::midi_info::input_ports ( )  [inline]
```

10.46.2.5 output_ports()

```
midi_port_info& seq64::midi_info::output_ports ( )  [inline]
```

10.46.2.6 full_port_count()

```
int seq64::midi_info::full_port_count ( ) const  [inline]
```

10.46.2.7 clear()

```
void seq64::midi_info::clear ( )  [inline]
```

10.46.2.8 app_name()

```
const std::string& seq64::midi_info::app_name ( ) const  [inline]
```

10.46.2.9 ppqn()

```
int seq64::midi_info::ppqn ( ) const  [inline]
```

10.46.2.10 bpm()

```
midibpm seq64::midi_info::bpm ( ) const  [inline]
```

10.46.2.11 api_set_ppqn()

```
virtual void seq64::midi_info::api_set_ppqn (
             int p )  [inline], [virtual]
```

Reimplemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.12 api_set_beats_per_minute()

```
virtual void seq64::midi_info::api_set_beats_per_minute (
             midibpm b )  [inline], [virtual]
```

Reimplemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.13 api_port_start()

```
virtual void seq64::midi_info::api_port_start (
             mastermidibus & ,
             int ,
             int  )  [inline], [virtual]
```

Reimplemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.14 api_get_midi_event()

```
virtual bool seq64::midi_info::api_get_midi_event (
             event * inev )  [pure virtual]
```

Implemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.15 api_poll_for_midi()

```
virtual int seq64::midi_info::api_poll_for_midi ( )  [pure virtual]
```

Implemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.16 api_flush()

```
virtual void seq64::midi_info::api_flush ( )  [pure virtual]
```

Implemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.17 api_connect()

```
virtual bool seq64::midi_info::api_connect ( )  [inline], [virtual]
```

Reimplemented in seq64::midi_jack_info.

10.46.2.18 get_port_count()

```
virtual int seq64::midi_info::get_port_count ( ) const  [inline], [virtual]
```

10.46.2.19 get_bus_id()

```
virtual int seq64::midi_info::get_bus_id (
             int index ) const  [inline], [virtual]
```

10.46.2.20 get_bus_name()

```
virtual std::string seq64::midi_info::get_bus_name (
             int index ) const  [inline], [virtual]
```

10.46.2.21 get_port_id()

```
virtual int seq64::midi_info::get_port_id (
             int index ) const  [inline], [virtual]
```

10.46.2.22 get_port_name()

```
virtual std::string seq64::midi_info::get_port_name (
             int index ) const  [inline], [virtual]
```

10.46.2.23 get_input()

```
virtual bool seq64::midi_info::get_input (
             int index ) const  [inline], [virtual]
```

10.46.2.24 get_virtual()

```
virtual bool seq64::midi_info::get_virtual (
             int index ) const  [inline], [virtual]
```

10.46.2.25 get_system()

```
virtual bool seq64::midi_info::get_system (
             int index ) const  [inline], [virtual]
```

10.46.2.26 queue_number()

```
virtual int seq64::midi_info::queue_number (
             int index ) const  [inline], [virtual]
```

10.46.2.27 connect_name()

```
std::string seq64::midi_info::connect_name (
            int index ) const  [inline]
```

10.46.2.28 port_list()

```
std::string seq64::midi_info::port_list ( ) const
```

10.46.2.29 global_queue() [1/2]

```
int seq64::midi_info::global_queue ( ) const  [inline]
```

10.46.2.30 error()

```
void seq64::midi_info::error (
            rterror::Type type,
            const std::string & errorstring )
```

10.46.2.31 get_all_port_info()

```
virtual int seq64::midi_info::get_all_port_info ( )  [pure virtual]
```

Implemented in seq64::midi_alsa_info, and seq64::midi_jack_info.

10.46.2.32 add_bus()

```
void seq64::midi_info::add_bus (
            const midibus * m )  [inline], [protected]
```

We could add the midibus pointer to the midi_port_info structure, but that information is strictly for representing data obtained by querying the system via the selected API.

10.46.2.33 global_queue() [2/2]

```
void seq64::midi_info::global_queue (
            int q )  [inline], [protected]
```

10.46.2.34 midi_handle() [2/2]

```
void seq64::midi_info::midi_handle (
             void * h )  [inline], [protected]
```

10.46.2.35 bus_container()

```
std::vector<midibus *>& seq64::midi_info::bus_container ( )  [inline], [protected]
```

10.46.2.36 nc_midi_port_info()

```
const midi_port_info& seq64::midi_info::nc_midi_port_info ( ) const  [inline], [private]
```

The caller must insure the proper container by calling the midi_mode() function with the value of true (SEQ64_MI↩
DI_INPUT_PORT) or false (SEQ64_MIDI_OUTPUT_PORT) first. Ugly stuff. I hate it.

10.46.2.37 ref_midi_port_info()

```
midi_port_info& seq64::midi_info::ref_midi_port_info ( )  [inline], [private]
```

10.46.3 Friends And Related Function Documentation

10.46.3.1 rtmidi_info

```
friend class rtmidi_info  [friend]
```

10.46.4 Field Documentation

10.46.4.1 m_midi_mode_input

```
bool seq64::midi_info::m_midi_mode_input  [private]
```

We have to pick the mode we need to be in with the set_mode() function before we do a series of operations. This clumsy two-step is needed in order to preserve the midi_api interface.

10.46.4.2 m_input

```
midi_port_info seq64::midi_info::m_input [private]
```

10.46.4.3 m_output

```
midi_port_info seq64::midi_info::m_output [private]
```

10.46.4.4 m_bus_container

```
std::vector<midibus *> seq64::midi_info::m_bus_container [private]
```

See the add_bus() and bus_container() member functions.

10.46.4.5 m_global_queue

```
int seq64::midi_info::m_global_queue [private]
```

10.46.4.6 m_midi_handle

```
void* seq64::midi_info::m_midi_handle [private]
```

Created by the class derived from midi_info.

10.46.4.7 m_app_name

```
const std::string seq64::midi_info::m_app_name [private]
```

This value is the main application name as determined at ./configure time.

10.46.4.8 m_ppqn

```
int seq64::midi_info::m_ppqn [private]
```

Some APIs can use this value.

10.46.4.9 m_bpm

```
midibpm seq64::midi_info::m_bpm [private]
```

Some APIs can use this value.

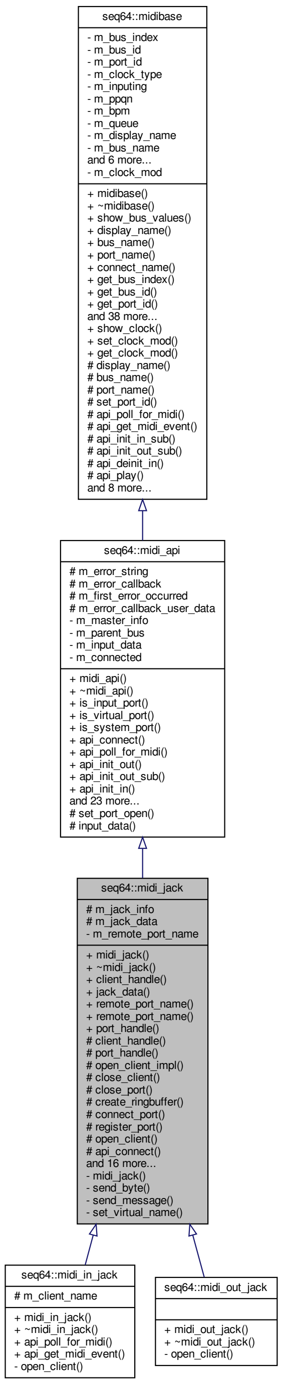
10.46.4.10 m_error_string

```
std::string seq64::midi_info::m_error_string  [protected]
```

10.47 seq64::midi_jack Class Reference

This class implements with JACK version of the midi_alsa object.

Inheritance diagram for seq64::midi_jack:



Public Member Functions

- midi_jack (midibus &parentbus, midi_info &masterinfo)
- virtual ∼midi_jack ()
- jack_client_t ∗ client_handle ()

    'Getter' function for member m_jack_client This is the platform-specific version of midi_handle().
- midi_jack_data & jack_data ()

    'Getter' function for member m_jack_data
- const std::string & remote_port_name () const

    'Getter' function for member m_remote_port_name
- void remote_port_name (const std::string &s)

    'Setter' function for member m_remote_port_name
- jack_port_t ∗ port_handle ()

    'Getter' function for member m_jack_port This is the platform-specific version of midi_handle().

Protected Member Functions

- void client_handle (jack_client_t ∗handle)

    'Setter' function for member m_jack_data.m_jack_client
- void port_handle (jack_port_t ∗handle)

    'Setter' function for member m_jack_data.m_jack_port
- bool open_client_impl (bool input)
- void close_client ()
- void close_port ()
- bool create_ringbuffer (size_t rbsize)
- bool connect_port (bool input, const std::string &sourceportname, const std::string &destportname)
- bool register_port (bool input, const std::string &portname)
- virtual bool open_client ()=0
- virtual bool api_connect ()
- virtual bool api_init_out ()
- virtual bool api_init_in ()
- virtual bool api_init_out_sub ()
- virtual bool api_init_in_sub ()
- virtual bool api_deinit_in ()
- virtual bool api_get_midi_event (event ∗)
- virtual void api_play (event ∗e24, midibyte channel)
- virtual void api_sysex (event ∗e24)
- virtual void api_flush ()
- virtual void api_continue_from (midipulse tick, midipulse beats)
- virtual void api_start ()
- virtual void api_stop ()
- virtual void api_clock (midipulse tick)
- virtual void api_set_ppqn (int ppqn)
- virtual void api_set_beats_per_minute (midibpm bpm)
- virtual std::string api_get_port_name ()

Protected Attributes

- midi_jack_info & m_jack_info

    This reference is needed in order for this midi_jack object to add itself to the main midi_jack_info list when running in single-JACK client mode.
- midi_jack_data m_jack_data

    Holds the data needed for JACK processing.

Private Member Functions

- midi_jack ()
- void send_byte (midibyte evbyte)
- bool send_message (const midi_message &message)
- bool set_virtual_name (int portid, const std::string &portname)

Private Attributes

- std::string m_remote_port_name
  Preserves the original name of the remote port, so it can be used later for connection.

Friends

- class midi_jack_info

Additional Inherited Members

10.47.1 Constructor & Destructor Documentation

10.47.1.1 midi_jack() [1/2]

```
seq64::midi_jack::midi_jack ( )  [private]
```

10.47.1.2 midi_jack() [2/2]

```
seq64::midi_jack::midi_jack (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.47.1.3 ∼midi_jack()

```
virtual seq64::midi_jack::∼midi_jack ( )  [virtual]
```

10.47.2 Member Function Documentation

10.47.2.1 client_handle() [1/2]

```
jack_client_t* seq64::midi_jack::client_handle ( )  [inline]
```

10.47.2.2 jack_data()

```
midi_jack_data& seq64::midi_jack::jack_data ( )  [inline]
```

10.47.2.3 remote_port_name() [1/2]

```
const std::string& seq64::midi_jack::remote_port_name ( ) const  [inline]
```

10.47.2.4 remote_port_name() [2/2]

```
void seq64::midi_jack::remote_port_name (
             const std::string & s )  [inline]
```

10.47.2.5 port_handle() [1/2]

```
jack_port_t* seq64::midi_jack::port_handle ( )  [inline]
```

10.47.2.6 client_handle() [2/2]

```
void seq64::midi_jack::client_handle (
             jack_client_t * handle )  [inline], [protected]
```

10.47.2.7 port_handle() [2/2]

```
void seq64::midi_jack::port_handle (
             jack_port_t * handle )  [inline], [protected]
```

10.47.2.8 open_client_impl()

```
bool seq64::midi_jack::open_client_impl (
            bool input )  [protected]
```

10.47.2.9 close_client()

```
void seq64::midi_jack::close_client ( )  [protected]
```

10.47.2.10 close_port()

```
void seq64::midi_jack::close_port ( )  [protected]
```

10.47.2.11 create_ringbuffer()

```
bool seq64::midi_jack::create_ringbuffer (
            size_t rbsize )  [protected]
```

10.47.2.12 connect_port()

```
bool seq64::midi_jack::connect_port (
            bool input,
            const std::string & sourceportname,
            const std::string & destportname )  [protected]
```

10.47.2.13 register_port()

```
bool seq64::midi_jack::register_port (
            bool input,
            const std::string & portname )  [protected]
```

10.47.2.14 open_client()

```
virtual bool seq64::midi_jack::open_client ( )  [protected], [pure virtual]
```

Implemented in seq64::midi_out_jack, and seq64::midi_in_jack.

10.47.2.15 api_connect()

```
virtual bool seq64::midi_jack::api_connect ( )  [protected], [virtual]
```

Reimplemented from seq64::midi_api.

10.47.2.16 api_init_out()

```
virtual bool seq64::midi_jack::api_init_out ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.17 api_init_in()

```
virtual bool seq64::midi_jack::api_init_in ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.18 api_init_out_sub()

```
virtual bool seq64::midi_jack::api_init_out_sub ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.19 api_init_in_sub()

```
virtual bool seq64::midi_jack::api_init_in_sub ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.20 api_deinit_in()

```
virtual bool seq64::midi_jack::api_deinit_in ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.21 api_get_midi_event()

```
virtual bool seq64::midi_jack::api_get_midi_event (
            event * )  [inline], [protected], [virtual]
```

Returns

Returns false, since this is an input function that is implemented fully only by midi_in_jack.

Implements seq64::midi_api.

Reimplemented in seq64::midi_in_jack.

10.47.2.22 api_play()

```
virtual void seq64::midi_jack::api_play (
            event * e24,
            midibyte channel )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.23 api_sysex()

```
virtual void seq64::midi_jack::api_sysex (
            event * e24 )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.24 api_flush()

```
virtual void seq64::midi_jack::api_flush ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.25 api_continue_from()

```
virtual void seq64::midi_jack::api_continue_from (
            midipulse tick,
            midipulse beats )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.26 api_start()

```
virtual void seq64::midi_jack::api_start ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.27 api_stop()

```
virtual void seq64::midi_jack::api_stop ( )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.28 api_clock()

```
virtual void seq64::midi_jack::api_clock (
             midipulse tick )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.29 api_set_ppqn()

```
virtual void seq64::midi_jack::api_set_ppqn (
             int ppqn )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.30 api_set_beats_per_minute()

```
virtual void seq64::midi_jack::api_set_beats_per_minute (
             midibpm bpm )  [protected], [virtual]
```

Implements seq64::midi_api.

10.47.2.31 api_get_port_name()

```
virtual std::string seq64::midi_jack::api_get_port_name ( )  [protected], [virtual]
```

Reimplemented from seq64::midi_api.

10.47.2.32 send_byte()

```
void seq64::midi_jack::send_byte (
             midibyte evbyte )  [private]
```

10.47.2.33 send_message()

```
bool seq64::midi_jack::send_message (
             const midi_message & message )  [private]
```

10.47.2.34 set_virtual_name()

```
bool seq64::midi_jack::set_virtual_name (
             int portid,
             const std::string & portname )  [private]
```

10.47.3 Friends And Related Function Documentation

10.47.3.1 midi_jack_info

```
friend class midi_jack_info  [friend]
```

10.47.4 Field Documentation

10.47.4.1 m_remote_port_name

```
std::string seq64::midi_jack::m_remote_port_name  [private]
```

10.47.4.2 m_jack_info

```
midi_jack_info& seq64::midi_jack::m_jack_info  [protected]
```

10.47.4.3 m_jack_data

```
midi_jack_data seq64::midi_jack::m_jack_data  [protected]
```

Please do not confuse this item with the m_midi_handle of the midi_api base class. This object holds a JACK-client pointer and a JACK-port pointer.

10.48 seq64::midi_jack_data Struct Reference

Contains the JACK MIDI API data as a kind of scratchpad for this object.

Public Member Functions

- midi_jack_data ()

  Constructor midi_jack_data
- ∼midi_jack_data ()

  This destructor currently does nothing.
- bool valid_buffer () const

  Tests that the buffer is good.

Data Fields

- jack_client_t ∗ m_jack_client

  Holds the JACK sequencer client pointer so that it can be used by the midibus objects.
- jack_port_t ∗ m_jack_port

  Holds the JACK port information of the JACK client.
- jack_ringbuffer_t ∗ m_jack_buffsize

  Holds the size of data for communicating between the client ring-buffer and the JACK port's internal buffer.
- jack_ringbuffer_t ∗ m_jack_buffmessage

  Holds the data for communicating between the client ring-buffer and the JACK port's internal buffer.
- jack_time_t m_jack_lasttime

  The last time-stamp obtained.
- rtmidi_in_data ∗ m_jack_rtmidiin

  Holds special data peculiar to the client and its MIDI input processing.

10.48.1 Detailed Description

This guy needs a constructor taking parameters for an rtmidi_in_data pointer.

10.48.2 Constructor & Destructor Documentation

10.48.2.1 midi_jack_data()

```
seq64::midi_jack_data::midi_jack_data ( )  [inline]
```

10.48.2.2 ∼midi_jack_data()

```
seq64::midi_jack_data::∼midi_jack_data ( )  [inline]
```

We rely on the enclosing class to close out the things that it created.

10.48.3 Member Function Documentation

10.48.3.1 valid_buffer()

```
bool seq64::midi_jack_data::valid_buffer ( ) const  [inline]
```

10.48.4 Field Documentation

10.48.4.1 m_jack_client

```
jack_client_t* seq64::midi_jack_data::m_jack_client
```

This is actually an opaque pointer; there is no way to get the actual fields in this structure; they can only be accessed through functions in the JACK API. Note that it is also stored as a void pointer in midi_info::m_midi_handle. This item can either be the single JACK client created by the midi_jack_info object, or a JACK client created by the midi_jack object in the "multi-client" mode (which is not yet complete or usable).

10.48.4.2 m_jack_port

```
jack_port_t* seq64::midi_jack_data::m_jack_port
```

10.48.4.3 m_jack_buffsize

```
jack_ringbuffer_t* seq64::midi_jack_data::m_jack_buffsize
```

10.48.4.4 m_jack_buffmessage

```
jack_ringbuffer_t* seq64::midi_jack_data::m_jack_buffmessage
```

10.48.4.5 m_jack_lasttime

```
jack_time_t seq64::midi_jack_data::m_jack_lasttime
```

Use for calculating the delta time, I would imagine.

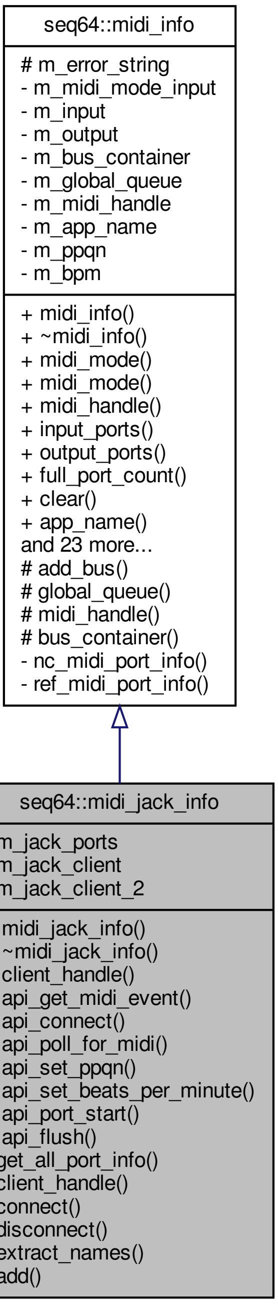
10.48.4.6 m_jack_rtmidiin

```
rtmidi_in_data* seq64::midi_jack_data::m_jack_rtmidiin
```

10.49 seq64::midi_jack_info Class Reference

The class for handling JACK MIDI port enumeration.

Inheritance diagram for seq64::midi_jack_info:



Public Member Functions

- midi_jack_info (const std::string &appname, int ppqn=SEQ64_DEFAULT_PPQN, midibpm bpm=SEQ64_↩ DEFAULT_BPM)
- virtual ∼midi_jack_info ()
- jack_client_t ∗ client_handle ()

    'Getter' function for member m_jack_client This is the platform-specific version of midi_handle().

- virtual bool api_get_midi_event (event ∗inev)
- virtual bool api_connect ()
- virtual int api_poll_for_midi ()
- virtual void api_set_ppqn (int p)
- virtual void api_set_beats_per_minute (midibpm b)
- virtual void api_port_start (mastermidibus &masterbus, int bus, int port)
- virtual void api_flush ()

Private Member Functions

- virtual int get_all_port_info ()
- void client_handle (jack_client_t ∗j)

  'Getter' function for member m_jack_client This is the platform-specific version of midi_handle().
- jack_client_t ∗ connect ()
- void disconnect ()
- void extract_names (const std::string &fullname, std::string &clientname, std::string &portname)
- bool add (midi_jack &mj)

  Adds a pointer to a JACK port.

Private Attributes

- std::vector< midi_jack ∗ > m_jack_ports

  Holds the port data.
- jack_client_t ∗ m_jack_client

  Holds the JACK sequencer client pointer so that it can be used by the midibus objects.
- jack_client_t ∗ m_jack_client_2

  Holds the JACK input client pointer if multi-client mode is in force.

Friends

- class midi_jack
- int jack_process_io (jack_nframes_t nframes, void ∗arg)

Additional Inherited Members

10.49.1 Constructor & Destructor Documentation

10.49.1.1 midi_jack_info()

```
seq64::midi_jack_info::midi_jack_info (
             const std::string & appname,
             int ppqn = SEQ64_DEFAULT_PPQN,
             midibpm bpm = SEQ64_DEFAULT_BPM )
```

10.49.1.2 ∼midi_jack_info()

```
virtual seq64::midi_jack_info::∼midi_jack_info ( )  [virtual]
```

10.49.2 Member Function Documentation

10.49.2.1 client_handle() [1/2]

```
jack_client_t* seq64::midi_jack_info::client_handle ( )  [inline]
```

10.49.2.2 api_get_midi_event()

```
virtual bool seq64::midi_jack_info::api_get_midi_event (
             event * inev )  [virtual]
```

Implements seq64::midi_info.

10.49.2.3 api_connect()

```
virtual bool seq64::midi_jack_info::api_connect ( )  [virtual]
```

Reimplemented from seq64::midi_info.

10.49.2.4 api_poll_for_midi()

```
virtual int seq64::midi_jack_info::api_poll_for_midi ( )  [virtual]
```

Implements seq64::midi_info.

10.49.2.5 api_set_ppqn()

```
virtual void seq64::midi_jack_info::api_set_ppqn (
             int p )  [virtual]
```

Reimplemented from seq64::midi_info.

10.49.2.6 api_set_beats_per_minute()

```
virtual void seq64::midi_jack_info::api_set_beats_per_minute (
             midibpm b )  [virtual]
```

Reimplemented from seq64::midi_info.

10.49.2.7 api_port_start()

```
virtual void seq64::midi_jack_info::api_port_start (
             mastermidibus & masterbus,
             int bus,
             int port )  [virtual]
```

Reimplemented from seq64::midi_info.

10.49.2.8 api_flush()

```
virtual void seq64::midi_jack_info::api_flush ( )  [virtual]
```

Implements seq64::midi_info.

10.49.2.9 get_all_port_info()

```
virtual int seq64::midi_jack_info::get_all_port_info ( )  [private], [virtual]
```

Implements seq64::midi_info.

10.49.2.10 client_handle() [2/2]

```
void seq64::midi_jack_info::client_handle (
             jack_client_t * j )  [inline], [private]
```

10.49.2.11 connect()

```
jack_client_t* seq64::midi_jack_info::connect ( )  [private]
```

10.49.2.12 disconnect()

```
void seq64::midi_jack_info::disconnect ( )  [private]
```

10.49.2.13 extract_names()

```
void seq64::midi_jack_info::extract_names (
            const std::string & fullname,
            std::string & clientname,
            std::string & portname )  [private]
```

10.49.2.14 add()

```
bool seq64::midi_jack_info::add (
            midi_jack & mj )  [inline], [private]
```

10.49.3 Friends And Related Function Documentation

10.49.3.1 midi_jack

```
friend class midi_jack  [friend]
```

10.49.3.2 jack_process_io

```
int jack_process_io (
            jack_nframes_t nframes,
            void * arg )  [friend]
```

10.49.4 Field Documentation

10.49.4.1 m_jack_ports

```
std::vector<midi_jack *> seq64::midi_jack_info::m_jack_ports  [private]
```

Not for use with the multi-client option. This list is iterated in the input and output portions of the JACK process callback.

10.49.4.2 m_jack_client

```
jack_client_t* seq64::midi_jack_info::m_jack_client  [private]
```

This is actually an opaque pointer; there is no way to get the actual fields in this structure; they can only be accessed through functions in the JACK API. Note that it is also stored as a void pointer in midi_info::m_midi_handle.

In multi-client mode, this pointer is the output client pointer.

10.49.4.3 m_jack_client_2

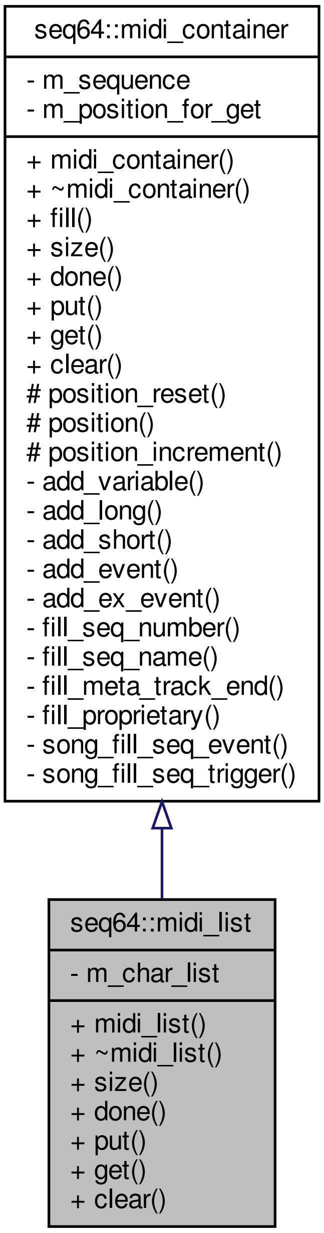
```
jack_client_t* seq64::midi_jack_info::m_jack_client_2  [private]
```

Otherwise, it is an unused null pointer.

10.50 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 () const

  Provide a way to get the next byte from the container.
- virtual void clear ()

  Provides a way to clear 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

10.50.1 Member Typedef Documentation

10.50.1.1 CharList

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

This type is basically the same as the midifile::m_char_list container in the midifile module.

10.50.2 Constructor & Destructor Documentation

10.50.2.1 midi_list()

```
seq64::midi_list::midi_list (
                sequence & seq )
```

Parameters

seq	The sequence/track object that is using this container.

10.50.2.2 ∼midi_list()

```
virtual seq64::midi_list::∼midi_list ( )  [inline], [virtual]
```

10.50.3 Member Function Documentation

10.50.3.1 size()

```
virtual std::size_t seq64::midi_list::size ( ) const  [inline], [virtual]
```

Reimplemented from seq64::midi_container.

10.50.3.2 done()

```
virtual bool seq64::midi_list::done ( ) const  [inline], [virtual]
```

Reimplemented from seq64::midi_container.

10.50.3.3 put()

```
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.

10.50.3.4 get()

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

In this implementation, m_position_for_get is not used. The elements of the container are popped off backward! This modifies the character list, so it has to be mutable.

Implements seq64::midi_container.

10.50.3.5 clear()

```
virtual void seq64::midi_list::clear ( )  [inline], [virtual]
```

Implements seq64::midi_container.

10.50.4 Field Documentation

10.50.4.1 m_char_list

```
CharList seq64::midi_list::m_char_list  [mutable], [private]
```

It has to be mutable because the const-function get() actually modifies the container when getting a byte.

10.51 seq64::midi_measures Class Reference

Provides a data structure to hold the numeric equivalent of the measures string "measures:beats:divisions" ("m:b↩
:d").

Public Member Functions

- midi_measures ()
  Default constructor for midi_measures.
- midi_measures (int measures, int beats, int divisions)
  Principal constructor for midi_measures.
- int measures () const
  'Getter' function for member m_measures
- void measures (int m)
  'Setter' function for member m_measures
- int beats () const
  'Getter' function for member m_beats
- void beats (int b)
  'Setter' function for member m_beats
- int divisions () const
  'Getter' function for member m_divisions
- void divisions (int d)
  'Setter' function for member m_divisions

Private Attributes

- int m_measures
  The integral number of measures in the measures-based time.
- int m_beats
  The integral number of beats in the measures-based time.
- int m_divisions
  The integral number of divisions/pulses in the measures-based time.

10.51.1 Detailed Description

More commonly known as "bars:beats:ticks", or "BBT".

10.51.2 Constructor & Destructor Documentation

10.51.2.1 midi_measures() [1/2]

```
seq64::midi_measures::midi_measures ( )
```

10.51.2.2 midi_measures() [2/2]

```
seq64::midi_measures::midi_measures (
             int measures,
             int beats,
             int divisions )
```

Parameters

measures	Copied into the m_measures member.
beats	Copied into the m_beats member.
divisions	Copied into the m_divisions member.

10.51.3 Member Function Documentation

10.51.3.1 measures() [1/2]

```
int seq64::midi_measures::measures ( ) const  [inline]
```

10.51.3.2 measures() [2/2]

```
void seq64::midi_measures::measures (
             int m )  [inline]
```

Parameters

m	The value to which to set the number of measures. We can add validation later.

10.51.3.3 beats() [1/2]

```
int seq64::midi_measures::beats ( ) const  [inline]
```

10.51.3.4 beats() [2/2]

```
void seq64::midi_measures::beats (
             int b )  [inline]
```

Parameters

b	The value to which to set the number of beats. We can add validation later.

10.51.3.5 divisions() [1/2]

```
int seq64::midi_measures::divisions ( ) const  [inline]
```

10.51.3.6 divisions() [2/2]

```
void seq64::midi_measures::divisions (
             int d )  [inline]
```

Parameters

d	The value to which to set the number of divisions. We can add validation later.

10.51.4 Field Documentation

10.51.4.1 m_measures

```
int seq64::midi_measures::m_measures  [private]
```

10.51.4.2 m_beats

```
int seq64::midi_measures::m_beats  [private]
```

10.51.4.3 m_divisions

```
int seq64::midi_measures::m_divisions  [private]
```

There are two possible translations of the two bytes of a division. If the top bit of the 16 bits is 0, then the time division is in "ticks per beat" (or “pulses per quarter note”). If the top bit is 1, then the time division is in "frames per second". This member deals only with the ticks/beat definition.

10.52 seq64::midi_message Class Reference

Provides a handy capsule for a MIDI message, based on the std::vector<unsigned char> data type from the RtMidi project.

Public Types

- typedef std::vector< midibyte > container

  Holds the data of the MIDI message.

Public Member Functions

- midi_message ()
- midibyte operator[ ] (int i) const
- const char ∗ array () const
- int count () const
- bool empty () const
- void push (midibyte b)
- double timestamp () const
- void timestamp (double t)
- bool is_sysex () const
- void show () const

Private Attributes

- container m_bytes

  Holds the event status and data bytes.
- double m_timestamp

  Holds the (optional) timestamp of the MIDI message.

10.52.1 Detailed Description

Please note that the ALSA module in sequencer64's rtmidi infrastructure uses the seq64::event rather than the seq64::midi_message object. For the moment, we will translate between them until we have the interactions between the old and new modules under control.

10.52.2 Member Typedef Documentation

10.52.2.1 container

```
typedef std::vector<midibyte> seq64::midi_message::container
```

Callers should use midi_message::container rather than using the vector directly. Bytes are added by the push() function, and are safely accessed (with bounds-checking) by operator [].

10.52.3 Constructor & Destructor Documentation

10.52.3.1 midi_message()

```
seq64::midi_message::midi_message ( )
```

10.52.4 Member Function Documentation

10.52.4.1 operator[]()

```
midibyte seq64::midi_message::operator[ ] (
              int i ) const  [inline]
```

10.52.4.2 array()

```
const char* seq64::midi_message::array ( ) const  [inline]
```

10.52.4.3 count()

```
int seq64::midi_message::count ( ) const  [inline]
```

10.52.4.4 empty()

```
bool seq64::midi_message::empty ( ) const  [inline]
```

10.52.4.5 push()

```
void seq64::midi_message::push (
             midibyte b )  [inline]
```

10.52.4.6 timestamp() [1/2]

```
double seq64::midi_message::timestamp ( ) const  [inline]
```

10.52.4.7 timestamp() [2/2]

```
void seq64::midi_message::timestamp (
             double t )  [inline]
```

10.52.4.8 is_sysex()

```
bool seq64::midi_message::is_sysex ( ) const  [inline]
```

10.52.4.9 show()

```
void seq64::midi_message::show ( ) const
```

10.52.5 Field Documentation

10.52.5.1 m_bytes

```
container seq64::midi_message::m_bytes  [private]
```

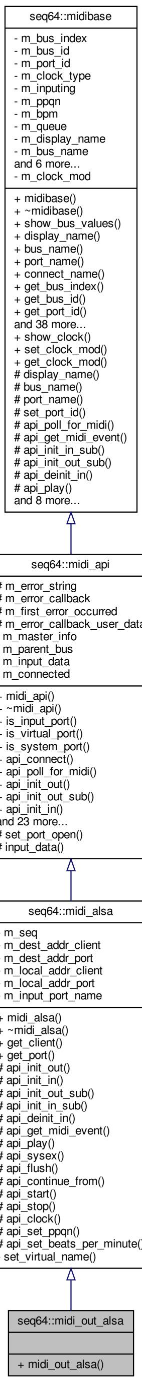
10.52.5.2 m_timestamp

```
double seq64::midi_message::m_timestamp  [private]
```

10.53 seq64::midi_out_alsa Class Reference

This class implements the ALSA version of a MIDI output object.

Inheritance diagram for seq64::midi_out_alsa:



Public Member Functions

- midi_out_alsa (midibus &parentbus, midi_info &masterinfo)

Additional Inherited Members

10.53.1 Constructor & Destructor Documentation

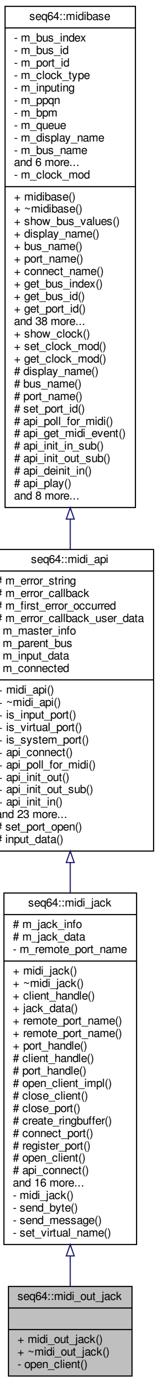
10.53.1.1 midi_out_alsa()

```
seq64::midi_out_alsa::midi_out_alsa (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.54 seq64::midi_out_jack Class Reference

The JACK MIDI output API class.

Inheritance diagram for seq64::midi_out_jack:



Public Member Functions

- midi_out_jack (midibus &parentbus, midi_info &masterinfo)
- virtual ∼midi_out_jack ()

Private Member Functions

- virtual bool open_client ()

virtual bool send_message (const midi_message & message);

Additional Inherited Members

10.54.1 Constructor & Destructor Documentation

10.54.1.1 midi_out_jack()

```
seq64::midi_out_jack::midi_out_jack (
            midibus & parentbus,
            midi_info & masterinfo )
```

10.54.1.2 ∼midi_out_jack()

```
virtual seq64::midi_out_jack::∼midi_out_jack ( )  [virtual]
```

10.54.2 Member Function Documentation

10.54.2.1 open_client()

```
virtual bool seq64::midi_out_jack::open_client ( )  [inline], [private], [virtual]
```

This function is virtual, so we don't call it in the constructor, using open_client_impl() directly instead. This function replaces the RtMidi function "connect()".

Implements seq64::midi_jack.

10.55 seq64::midi_port_info Class Reference

A class for holding port information.

Data Structures

- struct port_info_t

  Hold the information for a single port.

Public Member Functions

- midi_port_info ()
- void add (int clientnumber, const std::string &clientname, int portnumber, const std::string &portname, bool makevirtual, bool makesystem, bool makeinput, int queuenumber=SEQ64_BAD_QUEUE_ID)
- void add (const midibus ∗m)
- void clear ()

  This function is useful in replacing the discovered system ports with the manual/virtual ports added in "manual" mode.
- int get_port_count () const
- int get_bus_id (int index) const
- std::string get_bus_name (int index) const
- int get_port_id (int index) const
- std::string get_port_name (int index) const
- bool get_input (int index) const
- bool get_virtual (int index) const
- bool get_system (int index) const
- int get_queue_number (int index) const
- std::string connect_name (int index) const

  Provides the bus name and port name in canonical JACK format: "busname:portname".

Private Attributes

- int m_port_count

  Holds the number of ports counted.
- std::vector< port_info_t > m_port_container

  Holds information on all of the ports that were "scanned".

10.55.1 Constructor & Destructor Documentation

10.55.1.1 midi_port_info()

```
seq64::midi_port_info::midi_port_info ( )
```

10.55.2 Member Function Documentation

10.55.2.1 add() [1/2]

```
void seq64::midi_port_info::add (
             int clientnumber,
             const std::string & clientname,
             int portnumber,
             const std::string & portname,
             bool makevirtual,
             bool makesystem,
             bool makeinput,
             int queuenumber = SEQ64_BAD_QUEUE_ID )
```

10.55.2.2 add() [2/2]

```
void seq64::midi_port_info::add (
            const midibus * m )
```

10.55.2.3 clear()

```
void seq64::midi_port_info::clear ( )  [inline]
```

10.55.2.4 get_port_count()

```
int seq64::midi_port_info::get_port_count ( ) const  [inline]
```

10.55.2.5 get_bus_id()

```
int seq64::midi_port_info::get_bus_id (
            int index ) const  [inline]
```

10.55.2.6 get_bus_name()

```
std::string seq64::midi_port_info::get_bus_name (
            int index ) const  [inline]
```

10.55.2.7 get_port_id()

```
int seq64::midi_port_info::get_port_id (
            int index ) const  [inline]
```

10.55.2.8 get_port_name()

```
std::string seq64::midi_port_info::get_port_name (
            int index ) const  [inline]
```

10.55.2.9 get_input()

```
bool seq64::midi_port_info::get_input (
             int index ) const  [inline]
```

10.55.2.10 get_virtual()

```
bool seq64::midi_port_info::get_virtual (
             int index ) const  [inline]
```

10.55.2.11 get_system()

```
bool seq64::midi_port_info::get_system (
             int index ) const  [inline]
```

10.55.2.12 get_queue_number()

```
int seq64::midi_port_info::get_queue_number (
             int index ) const  [inline]
```

10.55.2.13 connect_name()

```
std::string seq64::midi_port_info::connect_name (
             int index ) const  [inline]
```

This function is basically the same as midibase::connect_name() function. If either the bus name or port name are empty, then an empty string is returned.

10.55.3 Field Documentation

10.55.3.1 m_port_count

```
int seq64::midi_port_info::m_port_count  [private]
```

10.55.3.2 m_port_container

```
std::vector<port_info_t> seq64::midi_port_info::m_port_container  [private]
```

10.56 seq64::midi_queue Class Reference

Provides a queue of midi_message structures.

Public Member Functions

- midi_queue ()
- ∼midi_queue ()
- bool empty () const

  'Getter' function for member m_size == 0
- int count () const

  'Getter' function for member m_size == 0
- bool full () const
- bool add (const midi_message &mmsg)
- void pop ()
- midi_message pop_front ()
- void allocate (unsigned queuesize=SEQ64_DEFAULT_QUEUE_SIZE)
- void deallocate ()
- const midi_message & front () const

  'Getter' function for member m_ring[m_front]

Private Attributes

- unsigned m_front
- unsigned m_back
- unsigned m_size
- unsigned m_ring_size
- midi_message ∗ m_ring

10.56.1 Detailed Description

This entity used to be a plain structure nested in the midi_in_api class. We made it a class to encapsulate some common operations to save a burden on the callers.

10.56.2 Constructor & Destructor Documentation

10.56.2.1 midi_queue()

```
seq64::midi_queue::midi_queue ( )
```

10.56.2.2 ∼midi_queue()

```
seq64::midi_queue::∼midi_queue ( )
```

10.56.3 Member Function Documentation

10.56.3.1 empty()

```
bool seq64::midi_queue::empty ( ) const  [inline]
```

10.56.3.2 count()

```
int seq64::midi_queue::count ( ) const  [inline]
```

10.56.3.3 full()

```
bool seq64::midi_queue::full ( ) const  [inline]
```

Returns

Returns true if the queue size is at maximum.

10.56.3.4 add()

```
bool seq64::midi_queue::add (
             const midi_message & mmsg )
```

10.56.3.5 pop()

```
void seq64::midi_queue::pop ( )
```

10.56.3.6 pop_front()

```
midi_message seq64::midi_queue::pop_front ( )
```

10.56.3.7 allocate()

```
void seq64::midi_queue::allocate (
             unsigned queuesize = SEQ64_DEFAULT_QUEUE_SIZE )
```

10.56.3.8 deallocate()

```
void seq64::midi_queue::deallocate ( )
```

10.56.3.9 front()

```
const midi_message& seq64::midi_queue::front ( ) const  [inline]
```

10.56.4 Field Documentation

10.56.4.1 m_front

```
unsigned seq64::midi_queue::m_front  [private]
```

10.56.4.2 m_back

```
unsigned seq64::midi_queue::m_back  [private]
```

10.56.4.3 m_size

```
unsigned seq64::midi_queue::m_size  [private]
```

10.56.4.4 m_ring_size

```
unsigned seq64::midi_queue::m_ring_size  [private]
```

10.56.4.5 m_ring

```
midi_message* seq64::midi_queue::m_ring  [private]
```

10.57 seq64::midi_splitter Class Reference

This class handles the parsing and writing of MIDI files.

Public Member Functions

- midi_splitter (int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.
- ∼midi_splitter ()

  A rote destructor.
- bool log_main_sequence (sequence &seq, int seqnum)

  Logs the main sequence (an SMF 0 track) for later usage in splitting the track.
- void initialize ()

  Resets the SMF 0 support variables in preparation for parsing a new MIDI file.
- void increment (int channel)

  Processes a channel number by raising its flag in the m_smf0_channels[] array.
- bool split (perform &p, int screenset)

  This function splits an SMF 0 file, splitting all of the channels in the sequence out into separate sequences, and adding each to the perform object.
- 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.
- int count () const

  'Getter' function for member m_smf0_channels_count

Private Member Functions

- bool split_channel (const sequence &main_seq, sequence ∗seq, int channel)

  This function splits the given sequence into a new sequence, for the given channel found in the SMF 0 track.

Private Attributes

- int m_ppqn

  Provides the current value of the PPQN, which used to be constant and is now only the macro DEFAULT_PPQN.
- bool m_use_default_ppqn

  Indicates that the default PPQN is in force.
- int m_smf0_channels_count

  Provides support for SMF 0, indicates how many channels were found in the file in a single sequence.
- bool m_smf0_channels [16]

  Provides support for SMF 0, holds a bool value that indicates the occurrence of a given channel.
- sequence ∗ m_smf0_main_sequence

  Provides support for SMF 0, points to the initial SMF 0 sequence, from which the single-channel sequences will be created.
- int m_smf0_seq_number

  Provides support for SMF 0, holds the prospective sequence number of the main (SMF 0) sequence.

10.57.1 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.

10.57.2 Constructor & Destructor Documentation

10.57.2.1 midi_splitter()

```
seq64::midi_splitter::midi_splitter (
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

Parameters

ppqn	Provides the initial value of the PPQN setting. It is handled differently for parsing (reading) versus writing the MIDI file. • Reading. – If set to SEQ64_USE_DEFAULT_PPQN, the legacy application behavior is used. The m_ppqn member is set to the default PPQN, DEFAULT_PPQN. The value read from the MIDI file, ppqn, is then use to scale the running-time of the sequence relative to DEFAULT_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, to get this behavior. • Writing. This value is written to the MIDI file in the header chunk of the song. Note that the caller must query for the PPQN set during parsing, and pass it to the constructor when preparing to write the file. See how it is done in the mainwnd class.

10.57.2.2 ∼midi_splitter()

```
seq64::midi_splitter::∼midi_splitter ( )
```

10.57.3 Member Function Documentation

10.57.3.1 log_main_sequence()

```
bool seq64::midi_splitter::log_main_sequence (
            sequence & seq,
            int seqnum )
```

/param seq The main sequence to be logged.

/param seqnum The sequence number of the main sequence.

/return Returns true if the main sequence's address was logged, and false if it was already logged.

10.57.3.2 initialize()

```
void seq64::midi_splitter::initialize ( )
```

10.57.3.3 increment()

```
void seq64::midi_splitter::increment (
            int channel )
```

If it is the first entry for that channel, m_smf0_channels_count is incremented. We won't check the channel number, to save time, until someday we segfault :-D

Parameters

channel	The MIDI channel number. The caller is responsible to make sure it ranges from 0 to 15.

10.57.3.4 split()

```
bool seq64::midi_splitter::split (
            perform & p,
            int screenset )
```

Lastly, it adds the SMF 0 track as the last track; the user can then examine it before removing it. Is this worth the effort?

There is a little oddity, in that, if the SMF 0 track has events for only one channel, this code will still create a new sequence, as well as the main sequence. Not sure if this is worth extra code to just change the channels on the main sequence and put it into the correct track for the one channel it contains. In fact, we just want to keep it in pattern slot number 16, to keep it out of the way.

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file.

Returns

Returns true if the parsing succeeded. Returns false if no SMF 0 main sequence was logged.

10.57.3.5 ppqn()

```
int seq64::midi_splitter::ppqn ( ) const  [inline]
```

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

10.57.3.6 count()

```
int seq64::midi_splitter::count ( ) const  [inline]
```

10.57.3.7 split_channel()

```
bool seq64::midi_splitter::split_channel (
              const sequence & main_seq,
              sequence * s,
              int channel )  [private]
```

It is called for each possible channel, resulting in multiple passes over the SMF 0 track.

Note that the events that are read from the MIDI file have delta times. Sequencer64 converts these delta times to cumulative times. We need to preserve that here. Conversion back to delta times is needed only when saving the sequences to a file. This is done in midi_container::fill().

We have to accumulate the delta times in order to be able to set the length of the sequence in pulses.

Luckily, we don't have to worry about copying triggers, since the imported SMF 0 track won't have any Seq24/↩
Sequencer24 triggers.

It doesn't set the sequence number of the sequence; that is set when the sequence is added to the perform object.

Parameters

main_seq	This parameter is the whole SMF 0 track that was read from the MIDI file. It contains all of the channel data that needs to be split into separate sequences.
s	Provides the new sequence that needs to have its settings made, and all of the selected channel events added to it.
channel	Provides the MIDI channel number (re 0) that marks the channel data the needs to be extracted and added to the new sequence. If this channel is 0, then we need to add certain Meta events to this sequence, as well. So far we support only Tempo Meta events.

Returns

Returns true if at least one event got added. If none were added, the caller should delete the sequence object represented by parameter *s*.

10.57.4 Field Documentation

10.57.4.1 m_ppqn

```
int seq64::midi_splitter::m_ppqn  [private]
```

10.57.4.2 m_use_default_ppqn

```
bool seq64::midi_splitter::m_use_default_ppqn  [private]
```

10.57.4.3 m_smf0_channels_count

```
int seq64::midi_splitter::m_smf0_channels_count  [private]
```

SMF 1 file parsing will only warn about more than one channel found in a given sequence.

10.57.4.4 m_smf0_channels

```
bool seq64::midi_splitter::m_smf0_channels[16]  [private]
```

Obviously, we don't have to worry about multiple MIDI busses.

10.57.4.5 m_smf0_main_sequence

```
sequence* seq64::midi_splitter::m_smf0_main_sequence  [private]
```

10.57.4.6 m_smf0_seq_number

```
int seq64::midi_splitter::m_smf0_seq_number [private]
```

We want to be able to add that sequence last, for easier and cleaner removal of that sequence by the user.

10.58 seq64::midi_timing Class Reference

We anticipate the need to have a small structure holding the parameters needed to calculate MIDI times within an arbitrary song.

Public Member Functions

- midi_timing ()
  Defaults constructor for midi_timing.
- midi_timing (midibpm bpminute, int bpmeasure, int beatwidth, int ppqn)
  Principal constructor for midi_timing.
- midibpm beats_per_minute () const
  'Getter' function for member m_beats_per_minute
- void beats_per_minute (midibpm b)
  'Setter' function for member m_beats_per_minute
- int beats_per_measure () const
  'Getter' function for member m_beats_per_measure
- void beats_per_measure (int b)
  'Setter' function for member m_beats_per_measure
- int beat_width () const
  'Getter' function for member m_beats_per_beat_width
- void beat_width (int bw)
  'Setter' function for member m_beats_per_beat_width
- int ppqn () const
  'Getter' function for member m_ppqn
- void ppqn (int p)
  'Setter' function for member m_ppqn

Private Attributes

- midibpm m_beats_per_minute
  This value should match the BPM value selected when editing the song.
- int m_beats_per_measure
  This value should match the numerator value selected when editing the sequence.
- int m_beat_width
  This value should match the denominator value selected when editing the sequence.
- int m_ppqn
  This value provides the precision of the MIDI song.

10.58.1 Detailed Description

Although Seq24/Sequencer64 currently are heavily dependent on hard-wired values, that will be rectified eventually, so let us get ready for it.

10.58.2 Constructor & Destructor Documentation

10.58.2.1 midi_timing() [1/2]

```
seq64::midi_timing::midi_timing ( )
```

10.58.2.2 midi_timing() [2/2]

```
seq64::midi_timing::midi_timing (
             midibpm bpminute,
             int bpmeasure,
             int beatwidth,
             int ppqn )
```

Parameters

bpminute	Copied into the m_beats_per_minute member.
bpmeasure	Copied into the m_beats_per_measure member.
beatwidth	Copied into the m_beat_width member.
ppqn	Copied into the m_ppqn member.

10.58.3 Member Function Documentation

10.58.3.1 beats_per_minute() [1/2]

```
midibpm seq64::midi_timing::beats_per_minute ( ) const  [inline]
```

10.58.3.2 beats_per_minute() [2/2]

```
void seq64::midi_timing::beats_per_minute (
             midibpm b )  [inline]
```

Parameters

b	The value to which to set the number of beats/minute. We can add validation later.

10.58.3.3 beats_per_measure() [1/2]

```
int seq64::midi_timing::beats_per_measure ( ) const  [inline]
```

10.58.3.4 beats_per_measure() [2/2]

```
void seq64::midi_timing::beats_per_measure (
             int b )  [inline]
```

Parameters

b	The value to which to set the number of beats/measure. We can add validation later.

10.58.3.5 beat_width() [1/2]

```
int seq64::midi_timing::beat_width ( ) const  [inline]
```

10.58.3.6 beat_width() [2/2]

```
void seq64::midi_timing::beat_width (
             int bw )  [inline]
```

Parameters

bw	The value to which to set the number of beats in the denominator of the time signature. We can add validation later.

10.58.3.7 ppqn() [1/2]

```
int seq64::midi_timing::ppqn ( ) const  [inline]
```

10.58.3.8 ppqn() [2/2]

```
void seq64::midi_timing::ppqn (
             int p )  [inline]
```

Parameters

p	The value to which to set the PPQN member. We can add validation later.

10.58.4 Field Documentation

10.58.4.1 m_beats_per_minute

```
midibpm seq64::midi_timing::m_beats_per_minute  [private]
```

This value is most commonly set to 120, but is also read from the MIDI file. This value is needed if one want to calculate durations in true time units such as seconds, but is not needed to calculate the number of pulses/ticks/divisions.

10.58.4.2 m_beats_per_measure

```
int seq64::midi_timing::m_beats_per_measure  [private]
```

This value is most commonly set to 4.

10.58.4.3 m_beat_width

```
int seq64::midi_timing::m_beat_width  [private]
```

This value is most commonly set to 4, meaning that the fundamental beat unit is the quarter note.

10.58.4.4 m_ppqn

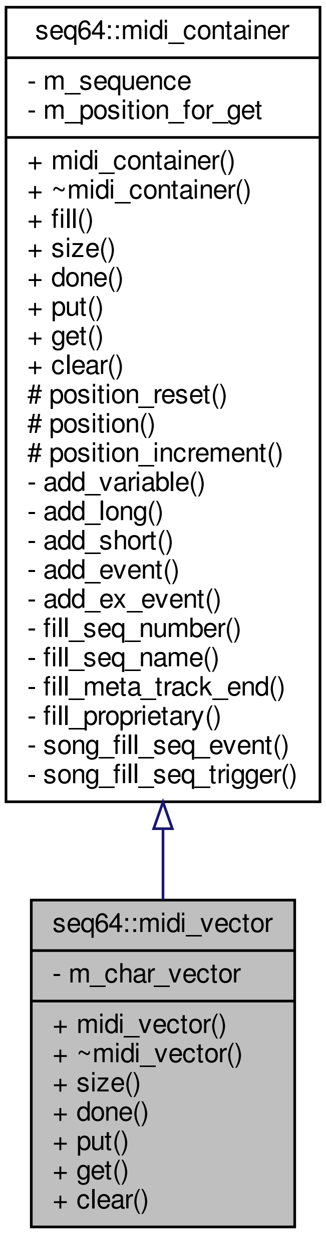
```
int seq64::midi_timing::m_ppqn  [private]
```

This value is most commonly set to 192, but is also read from the MIDI file. We are still working getting "non-standard" values to work.

10.59 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 of this class.
- virtual ∼midi_vector ()

  A rote constructor needed for a base class.
- virtual std::size_t size () const
- 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 () const

  Provide a way to get the next byte from the container.
- virtual void clear ()

  Provides a way to clear 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

10.59.1 Member Typedef Documentation

10.59.1.1 CharVector

```
typedef std::vector<midibyte> seq64::midi_vector::CharVector  [private]
```

10.59.2 Constructor & Destructor Documentation

10.59.2.1 midi_vector()

```
seq64::midi_vector::midi_vector (
            sequence & seq )
```

Parameters

seq	Provides a reference to the sequence/track for which this container holds MIDI data.

10.59.2.2 ∼midi_vector()

```
virtual seq64::midi_vector::∼midi_vector ( )  [inline], [virtual]
```

10.59.3 Member Function Documentation

10.59.3.1 size()

```
virtual std::size_t seq64::midi_vector::size ( ) const  [inline], [virtual]
```

Returns

Returns the size of the container, in midibytes.

Reimplemented from seq64::midi_container.

10.59.3.2 done()

```
virtual bool seq64::midi_vector::done ( ) const  [inline], [virtual]
```

Returns

Returns true if the position is greater than or equal to the size of the character vector.

Reimplemented from seq64::midi_container.

10.59.3.3 put()

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

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

Parameters

b	Provides the MIDI byte to push_back() into the character vector.

Implements seq64::midi_container.

10.59.3.4 get()

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

In this implementation, m_position_for_get is used. As a side-effect, the position value is incremented.

Returns

Returns the next byte in the character vector.

Implements seq64::midi_container.

10.59.3.5 clear()

```
virtual void seq64::midi_vector::clear ( )  [inline], [virtual]
```

Implements seq64::midi_container.

10.59.4 Field Documentation

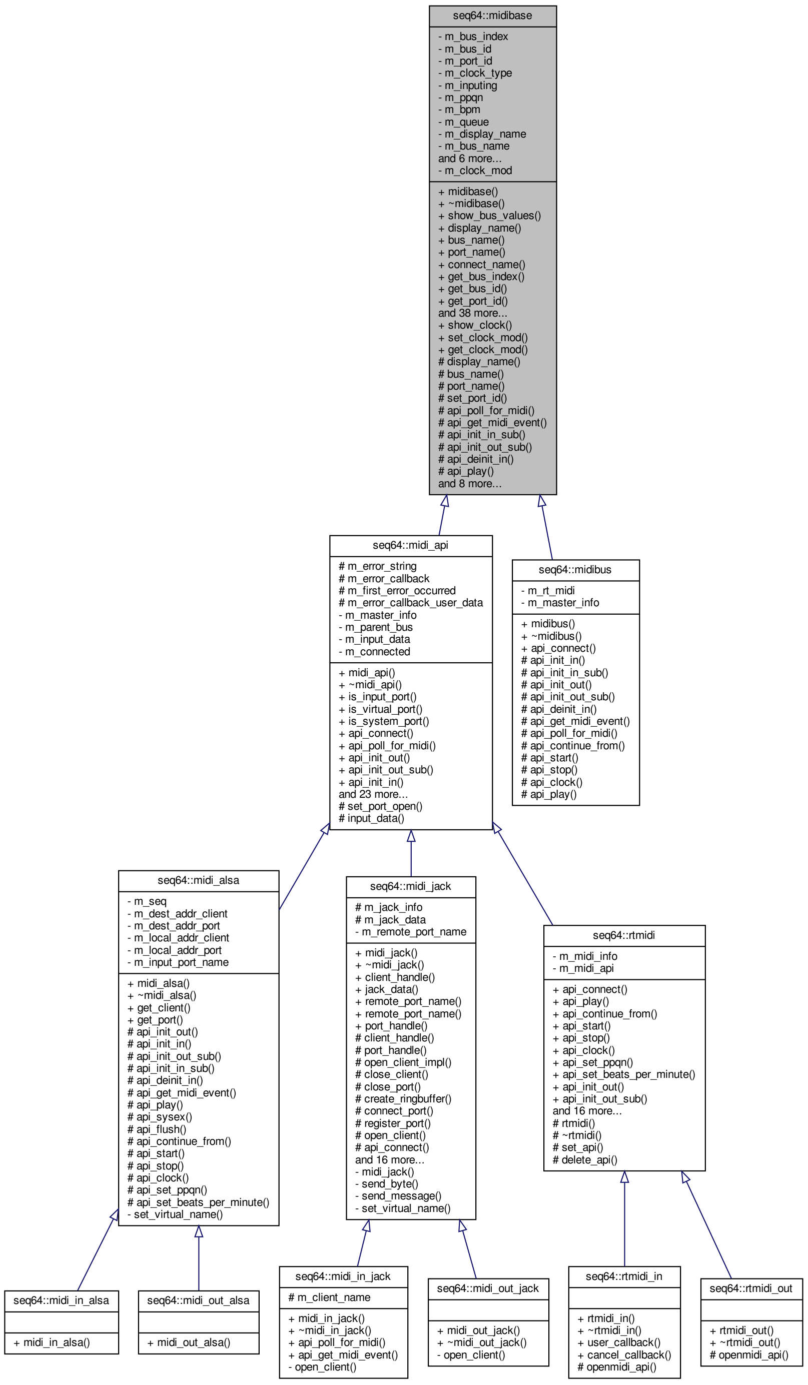
10.59.4.1 m_char_vector

```
CharVector seq64::midi_vector::m_char_vector  [private]
```

10.60 seq64::midibase Class Reference

This class implements with ALSA version of the midibase object.

Inheritance diagram for seq64::midibase:



Public Member Functions

- midibase (const std::string &appname, const std::string &busname="", const std::string &portname="", int index=0, int bus_id=SEQ64_NO_BUS, int port_id=SEQ64_NO_PORT, int queue=SEQ64_NO_QUEUE, int ppqn=SEQ64_USE_DEFAULT_PPQN, midibpm bpm=SEQ64_DEFAULT_BPM, bool makevirtual=false, bool isinput=false, bool makesystem=false)

Creates a normal MIDI port, which will correspond to an existing system MIDI port, such as one provided by Timidity or a running JACK application, or a virtual port, which has a name made up by the application.

- virtual ∼midibase ()

  A rote empty destructor.
- void show_bus_values ()

  Shows most midibase members.
- const std::string & display_name () const

  'Getter' function for member m_display_name
- const std::string & bus_name () const

  'Getter' function for member m_bus_name
- const std::string & port_name () const

  'Getter' function for member m_port_name
- std::string connect_name () const

  'Getter' function for member m_bus_name and m_port_name Concatenates the bus and port names into a string of the form "busname:portname".
- int get_bus_index () const

  'Getter' function for member m_bus_index
- int get_bus_id () const

  'Getter' function for member m_bus_id
- int get_port_id () const

  'Getter' function for member m_port_id
- int ppqn () const

  'Getter' function for member m_ppqn;
- midibpm bpm () const

  'Getter' function for member m_bpm;
- bool match (int bus, int port)

  Checks if the given parameters match the current bus and port numbers.
- bool is_virtual_port () const

  'Getter' function for member m_is_virtual_port
- void is_virtual_port (bool flag)

  'Setter' function for member m_is_virtual_port This function is needed in the rtmidi library to set the is-virtual flag in the api_init_∗_sub() functions, so that midi_alsa, midi_jack (and any other additional APIs that end up supported by our heavily-refactored rtmidi library), as well as the original midibus, can know that they represent a virtual port.
- bool is_input_port () const

  'Getter' function for member m_is_input_port
- bool is_output_port () const

  'Getter' function for member ! m_is_input_port
- void is_input_port (bool flag)

  'Setter' function for member m_is_input_port
- bool is_system_port () const

  'Getter' function for member m_is_system_port
- void set_system_port_flag ()

  'Setter' function for member m_is_system_port Can only set it to true.
- void set_clock (clock_e clocktype)

  'Setter' function for member m_clock_type We removed the redundant set_clock_status() function.
- clock_e get_clock () const

  'Getter' function for member m_clock_type
- bool port_disabled () const

  'Getter' function for member m_clock_type
- bool clock_enabled () const

'Getter' function for member m_clock_type

- bool get_input () const

  'Getter' function for member m_inputing
- void set_input_status (bool flag)

  'Setter' function for member m_inputing
- int queue_number () const

  'Getter' function for member m_queue
- void set_bus_id (int id)

  'Setter' function for member m_bus_id Useful for setting the buss ID when using the rtmidi_info object to create a list of busses and ports.
- void set_name (const std::string &appname, const std::string &busname, const std::string &portname)

  Sets the name of the buss by assembling the name components obtained from the system in a straightforward manner:
- void set_alt_name (const std::string &appname, const std::string &busname, const std::string &portname)

  Sets the name of the buss in a different way.
- void set_multi_name (const std::string &appname, const std::string &localbusname, const std::string &remoteportname)

  Sets the name of the buss in yet another different way, suitable for the multiclient mode of some APIs (such as JACK).
- int poll_for_midi ()

  Polls for MIDI events.
- bool get_midi_event (event ∗inev)

  Obtains a MIDI event.
- bool init_out ()

  Initialize the MIDI output port.
- bool init_in ()

  Initialize the MIDI input port.
- bool deinit_in ()

  Deinitialize the MIDI input.
- bool init_out_sub ()

  Initialize the output in a different way?
- bool init_in_sub ()

  Initialize the output in a different way?
- void play (event ∗e24, midibyte channel)

  This play() function takes a native event, encodes it to a MIDI sequencer event, sets the broadcasting to the subscribers, sets the direct-passing mode to send the event without queueing, and puts it in the queue.
- void sysex (event ∗e24)

  Takes a native SYSEX event, encodes it to an ALSA event, and then puts it in the queue.
- void flush ()

  Flushes our local queue events out into ALSA.
- void start ()

  This function gets the MIDI clock a-runnin', if the clock type is not e_clock_off or e_clock_disabled.
- void stop ()

  Stop the MIDI buss.
- void clock (midipulse tick)

  Generates the MIDI clock, starting at the given tick value.
- void continue_from (midipulse tick)

  Continue from the given tick.
- void init_clock (midipulse tick)

  Initialize the clock, continuing from the given tick.
- void print ()

  Prints m_name.
- bool set_input (bool inputing)

  Set status to of "inputting" to the given value.

Static Public Member Functions

- static void show_clock (const std::string &context, midipulse tick)

    A static debug function, enabled only for trouble-shooting.
- static void set_clock_mod (int clockmod)

    Set the clock mod to the given value, if legal.
- static int get_clock_mod ()

    Get the clock mod value.

Protected Member Functions

- void display_name (const std::string &name)

    'Setter' function for member m_display_name
- void bus_name (const std::string &name)

    'Setter' function for member m_bus_name
- void port_name (const std::string &name)

    'Setter' function for member m_port_name
- void set_port_id (int id)

    'Setter' function for member m_port_id Useful for setting the port ID when using the rtmidi_info object to inspect and create a list of busses and ports.
- virtual int api_poll_for_midi ()

    Now defined in the ALSA implementation, and used by mastermidibus.
- virtual bool api_get_midi_event (event ∗inev)

    Used in the JACK implementation.
- virtual bool api_init_in_sub ()

    Not defined in the PortMidi implementation.
- virtual bool api_init_out_sub ()

    Not defined in the PortMidi implementation.
- virtual bool api_deinit_in ()

    Not defined in the PortMidi implementation.
- virtual void api_play (event ∗e24, midibyte channel)=0
- virtual void api_sysex (event ∗)

    Handles implementation details for SysEx messages.
- virtual void api_flush ()

    Handles implementation details for the flush() function.
- virtual bool api_init_in ()=0
- virtual bool api_init_out ()=0
- virtual void api_continue_from (midipulse tick, midipulse beats)=0
- virtual void api_start ()=0
- virtual void api_stop ()=0
- virtual void api_clock (midipulse tick)=0

Private Attributes

- const int m_bus_index

    Provides the index of the midibase object in either the input list or the output list.
- int m_bus_id

    The buss ID of the midibase object.
- int m_port_id

    The port ID of the midibase object.

- clock_e m_clock_type

  The type of clock to use.
- bool m_inputing

  This flag indicates if an input bus has been selected for action as an input device (such as a MIDI controller).
- int m_ppqn

  Provides the PPQN value in force, currently a constant.
- midibpm m_bpm

  Provides the PPQN value in force, currently a constant.
- int m_queue

  Another ID of the MIDI queue? This is an implementation-dependent value.
- std::string m_display_name

  Holds the full display name of the bus, index, ID numbers, and item names.
- std::string m_bus_name

  The name of the MIDI buss.
- std::string m_port_name

  The name of the MIDI port.
- midipulse m_lasttick

  The last (most recent? final?) tick.
- bool m_is_virtual_port

  Indicates if the port is to be a virtual port.
- bool m_is_input_port

  Indicates if the port is to be an input (versus output) port.
- bool m_is_system_port

  Indicates if the port is a system port.
- mutex m_mutex

  Locking mutex.

Static Private Attributes

- static int m_clock_mod

  This is another name for "16 $*$ 4".

Friends

- class mastermidibus

  The master MIDI bus sets up the buss.

10.60.1 Constructor & Destructor Documentation

10.60.1.1 midibase()

```
seq64::midibase::midibase (
            const std::string & appname,
            const std::string & busname = "",
            const std::string & portname = "",
            int index = 0,
            int bus_id = SEQ64_NO_BUS,
            int port_id = SEQ64_NO_PORT,
            int queue = SEQ64_NO_QUEUE,
            int ppqn = SEQ64_USE_DEFAULT_PPQN,
            midibpm bpm = SEQ64_DEFAULT_BPM,
            bool makevirtual = false,
            bool isinput = false,
            bool makesystem = false )
```

Provides a constructor with client number, port number, name of client, name of port.

This constructor is the one that seems to be the one that is used for the MIDI input and output busses, when the [manual-alsa-ports] option is *not* in force. Also used for the announce buss, and in the mastermidibase::port_start() function.

Parameters

appname	Provides the the name of the application. The derived class will determine this name.
busname	Provides the ALSA client name or the MIDI subsystem name (e.g. "TiMidity"). If empty, a name will be assembled by the derived class at port-setup time.
portname	Provides the port name. This item defaults to empty, which means the port name should be obtained via the API, or be assembled by the derived class at port-setup time.
index	Provides the ordinal of this buss/port, mostly for display purposes.
bus_id Indicates the port ID. Defaults to SEQ64_NO_PORT. If SEQ64_NO_PORT, the derived class will get the port ID at port-setup time.	
queue Provides the PPQN value. Defaults to SEQ64_USE_DEFAULT_PPQN.	
bpm	Provides the BPM value. Defaults to SEQ64_DEFAULT_BPM.
makevirtual	Indicates that the port represented by this object is to be virtual. Defaults to false. This could also be set via the init_in(), init_out(), init_in_sub(), or init_out_sub() routines. Doing it here seems okay.
isinput	Indicates that this midibus represents and input port, as opposed to an output port.
makesystem	Indicates that the port represented by this object is a system port. Currently true only for ALSA system ports (timer or announce ports).

10.60.1.2 ∼midibase()

```
seq64::midibase::∼midibase ( )  [virtual]
```

10.60.2 Member Function Documentation

10.60.2.1 show_bus_values()

```
void seq64::midibase::show_bus_values ( )
```

10.60.2.2 show_clock()

```
void seq64::midibase::show_clock (
             const std::string & context,
             midipulse tick )  [static]
```

Parameters

context	Human readable context information (e.g. "ALSA").
tick	Provides the current tick value.

10.60.2.3 display_name() [1/2]

```
const std::string& seq64::midibase::display_name ( ) const  [inline]
```

10.60.2.4 bus_name() [1/2]

```
const std::string& seq64::midibase::bus_name ( ) const  [inline]
```

10.60.2.5 port_name() [1/2]

```
const std::string& seq64::midibase::port_name ( ) const  [inline]
```

10.60.2.6 connect_name()

```
std::string seq64::midibase::connect_name ( ) const
```

If either name is empty, an empty string is returned.

10.60.2.7 get_bus_index()

```
int seq64::midibase::get_bus_index ( ) const  [inline]
```

10.60.2.8 get_bus_id()

```
int seq64::midibase::get_bus_id ( ) const  [inline]
```

10.60.2.9 get_port_id()

```
int seq64::midibase::get_port_id ( ) const  [inline]
```

10.60.2.10 ppqn()

```
int seq64::midibase::ppqn ( ) const  [inline]
```

10.60.2.11 bpm()

```
midibpm seq64::midibase::bpm ( ) const  [inline]
```

10.60.2.12 match()

```
bool seq64::midibase::match (
             int bus,
             int port )  [inline]
```

10.60.2.13 is_virtual_port() [1/2]

```
bool seq64::midibase::is_virtual_port ( ) const  [inline]
```

10.60.2.14 is_virtual_port() [2/2]

```
void seq64::midibase::is_virtual_port (
             bool flag )  [inline]
```

10.60.2.15 is_input_port() [1/2]

```
bool seq64::midibase::is_input_port ( ) const  [inline]
```

10.60.2.16 is_output_port()

```
bool seq64::midibase::is_output_port ( ) const  [inline]
```

10.60.2.17 is_input_port() [2/2]

```
void seq64::midibase::is_input_port (
             bool flag )  [inline]
```

10.60.2.18 is_system_port()

```
bool seq64::midibase::is_system_port ( ) const  [inline]
```

10.60.2.19 set_system_port_flag()

```
void seq64::midibase::set_system_port_flag ( )  [inline]
```

10.60.2.20 set_clock()

```
void seq64::midibase::set_clock (
             clock_e clocktype )  [inline]
```

Parameters

clocktype	The value used to set the clock-type.

10.60.2.21 get_clock()

```
clock_e seq64::midibase::get_clock ( ) const  [inline]
```

10.60.2.22 port_disabled()

```
bool seq64::midibase::port_disabled ( ) const  [inline]
```

10.60.2.23 clock_enabled()

```
bool seq64::midibase::clock_enabled ( ) const  [inline]
```

10.60.2.24 get_input()

```
bool seq64::midibase::get_input ( ) const  [inline]
```

10.60.2.25 set_input_status()

```
void seq64::midibase::set_input_status (
             bool flag )  [inline]
```

10.60.2.26 queue_number()

```
int seq64::midibase::queue_number ( ) const  [inline]
```

10.60.2.27 set_bus_id()

```
void seq64::midibase::set_bus_id (
             int id )  [inline]
```

Would be protected, but midi_alsa needs to change this value to reflect the user-client ID actually assigned by ALSA. (That value ranges from 128 to 191.)

10.60.2.28 set_name()

```
void seq64::midibase::set_name (
             const std::string & appname,
             const std::string & busname,
             const std::string & portname )
```

[0] 128:2 seq64:seq64 port 2

We want to see if the user has configured a port name. If so, and this is an output port, then the buss name is overridden by the entry in the "usr" configuration file. Otherwise, we fall back to the parameters. Note that this has been tweaked versus Seq24, where the "usr" devices were also applied to the input ports. Also note that the "usr" device names should be kept short, and the actual buss name from the system is shown in brackets.

Parameters

appname	This is the name of the client, or application. Not to be confused with the ALSA client-name, which is actually a buss or subsystem name.
busname	Provides the name of the sub-system, such as "Midi Through" or "TiMidity".
portname	Provides the name of the port. In ALSA, this is something like "busname port X".

10.60.2.29 set_alt_name()

```
void seq64::midibase::set_alt_name (
             const std::string & appname,
             const std::string & busname,
             const std::string & portname )
```

If the port is virtual, this function just calls set_name(). Otherwise, it reassembles the name so that it refers to a port found on the system, but modified to make it a unique application port. For example:

```
[0] 128:0 yoshimi:midi in
```

is transformed to this:

```
[0] 128:0 seq64:yoshimi midi in
```

As a side-effect, the "short" portname is changed, from (for example) "midi in" to "yoshimi midi in".

Parameters

appname	This is the name of the client, or application. Not to be confused with the ALSA/JACK client-name, which is actually a buss or subsystem name.
busname	Provides the name of the sub-system, such as "Midi Through", "TiMidity", or "seq64".
portname	Provides the name of the port. In JACK, this should be the full port name, such as "qmidiarp:in".

10.60.2.30 set_multi_name()

```
void seq64::midibase::set_multi_name (
             const std::string & appname,
             const std::string & localbusname,
             const std::string & remoteportname )
```

If the port is virtual, this function just calls set_name(). Otherwise, it reassembles the name so that it refers to a port found on the system, but modified to make it a unique client port. For example:

```
[0] 128:0 yoshimi:midi in
```

is transformed to this:

```
[0] 128:0 seq64-yoshimi:midi in
```

The name in the latter is the original buss name, "seq64" plus the remote port's buss name (extracted from the long name), plus the remote port's short port name (extracted from the long name).

Internal parameter:

Parameters

appname	This is the name of the client, or application. Not to be confused with the ALSA client-name, which is actually a buss or subsystem name.
localbusname	Provides the name of the sub-system, such as "Midi Through", "TiMidity", "yoshimi", or "seq64". It is assumed this parameter has already been set properly.
remoteportname	Provides the name of the port. In JACK, this should be the long port name, such as "qmidiarp:in" or "yoshimi:midi in". It is assumed this parameter has already been set properly.

10.60.2.31 set_clock_mod()

```
static void seq64::midibase::set_clock_mod (
             int clockmod )  [inline], [static]
```

Parameters

clockmod	If this value is not equal to 0, it is used to set the static member m_clock_mod.

10.60.2.32 get_clock_mod()

```
static int seq64::midibase::get_clock_mod ( )  [inline], [static]
```

10.60.2.33 poll_for_midi()

```
int seq64::midibase::poll_for_midi ( )
```

EXPERIMENTAL FIX FOR PORTMIDI BUG BUT NEEDED FOR ALL.

Returns

Returns a value greater than 0 if MIDI events are available. Otherwise 0 is returned, or -1 for some APIs (ALSA) when an internal error occurs.

10.60.2.34 get_midi_event()

```
bool seq64::midibase::get_midi_event (
            event * inev )
```

Parameters

inev	Points the event to be filled with the MIDI event data.

Returns

Returns true if an event was found, thus making the return parameter useful.

10.60.2.35 init_out()

```
bool seq64::midibase::init_out ( )
```

Returns

Returns true unless setting up MIDI failed in some way.

10.60.2.36 init_in()

```
bool seq64::midibase::init_in ( )
```

Returns

Returns true unless setting up MIDI failed in some way.

10.60.2.37 deinit_in()

```
bool seq64::midibase::deinit_in ( )
```

Set the input and the output ports. The destination port is actually our local port.

Returns

Returns true, unless an error occurs.

10.60.2.38 init_out_sub()

```
bool seq64::midibase::init_out_sub ( )
```

Returns

Returns true unless setting up the ALSA port failed in some way.

10.60.2.39 init_in_sub()

```
bool seq64::midibase::init_in_sub ( )
```

Returns

Returns true unless setting up the ALSA port failed in some way.

10.60.2.40 play()

```
void seq64::midibase::play (
            event * e24,
            midibyte channel )
```

Threadsafe

Parameters

e24	The event to be played on this bus. For speed, we don't bother to check the pointer.
channel	The channel of the playback.

10.60.2.41 sysex()

```
void seq64::midibase::sysex (
            event * e24 )
```

Parameters

e24	The event to be handled.

10.60.2.42 flush()

```
void seq64::midibase::flush ( )
```

10.60.2.43 start()

```
void seq64::midibase::start ( )
```

10.60.2.44 stop()

```
void seq64::midibase::stop ( )
```

10.60.2.45 clock()

```
void seq64::midibase::clock (
            midipulse tick )
```

The number of ticks needed is calculated.

Threadsafe

Parameters

tick	Provides the starting tick.

10.60.2.46 continue_from()

```
void seq64::midibase::continue_from (
            midipulse tick )
```

Tell the device that we are going to start at a certain position (starting_tick). If there is anything left, then wait for next beat (16th note) to start clocking.

Parameters

tick	The continuing tick.

10.60.2.47 init_clock()

```
void seq64::midibase::init_clock (
            midipulse tick )
```

This function doesn't depend upon the MIDI API in use. Here, e_clock_off and e_clock_disabled have the same effect... none.

Parameters

tick	The starting tick.

10.60.2.48 print()

```
void seq64::midibase::print ( )
```

10.60.2.49 set_input()

```
bool seq64::midibase::set_input (
            bool inputing )
```

If the parameter is true, then init_in() is called; otherwise, deinit_in() is called.

Parameters

inputing	The inputing value to set. For input system ports, it is always set to true, no matter how it is configured in the "rc" file.

10.60.2.50 display_name() [2/2]

```
void seq64::midibase::display_name (
             const std::string & name )  [inline], [protected]
```

10.60.2.51 bus_name() [2/2]

```
void seq64::midibase::bus_name (
             const std::string & name )  [inline], [protected]
```

10.60.2.52 port_name() [2/2]

```
void seq64::midibase::port_name (
             const std::string & name )  [inline], [protected]
```

10.60.2.53 set_port_id()

```
void seq64::midibase::set_port_id (
             int id )  [inline], [protected]
```

10.60.2.54 api_poll_for_midi()

```
virtual int seq64::midibase::api_poll_for_midi ( )  [inline], [protected], [virtual]
```

Also used in the JACK implementation.

Reimplemented in seq64::midi_in_jack, seq64::rtmidi, seq64::midi_api, and seq64::midibus.

10.60.2.55 api_get_midi_event()

```
virtual bool seq64::midibase::api_get_midi_event (
            event * inev )  [inline], [protected], [virtual]
```

Reimplemented in seq64::midi_in_jack, seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::rtmidi, and seq64::midibus.

10.60.2.56 api_init_in_sub()

```
virtual bool seq64::midibase::api_init_in_sub ( )  [inline], [protected], [virtual]
```

Reimplemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::rtmidi, and seq64::midibus.

10.60.2.57 api_init_out_sub()

```
virtual bool seq64::midibase::api_init_out_sub ( )  [inline], [protected], [virtual]
```

Reimplemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::rtmidi, and seq64::midibus.

10.60.2.58 api_deinit_in()

```
virtual bool seq64::midibase::api_deinit_in ( )  [inline], [protected], [virtual]
```

Reimplemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::rtmidi, and seq64::midibus.

10.60.2.59 api_play()

```
virtual void seq64::midibase::api_play (
            event * e24,
            midibyte channel )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::midibus, and seq64::rtmidi.

10.60.2.60 api_sysex()

```
virtual void seq64::midibase::api_sysex (
            event * )  [inline], [protected], [virtual]
```

The *e24* parameter, the SysEx event pointer, is unused here.

Reimplemented in seq64::midi_jack, seq64::midi_alsa, seq64::rtmidi, and seq64::midi_api.

10.60.2.61 api_flush()

```
virtual void seq64::midibase::api_flush ( )  [inline], [protected], [virtual]
```

Reimplemented in seq64::midi_jack, seq64::midi_alsa, seq64::rtmidi, and seq64::midi_api.

10.60.2.62 api_init_in()

```
virtual bool seq64::midibase::api_init_in ( )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::rtmidi, and seq64::midibus.

10.60.2.63 api_init_out()

```
virtual bool seq64::midibase::api_init_out ( )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::rtmidi, and seq64::midibus.

10.60.2.64 api_continue_from()

```
virtual void seq64::midibase::api_continue_from (
             midipulse tick,
             midipulse beats )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::midibus, and seq64::rtmidi.

10.60.2.65 api_start()

```
virtual void seq64::midibase::api_start ( )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::midibus, and seq64::rtmidi.

10.60.2.66 api_stop()

```
virtual void seq64::midibase::api_stop ( )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::midibus, and seq64::rtmidi.

10.60.2.67 api_clock()

```
virtual void seq64::midibase::api_clock (
            midipulse tick )  [protected], [pure virtual]
```

Implemented in seq64::midi_jack, seq64::midi_alsa, seq64::midi_api, seq64::midibus, and seq64::rtmidi.

10.60.3 Friends And Related Function Documentation

10.60.3.1 mastermidibus

```
friend class mastermidibus  [friend]
```

10.60.4 Field Documentation

10.60.4.1 m_clock_mod

```
int seq64::midibase::m_clock_mod  [static], [private]
```

Initialize this static member.

10.60.4.2 m_bus_index

```
const int seq64::midibase::m_bus_index  [private]
```

Otherwise, it is currently -1.

10.60.4.3 m_bus_id

```
int seq64::midibase::m_bus_id  [private]
```

For example, on one system the IDs are 14 (MIDI Through), 128 (TiMidity), and 129 (Yoshimi).

10.60.4.4 m_port_id

```
int seq64::midibase::m_port_id  [private]
```

10.60.4.5 m_clock_type

```
clock_e seq64::midibase::m_clock_type  [private]
```

The special value e_clock_disabled means we will not be using the port, so that a failure in setting up the port is not a "fatal error". (We could have added an "m_outputing" boolean as an alternative.)

10.60.4.6 m_inputing

```
bool seq64::midibase::m_inputing  [private]
```

It is turned on if the user selects the port in the Options / MIDI Input tab.

10.60.4.7 m_ppqn

```
int seq64::midibase::m_ppqn  [private]
```

Some APIs can control or use this value.

10.60.4.8 m_bpm

```
midibpm seq64::midibase::m_bpm  [private]
```

Some APIs can control or use this value.

10.60.4.9 m_queue

```
int seq64::midibase::m_queue  [private]
```

For ALSA, it is the ALSA queue number. For PortMidi, this is the old "m_pm_num" value. For RtMidi, it is not currently used.

10.60.4.10 m_display_name

```
std::string seq64::midibase::m_display_name  [private]
```

Assembled by the set_name() function.

10.60.4.11 m_bus_name

```
std::string seq64::midibase::m_bus_name  [private]
```

This should be something like a major device name or the name of a subsystem such as Timidity.

10.60.4.12 m_port_name

```
std::string seq64::midibase::m_port_name  [private]
```

This should be the name of a specific device or port on a major device.

10.60.4.13 m_lasttick

```
midipulse seq64::midibase::m_lasttick  [private]
```

10.60.4.14 m_is_virtual_port

```
bool seq64::midibase::m_is_virtual_port  [private]
```

The default is to create a system port (true).

10.60.4.15 m_is_input_port

```
bool seq64::midibase::m_is_input_port  [private]
```

It matters when we are creating the name of the port, where we don't want an input virtual port to have the same name as an output virtual port... one of them will fail.

10.60.4.16 m_is_system_port

```
bool seq64::midibase::m_is_system_port  [private]
```

Two examples are the ALSA System Timer buss and the ALSA System Announce bus, the latter being necessary for input subscription and notification. For most ports, this value will be false. A restricted setter is provided. Only the rtmidi ALSA implementation sets this flag.

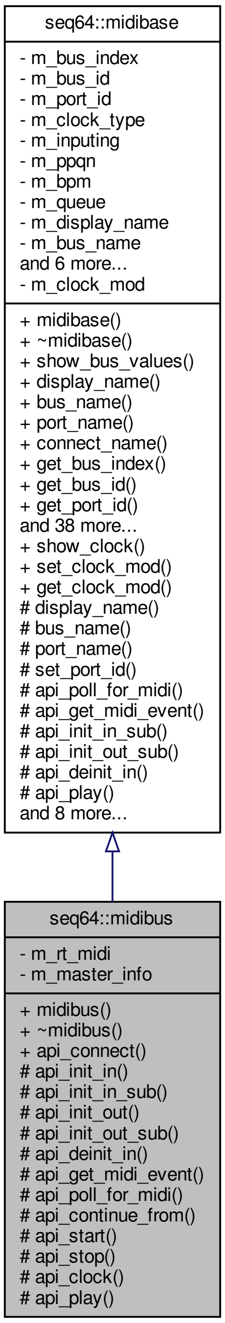
10.60.4.17 m_mutex

```
mutex seq64::midibase::m_mutex  [private]
```

10.61 seq64::midibus Class Reference

This class implements with rtmidi version of the midibus object.

Inheritance diagram for seq64::midibus:



Public Member Functions

- midibus (rtmidi_info &rt, int index, bool makevirtual=SEQ64_MIDI_NORMAL_PORT, bool isinput=SEQ64_↩ MIDI_OUTPUT_PORT, int bussoverride=SEQ64_NO_BUS, bool makesystem=false)

- virtual ∼midibus ()
- virtual bool api_connect ()

Protected Member Functions

- virtual bool api_init_in ()
- virtual bool api_init_in_sub ()
- virtual bool api_init_out ()
- virtual bool api_init_out_sub ()
- virtual bool api_deinit_in ()
- virtual bool api_get_midi_event (event ∗inev)
- virtual int api_poll_for_midi ()
- virtual void api_continue_from (midipulse tick, midipulse beats)
- virtual void api_start ()
- virtual void api_stop ()
- virtual void api_clock (midipulse tick)
- virtual void api_play (event ∗e24, midibyte channel)

Private Attributes

- rtmidi ∗ m_rt_midi

  The RtMidi API interface object this midibus will be creating and then using.
- rtmidi_info & m_master_info

  For Sequencer64, the ALSA model used requires that all the midibus objects use the same ASLA sequencer "handle".

Friends

- class mastermidibus

  The master MIDI bus sets up the buss, so it gets access to private details.

Additional Inherited Members

10.61.1 Constructor & Destructor Documentation

10.61.1.1 midibus()

```
seq64::midibus::midibus (
            rtmidi_info & rt,
            int index,
            bool makevirtual = SEQ64_MIDI_NORMAL_PORT,
            bool isinput = SEQ64_MIDI_OUTPUT_PORT,
            int bussoverride = SEQ64_NO_BUS,
            bool makesystem = false )
```

10.61.1.2 ∼midibus()

```
virtual seq64::midibus::∼midibus ( )  [virtual]
```

10.61.2 Member Function Documentation

10.61.2.1 api_connect()

```
virtual bool seq64::midibus::api_connect ( )  [virtual]
```

10.61.2.2 api_init_in()

```
virtual bool seq64::midibus::api_init_in ( )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.2.3 api_init_in_sub()

```
virtual bool seq64::midibus::api_init_in_sub ( )  [protected], [virtual]
```

Reimplemented from seq64::midibase.

10.61.2.4 api_init_out()

```
virtual bool seq64::midibus::api_init_out ( )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.2.5 api_init_out_sub()

```
virtual bool seq64::midibus::api_init_out_sub ( )  [protected], [virtual]
```

Reimplemented from seq64::midibase.

10.61.2.6 api_deinit_in()

```
virtual bool seq64::midibus::api_deinit_in ( )  [protected], [virtual]
```

Reimplemented from seq64::midibase.

10.61.2.7 api_get_midi_event()

```
virtual bool seq64::midibus::api_get_midi_event (
             event * inev )  [protected], [virtual]
```

Reimplemented from seq64::midibase.

10.61.2.8 api_poll_for_midi()

```
virtual int seq64::midibus::api_poll_for_midi ( )  [protected], [virtual]
```

Reimplemented from seq64::midibase.

10.61.2.9 api_continue_from()

```
virtual void seq64::midibus::api_continue_from (
             midipulse tick,
             midipulse beats )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.2.10 api_start()

```
virtual void seq64::midibus::api_start ( )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.2.11 api_stop()

```
virtual void seq64::midibus::api_stop ( )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.2.12 api_clock()

```
virtual void seq64::midibus::api_clock (
             midipulse tick )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.2.13 api_play()

```
virtual void seq64::midibus::api_play (
             event * e24,
             midibyte channel )  [protected], [virtual]
```

Implements seq64::midibase.

10.61.3 Friends And Related Function Documentation

10.61.3.1 mastermidibus

```
friend class mastermidibus  [friend]
```

10.61.4 Field Documentation

10.61.4.1 m_rt_midi

```
rtmidi* seq64::midibus::m_rt_midi  [private]
```

10.61.4.2 m_master_info

```
rtmidi_info& seq64::midibus::m_master_info  [private]
```

The rtmidi_info object used for enumerating the ports is a good place to get this handle. It is an extension of the legacy RtMidi interface.

10.62 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 oldformat=false, bool globalbgs=true)

  Principal constructor.
- virtual ∼midifile ()

  A rote destructor.
- virtual bool parse (perform &p, int screenset=0, bool importing=false)

  This function opens a binary MIDI file and parses it into sequences and other application objects.
- virtual bool write (perform &p, bool doseqspec=true)

  Write the whole MIDI data and Seq24 information out to the file.
- bool write_song (perform &p)
- const std::string & error_message () const

  'Getter' function for member m_error_message
- bool error_is_fatal () const

  'Getter' function for member m_error_is_fatal
- 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.
- size_t get_file_pos ()

  'Getter' function for member m_pos

Protected Member Functions

- virtual sequence ∗ initialize_sequence (perform &p)
- virtual void finalize_sequence (perform &p, sequence &seq, int seqnum, int screenset)
- void clear_errors ()

  'Setter' function for member m_error_message
- void ppqn (int p)

  'Setter' function for member m_ppqn
- bool at_end () const

  Checks if the data stream pointer has reached the end position.
- bool grab_input_stream (const std::string &tag)

  Creates the stream input, reads it into the "buffer", and then closes the file.
- bool parse_smf_0 (perform &p, int screenset)

  This function parses an SMF 0 binary MIDI file as if it were an SMF 1 file, then, if more than one MIDI channel was encountered in the sequence, splits all of the channels in the sequence out into separate sequences.
- bool parse_smf_1 (perform &p, int screenset, bool is_smf0=false)

  This function parses an SMF 1 binary MIDI file; it is basically the original seq24 midifile::parse() function.
- midilong 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.
- bool checklen (midilong len, midibyte type)

  Internal function to check for and report a bad length value.
- void add_trigger (sequence &seq, midishort ppqn)

  Internal function to make the parser easier to read.
- bool read_seek (size_t pos)

  Seeks to a new, absolute, position in the data stream.
- midilong read_long ()

Reads 4 bytes of data using read_byte().

- midishort read_short ()

  Reads 2 bytes of data using read_byte().
- midibyte read_byte ()

  Reads 1 byte of data directly from the m_data vector, incrementing m_pos after doing so.
- midilong read_varinum ()

  Read a MIDI Variable-Length Value (VLV), which has a variable number of bytes.
- bool read_byte_array (midibyte ∗b, size_t len)

  A helper function to simplify reading midi_control data from the MIDI file.
- bool read_byte_array (midistring &b, size_t len)

  A overload function to simplify reading midi_control data from the MIDI file.
- void read_gap (size_t sz)

  Jumps/skips the given number of bytes in the data stream.
- void write_long (midilong value)

  Writes 4 bytes, each extracted from the long value and shifted rightward down to byte size, using the write_byte() function.
- void write_triple (midilong value)

  Writes 3 bytes, each extracted from the long value and shifted rightward down to byte size, using the write_byte() function.
- void write_short (midishort value)

  Writes 2 bytes, each extracted from the long value and shifted rightward down to byte size, using the write_byte() function.
- void write_byte (midibyte c)

  Writes 1 byte.
- void write_varinum (midilong)

  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.
- std::string read_track_name ()

  Reads the track name.
- void write_seq_number (midishort seqnum)

  Writes out a sequence number.
- int read_seq_number ()

  Reads the sequence number.
- void write_track_end ()

  Writes out the end-of-track marker.
- bool write_header (int numtracks)

  We want to write:
- void write_prop_header (midilong tag, long len)

  Writes a "proprietary" (SeqSpec) Seq24 footer header in either the new MIDI-compliant format, or the legacy Seq24 format.
- bool write_proprietary_track (perform &a_perf)

  Writes out the final proprietary/SeqSpec 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.
- bool set_error (const std::string &msg)

  A new function that just sets the fatal-error status and the error message.

- bool set_error_dump (const std::string &msg)

    Helper function to emit more useful error messages.
- bool set_error_dump (const std::string &msg, unsigned long p)

    Helper function to emit more useful error messages for erroneous long values.
- void write_track (const midi_vector &lst)
- 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.
- bool is_sysex_special_id (midibyte ch)

    Check for special SysEx ID byte.

Private Attributes

- mutex m_mutex

    Provides locking for the sequence.
- size_t m_file_size

    Holds the size of the MIDI file.
- std::string m_error_message

    Holds the last error message, useful for trouble-shooting without having Sequencer64 running in a console window.
- bool m_error_is_fatal

    Indicates if the error should be considered fatal.
- bool m_disable_reported

    Indicates that file reading has already been disabled (due to serious errors), so don't complain about it anymore.
- size_t m_pos

    Holds the position in the MIDI file.
- const std::string m_name

    The unchanging name of the MIDI file.
- std::vector< midibyte > m_data

    This vector of characters holds our MIDI data.
- std::list< midibyte > 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.
- bool m_global_bgsequence

    Indicates to store the new key, scale, and background sequence in the global, "proprietary" section of the MIDI song.
- int m_ppqn

    Provides the current value of the PPQN, which used to be constant and is now only the macro SEQ64_DEFAULT←_PPQN.
- bool m_use_default_ppqn

    Indicates that the default PPQN is in force.
- midi_splitter m_smf0_splitter

    Provides support for SMF 0.

10.62.1 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.

10.62.2 Constructor & Destructor Documentation

10.62.2.1 midifile()

```
seq64::midifile::midifile (
            const std::string & name,
            int ppqn = SEQ64_USE_DEFAULT_PPQN,
            bool oldformat = false,
            bool globalbgs = true )
```

Parameters

name	Provides the name of the MIDI file to be read or written.
ppqn	Provides the initial value of the PPQN setting. It is handled differently for parsing (reading) versus writing the MIDI file. • Reading. – If set to SEQ64_USE_DEFAULT_PPQN, the legacy application behavior is used. The m_ppqn member is set to the default PPQN, DEFAULT_PPQN. The value read from the MIDI file, ppqn, is then use to scale the running-time of the sequence relative to DEFAULT_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, to get this behavior. • Writing. This value is written to the MIDI file in the header chunk of the song. Note that the caller must query for the PPQN set during parsing, and pass it to the constructor when preparing to write the file. See how it is done in the mainwnd class.
oldformat	If true, write out the MIDI file using the old Seq24 format, instead of the new MIDI-compliant sequencer-specific format, for the seq24-specific SeqSpec tags defined in the globals module. This option is false by default. Note that this option is only used in writing; reading can handle either format transparently.
globalbgs	If true, write any non-default values of the key, scale, and background sequence to the global "proprietary" section of the MIDI file, instead of to each sequence. Note that this option is only used in writing; reading can handle either format transparently.

10.62.2.2 ∼midifile()

```
seq64::midifile::∼midifile ( ) [virtual]
```

10.62.3 Member Function Documentation

10.62.3.1 parse()

```
bool seq64::midifile::parse (
            perform & p,
            int screenset = 0,
            bool importing = false )  [virtual]
```

In addition to the standard MIDI track data in a normal track, Seq24/Sequencer64 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


Note that only Sequencer64 adds "FF 7F len" to the SeqSpec data.

Standard MIDI provides for port and channel specification meta events, 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?

Note the is-modified flag:  We now assume that the perform object is
starting from scratch when parsing.  But we let mainwnd tell the perform
object when to clear everything with perform::clear_all().  The mainwnd
does this for a new file, opening a file, but not for a file import, which
might be done simply to add more MIDI tracks to the current composition.
So, if parsing succeeds, all we want to do is make sure the flag is set.
Parsing a file successfully is not always a modification of the setup.
For instance, the first read of a MIDI file should start clean, not dirty.
```

SysEx notes:

```
 Some files (e.g. Dixie04.mid) do not always encode System Exclusive
 messages properly for a MIDI file.  Instead of a varinum length value,
 they are followed by extended IDs (0x7D, 0x7E, or 0x7F).

 We've covered some of those cases by disabling access to m_data if the
 position passes the size of the file, but we want try to bypass these
 odd cases properly.  So we look ahead for one of these special values.

 Currently, Sequencer64, like Se24, handles SysEx message only to the
 extend of passing them via MIDI Thru.  We hope to improve on that
 capability eventually.
```

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file. This value ranges from -31 to 0 to +31 (32 is the maximum screen-set available in Seq24). This offset is added to the sequence number read in for the sequence, to place it elsewhere in the imported tune, and locate it in a specific screen-set. If this parameter is non-zero, then we will assume that the perform data is dirty.
importing	Indicates that we are importing a file, and do not want to parse/erase any "proprietrary" information from the performance.

Returns

Returns true if the parsing succeeded. Note that the error status is saved in m_error_is_fatal, and a message (to display later) is saved in m_error_message.

10.62.3.2 write()

```
bool seq64::midifile::write (
            perform & p,
            bool doseqspec = true )  [virtual]
```

Also see the write_song() function, for exporting to standard MIDI.

Sequencer64 sometimes reverses the order of some events, due to popping from its container. Not an issue, but can make a file slightly different for no reason.

Parameters

p	Provides the object that will contain and manage the entire performance.
doseqspec	If true (the default, then the Sequencer64-specific SeqSpec sections are written to the file. If false, we want to export the tracks as a basic MIDI sequence (which is not the same as exporting a Song, with triggers, as a MIDI sequence).

Returns

Returns true if the write operations succeeded. If false is returned, then m_error_message will contain a description of the error.

10.62.3.3 write_song()

```
bool seq64::midifile::write_song (
            perform & p )
```

10.62.3.4 error_message()

```
const std::string& seq64::midifile::error_message ( ) const  [inline]
```

10.62.3.5 error_is_fatal()

```
bool seq64::midifile::error_is_fatal ( ) const  [inline]
```

10.62.3.6 ppqn() [1/2]

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

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

10.62.3.7 get_file_pos()

```
size_t seq64::midifile::get_file_pos ( )  [inline]
```

Current position in the data stream.

10.62.3.8 initialize_sequence()

```
sequence * seq64::midifile::initialize_sequence (
             perform & p )  [protected], [virtual]
```

10.62.3.9 finalize_sequence()

```
void seq64::midifile::finalize_sequence (
             perform & p,
             sequence & seq,
             int seqnum,
             int screenset )  [protected], [virtual]
```

10.62.3.10 clear_errors()

```
void seq64::midifile::clear_errors ( )  [inline], [protected]
```

10.62.3.11 ppqn() [2/2]

```
void seq64::midifile::ppqn (
             int p )  [inline], [protected]
```

10.62.3.12 at_end()

```
bool seq64::midifile::at_end ( ) const  [inline], [protected]
```

Returns

Returns true if the read pointer is at the end.

10.62.3.13 grab_input_stream()

```
bool seq64::midifile::grab_input_stream (
             const std::string & tag )  [protected]
```

No file buffering needed on these beefy machines! :-) As a side-effect, also sets m_file_size.

Parameters

tag	Basically an informative string to denote what kind of file is being opened, "MIDI" or "WRK".

Returns

Returns true if the input stream was successfully opend on a good file. Use it only if the return value is true.

10.62.3.14 parse_smf_0()

```
bool seq64::midifile::parse_smf_0 (
            perform & p,
            int screenset )  [protected]
```

The original sequence remains in place, in sequence slot 16 (the 17th slot). The user is responsible for deleting it if it is not needed.

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file.

Returns

Returns true if the parsing succeeded.

10.62.3.15 parse_smf_1()

```
bool seq64::midifile::parse_smf_1 (
            perform & p,
            int screenset,
            bool is_smf0 = false )  [protected]
```

It assumes the file-data has already been read into memory. It also assumes that the ID, track-length, and format have already been read.

If the MIDI file contains both proprietary (c_timesig) and MIDI type 0x58 then it came from seq42 or seq32 (Stazed versions). In this case the MIDI type is parsed first (because it is listed first) then it gets overwritten by the proprietary, above.

Note that NumTracks doesn't count the Seq24 "proprietary" footer section, even if it uses the new format, so that section will still be read properly after all normal tracks have been processed.

PPQN:

```
Current time (RunningTime) is re the ppqn according to the file, we
have to adjust it to our own ppqn.  PPQN / ppqn gives us the ratio.
(This change is not enough; a song with a ppqn of 120 plays too fast
in Seq24, which has a constant ppqn of 192.  Triggers must also be
modified.)
```

Tempo events:

```
If valid, set the global tempo to the first encountered tempo; this is
legacy behavior.  Bad tempos occur and stick around, munging exported
songs.  We log only the first tempo officially; the rest are stored as
events if in the first track.  We also adjust the upper draw-tempo
range value to about twice this value, to give some headroom... it
will not be saved unless the --user-save option is in force.
```

Time Signature:

```
Like Tempo, Time signature is now handled more robustly.
```

Key Signature and other Meta events:

```
Although we don't support these events, we do want to keep them, so we
can output them upon saving.  Instead of bypassing unhandled Meta
events, we now store them, so that they are not lost when
exporting/saving the MIDI data.
```

Track name:

```
This event is optional. It's interpretation depends on its context. If
it occurs in the first track of a format 0 or 1 MIDI file, then it
gives the Sequence Name. Otherwise it gives the Track Name.
```

End of Track:

```
"If Delta is 0, then another event happened at the same time as
track-end.  Class sequence discards the last note.  This fixes that.
A native Seq24 file will always have a Delta >= 1." Not true!  We've
fixed the real issue by commenting the code that increments current
time.  Question:  What if BPM is set *after* this event?
```

Sequences:

```
If the sequence is shorter than a quarter note, assume it needs to be
padded to a measure.  This happens anyway if the short pattern is
opened in the sequence editor (seqedit).

Add sorting after reading all the events for the sequence.  Then add
the sequence with it's preferred location as a hint.
```

Unknown chunks:

```
Let's say we don't know what kind of chunk it is.  It's not a MTrk, we
don't know how to deal with it, so we just eat it.  If this happened
on the first track, it is a fatal error.
```

Parameters

p	Provides a reference to the perform object into which sequences/tracks are to be added.
screenset	The screen-set offset to be used when loading a sequence (track) from the file.
is_smf0	True if we detected that the MIDI file is in SMF 0 format.

Returns

Returns true if the parsing succeeded.

10.62.3.16 parse_prop_header()

```
midilong seq64::midifile::parse_prop_header (
              int file_size )  [protected]
```

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:

```
        0x00 0xFF 0x7F length data
```

```
For convenience, this function first checks the amount of file data left.
If enough, then it reads a long value.  If the value starts with 0x00 0xFF
0x7F, then that is a SeqSpec event, which signals usage of the new
Sequencer64 "proprietary" format.  Otherwise, it is probably the old
format, and the long value is a control tag (0x242400nn), which can be
returned immedidately.

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

file_size	The size of the data file. This value is compared against the member m_pos (the position inside m_data[]), 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.

10.62.3.17 parse_proprietary_track()

```
bool seq64::midifile::parse_proprietary_track (
            perform & p,
            int file_size )  [protected]
```

It consists of series of tags:

```
        c_midictrl
        c_midiclocks
        c_notes
        c_bpmtag (beats per minute)
        c_mutegroups
        c_musickey (new, added if usr() global_seq_feature() is true)
        c_musicscale (ditto)
        c_backsequence (ditto)
```

```
(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.  Oh, it turns out that they are set up by actions performed on
each sequence, and are stored as sequencer-specific ("SeqSpec") data with
each track's data as held in the MIDI container for the track.  See the
midi_container module for more information.)

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

First, we separate out this function for a little more clarity.  Then we
added code to handle reading both the legacy Seq24 format and the new,
MIDI-compliant format.  Note that even the new 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.  But it does have the "MTrk" marker
and track name, so that must be processed for the new format.

Now, in our "midicvt" project, we have a test MIDI file,
b4uacuse-non-mtrk.midi that is good, except for having a tag "MUnk"
instead of "MTrk".  We should consider being more permissive, if possible.
Otherwise, though, the only penality is that the "proprietary" chunk is
completely skipped.
```

Extra precision BPM:

Based on a request for two decimals of precision in beats-per-minute, we now save a scaled version of BPM. Our supported range of BPM is SEQ64_MINIMUM_BPM = 1 to SEQ64_MAXIMUM_BPM = 600. If this range is encountered, the value is read as is. If greater than this range (actually, we use 999 as the limit), then we divide the number by 1000 to get the actual BPM, which can thus have more precision than the old integer value allowed. Obviously, when saving, we will multiply by 1000 to encode the BPM.

Parameters

p	The performance object that is being set via the incoming MIDI file.
file_size	The file size as determined in the parse() function.

There are also implicit parameters, with the m_pos and m_new_format member variables.

10.62.3.18 checklen()

```
bool seq64::midifile::checklen (
            midilong len,
            midibyte type )  [protected]
```

A length of zero is now considered legal, but a "warning" message is shown. The largest value allowed within a MIDI file is 0x0FFFFFFF. This limit is set to allow variable-length quantities to be manipulated as 32-bit integers.

Parameters

len	The length value to be checked, and it should be greater than 0. However, we have seen files with zero-length events, such as Lyric events (0x05).
type	The type of meta event. Used for displaying an error.

Returns

Returns true if the length parameter is valid. This now means it is simply less than 0x0FFFFFFF.

10.62.3.19 add_trigger()

```
void seq64::midifile::add_trigger (
            sequence & seq,
            midishort ppqn )  [protected]
```

Handles only c_triggers_new values, not the old c_triggers value. If m_ppqn isn't set to the default value, then we must scale these triggers accordingly, just as is done for the MIDI events.

Parameters

seq	Provides the sequence to which the trigger is to be added.
ppqn	Provides the ppqn value to use to scale the tick values if m_use_default_ppqn is true. If 0, the ppqn value is not used.

10.62.3.20 read_seek()

```
bool seq64::midifile::read_seek (
            size_t pos )  [protected]
```

All this function does is change the value of m_pos. All of the file is already in memory.

Parameters

pos	Provides the new position to seek.

Returns

Returns true if the seek could be accomplished. No error message is logged, but the caller should take evasive action if false is returned. And, in that case, m_pos is unchanged.

10.62.3.21 read_long()

```
midilong seq64::midifile::read_long ( )  [protected]
```

Warning

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

Returns

Returns the four bytes, shifted appropriately and added together, most-significant byte first, to sum to a long value.

10.62.3.22 read_short()

```
midishort seq64::midifile::read_short ( )  [protected]
```

Returns

Returns the two bytes, shifted appropriately and added together, most-significant byte first, to sum to a short value.

10.62.3.23 read_byte()

```
midibyte seq64::midifile::read_byte ( )  [protected]
```

Returns

Returns the byte that was read. Returns 0 if there was an error, though there's no way for the caller to determine if this is an error or a good value.

10.62.3.24 read_varinum()

```
midilong seq64::midifile::read_varinum ( )  [protected]
```

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.

Returns

Returns the accumulated values as a single number.

10.62.3.25 read_byte_array() [1/2]

```
bool seq64::midifile::read_byte_array (
            midibyte * b,
            size_t len )  [protected]
```

Parameters

b	The byte array to receive the data.
len	The number of bytes in the array, and to be read.

Returns

Returns true if any bytes were read. Do not use *b* if false is returned.

10.62.3.26 read_byte_array() [2/2]

```
bool seq64::midifile::read_byte_array (
             midistring & b,
             size_t len )  [protected]
```

It uses a midistring object instead of a buffer.

Parameters

b	The midistring to receive the data.
len	The number of bytes to be read.

Returns

Returns true if any bytes were read. The string *b* will be empty if false is returned.

10.62.3.27 read_gap()

```
void seq64::midifile::read_gap (
             size_t sz )  [protected]
```

If too large, the position is left at the end.

Parameters

sz	Provides the gap size, in bytes.

10.62.3.28 write_long()

```
void seq64::midifile::write_long (
             midilong x )  [protected]
```

Warning

This code looks endian-dependent.

Parameters

x	The long value to be written to the MIDI file.

10.62.3.29 write_triple()

```
void seq64::midifile::write_triple (
            midilong x )  [protected]
```

This function is kind of the reverse of tempo_us_to_bytes() defined in the calculations.cpp module.

Warning

This code looks endian-dependent.

Parameters

x	The long value to be written to the MIDI file.

10.62.3.30 write_short()

```
void seq64::midifile::write_short (
            midishort x )  [protected]
```

Warning

This code looks endian-dependent.

Parameters

x	The short value to be written to the MIDI file.

10.62.3.31 write_byte()

```
void seq64::midifile::write_byte (
            midibyte c )  [inline], [protected]
```

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

Parameters

c	The MIDI byte to be "written".

10.62.3.32 write_varinum()

```
void seq64::midifile::write_varinum (
            midilong value )  [protected]
```

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 are represented by a single byte:
    0x00 to 7F.
-   0x80 is represented as 0x81 00.
-   The largest 2-byte MIDI value (e.g. a sequence number) is
    0xFF 7F, which is 127 * 128 + 127 = 16383 = 0x3FFF.
-   The largest 3-byte MIDI value is 0xFF FF 7F = 0x1FFFFF.
-   The largest number, 4 bytes, is 0xFF FF FF 7F = 0xFFFFFFF.
```

Also see the varinum_size() function.

Parameters

value	The long value to be encoded as a MIDI varinum, and written to the MIDI file.

10.62.3.33 write_track_name()

```
void seq64::midifile::write_track_name (
            const std::string & trackname )  [protected]
```

Note that we have to precede this "event" with a delta time value, set to 0. The format of the output is "0x00 0xFF 0x03 len track-name-bytes".

Parameters

trackname	Provides the name of the track to be written to the MIDI file.

10.62.3.34 read_track_name()

```
std::string seq64::midifile::read_track_name ( )  [protected]
```

Meant only for usage in the proprietary/SeqSpec footer track, in the new file format.

Returns

Returns the track name, or an empty string if there was a problem.

10.62.3.35 write_seq_number()

```
void seq64::midifile::write_seq_number (
            midishort seqnum )  [protected]
```

The format is "00 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 assumed to increment. Our application doesn't bother with that shortcut.

Parameters

seqnum	The sequence number to write.

10.62.3.36 read_seq_number()

```
int seq64::midifile::read_seq_number ( )  [protected]
```

Meant only for usage in the proprietary/SeqSpec footer track, in the new file format.

Returns

Returns the sequence number found, or -1 if it was not found.

10.62.3.37 write_track_end()

```
void seq64::midifile::write_track_end ( )  [protected]
```

10.62.3.38 write_header()

```
bool seq64::midifile::write_header (
            int numtracks )  [protected]
```

- 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. Sequence number, a special value, well out of normal range.
- The name of the track:
  - "Seq24-Spec"
  - "Sequencer64-S"

  Then follows the proprietary/SeqSpec 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/SeqSpec 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.
  ```

10.62.3.39 write_prop_header()

```
void seq64::midifile::write_prop_header (
            midilong control_tag,
            long data_length )  [protected]
```

This function does not write the data. It replaces calls such as "write_long(c_midich)" in the proprietary secton 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. Similary, this site shows that no manufacturer uses 0x24:

```
http://sequence15.blogspot.com/2008/12/midi-manufacturer-ids.html
```

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

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

10.62.3.40 write_proprietary_track()

```
bool seq64::midifile::write_proprietary_track (
            perform & p )  [protected]
```

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.

Here's the basics of what Seq24 did for writing the data in this part of the file:

```
-#  Write the c_midictrl value, then write a 0.  To us, this looks like
    no one wrote any code to write this data.  And yet, the parsing
    code can handles a non-zero value, which is the number of sequences
    as a long value, not a byte.  So shouldn't we write 4 bytes, not
    one?  Yes, indeed, we made a mistake.  However, we should be
    writing out the full data set as well.  But not even Seq24 does
    that!  Perhaps they decided it was best kept in the "rc"
    configuration file.
-#  MORE TO COME.
```

We need a way to make the group mute data optional. Why write 4096 bytes of zeroes?

Parameters

p	Provides the object that will contain and manage the entire performance.

Returns

Always returns true. No efficient way to check all of the writes that can happen. Might revisit this issue if some bug crops up.

10.62.3.41 varinum_size()

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

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
```

This restriction allows the calculation to be simple and fast.

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

Parameters

len	The long value whose length, when encoded as a MIDI varinum, is to be found.

Returns

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

10.62.3.42 prop_item_size()

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

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 then the data length is added.

Parameters

data_length	Provides the data length value to be encoded.

Returns

Returns the length of the item size, including the delta time, meta bytes, length byes, the control tag, and the data-length itself.

10.62.3.43 track_name_size()

```
long seq64::midifile::track_name_size (
            const std::string & trackname ) const  [protected]
```

Parameters

trackname	Provides the name of the track to be written to the MIDI file.

Returns

Returns the length of the event, which is of the format "0x00 0xFF 0x03 len track-name-bytes".

10.62.3.44 set_error()

```
bool seq64::midifile::set_error (
            const std::string & msg )  [protected]
```

Parameters

msg	Provides the error message.

Returns

Returns false, so that the caller can just assign this as the erroneous boolean function result.

10.62.3.45 set_error_dump() [1/2]

```
bool seq64::midifile::set_error_dump (
            const std::string & msg )  [protected]
```

It adds the file offset to the message.

Parameters

msg	The main error message string, without an ending newline character.

Returns

Always returns false, to make it easier on the caller. The constructed string is returned as a side-effect, in case we want to pass it along to the externally-accessible error-message buffer.

10.62.3.46 set_error_dump() [2/2]

```
bool seq64::midifile::set_error_dump (
            const std::string & msg,
            unsigned long value )  [protected]
```

It adds the file offset to the message.

Parameters

msg	The main error message string, without an ending newline character.
value	The long value to show as part of the message.

Returns

Always returns false, to make it easier on the caller. The constructed string is returned as a side-effect, in case we want to pass it along to the externally-accessible error-message buffer.

10.62.3.47 write_track()

```
void seq64::midifile::write_track (
            const midi_vector & lst )  [protected]
```

10.62.3.48 seq_number_size()

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

10.62.3.49 track_end_size()

```
long seq64::midifile::track_end_size ( ) const  [inline], [protected]
```

10.62.3.50 is_sysex_special_id()

```
bool seq64::midifile::is_sysex_special_id (
            midibyte ch )  [inline], [protected]
```

Parameters

ch	Provides the byte to be checked against 0x7D through 0x7F.

Returns

Returns true if the byte is SysEx special ID.

10.62.4 Field Documentation

10.62.4.1 m_mutex

```
mutex seq64::midifile::m_mutex  [mutable], [private]
```

Made mutable for use in certain locked getter functions.

10.62.4.2 m_file_size

```
size_t seq64::midifile::m_file_size  [private]
```

This variable was added when loading a file that caused an attempt to load data well beyond the file-size of the midicvt test file Dixie04.mid.

10.62.4.3 m_error_message

```
std::string seq64::midifile::m_error_message  [private]
```

If empty, there's no pending error. Currently most useful in the parse() function.

10.62.4.4 m_error_is_fatal

```
bool seq64::midifile::m_error_is_fatal  [private]
```

The caller can query for this value after getting the return value from parse().

10.62.4.5 m_disable_reported

```
bool seq64::midifile::m_disable_reported  [private]
```

Once is enough.

10.62.4.6 m_pos

```
size_t 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.

10.62.4.7 m_name

```
const std::string seq64::midifile::m_name  [private]
```

10.62.4.8 m_data

```
std::vector<midibyte> 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.

10.62.4.9 m_char_list

```
std::list<midibyte> 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.

10.62.4.10 m_new_format

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

In the new format, each sequencer-specfic value (0x242400xx, as defined in the globals module) is preceded by the sequencer-specific prefix, 0xFF 0x7F len id/date). By default, the new format is used, 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 "rc" configuration file.] Note that reading can handle either format transparently.

10.62.4.11 m_global_bgsequence

```
bool seq64::midifile::m_global_bgsequence  [private]
```

10.62.4.12 m_ppqn

```
int seq64::midifile::m_ppqn  [private]
```

10.62.4.13 m_use_default_ppqn

```
bool seq64::midifile::m_use_default_ppqn  [private]
```

10.62.4.14 m_smf0_splitter

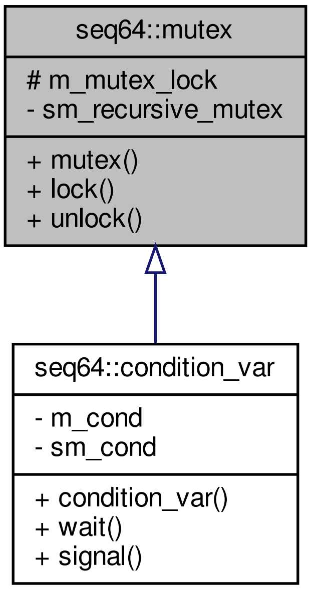
```
midi_splitter seq64::midifile::m_smf0_splitter  [private]
```

This object holds all of the information needed to split a multi-channel sequence.

10.63 seq64::mutex Class Reference

The mutex class provides a simple wrapper for the pthread_mutex_t type used as a recursive mutex.

Inheritance diagram for seq64::mutex:



Public Member Functions

- mutex ()

    The constructor assigns the recursive mutex to the local locking mutex.
- void lock () const

    Lock the mutex.
- void unlock () const

    Unlock the mutex.

Protected Attributes

- pthread_mutex_t m_mutex_lock

    Provides a mutex lock usable by a single module or class.

Static Private Attributes

- static const pthread_mutex_t sm_recursive_mutex

    Provides a recursive mutex that can be used by the whole application, and is, apparently.

10.63.1 Constructor & Destructor Documentation

10.63.1.1 mutex()

```
seq64::mutex::mutex ( )
```

10.63.2 Member Function Documentation

10.63.2.1 lock()

```
void seq64::mutex::lock ( ) const
```

10.63.2.2 unlock()

```
void seq64::mutex::unlock ( ) const
```

10.63.3 Field Documentation

10.63.3.1 sm_recursive_mutex

```
const pthread_mutex_t seq64::mutex::sm_recursive_mutex  [static], [private]
```

Define the static recursive mutex and its condition variable.

10.63.3.2 m_mutex_lock

```
pthread_mutex_t seq64::mutex::m_mutex_lock  [mutable], [protected]
```

However, this mutex ends up being a copy of the static sm_recursive_mutex (and, of course, a different "object").

10.64 seq64::editable_event::name_value_t Struct Reference

Provides a type that contains the pair of values needed for the various lookup maps that are needed to manage editable events.

Data Fields

- unsigned short event_value

  Holds a midibyte value (0x00 to 0xFF) or SEQ64_END_OF_MIDIBYTE_TABLE to indicate the end of an array of name_value_t items.
- std::string event_name

  Holds the human-readable name for an event code or other numeric value in an array of name_value_t items.

10.64.1 Field Documentation

10.64.1.1 event_value

```
unsigned short seq64::editable_event::name_value_t::event_value
```

This field can be considered a "key" value, as it is often looked up to find the event name.

10.64.1.2 event_name

```
std::string seq64::editable_event::name_value_t::event_name
```

10.65 seq64::options Class Reference

This class supports a full tabbed options dialog.

Inherits Dialog.

Public Member Functions

- options (Gtk::Window &parent, perform &p, bool showjack=false)

Private Types

- enum button {
  e_jack_transport,
  e_jack_master,
  e_jack_master_cond,
  e_jack_midi,
  e_jack_start_mode_live,
  e_jack_start_mode_song,
  e_jack_connect,
  e_jack_disconnect }

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

Private Member Functions

- perform & perf ()

  'Getter' function for member m_mainperf
- void clock_callback_off (int bus, Gtk::RadioButton ∗button)
- void clock_callback_on (int bus, Gtk::RadioButton ∗button)
- void clock_callback_mod (int bus, Gtk::RadioButton ∗button)
- void clock_callback_disable (int bus, Gtk::RadioButton ∗button)
- void clock_mod_callback (Gtk::Adjustment ∗adj)
- void edit_tempo_track_number (Gtk::Entry ∗text)
- void log_tempo_track_number ()
- void input_callback (int bus, Gtk::Button ∗button)
- void filter_callback (Gtk::Button ∗button)
- void transport_callback (button type, Gtk::Button ∗button)
- void mouse_seq24_callback (Gtk::RadioButton ∗)
- void mouse_fruity_callback (Gtk::RadioButton ∗)
- void mouse_mod4_callback (Gtk::CheckButton ∗)
- void mouse_snap_split_callback (Gtk::CheckButton ∗)
- void mouse_click_edit_callback (Gtk::CheckButton ∗)
- void lash_support_callback (Gtk::CheckButton ∗)
- void add_midi_clock_page ()
- void add_midi_input_page ()
- void add_keyboard_page ()
- void add_extended_keys_page ()
- void add_mouse_page ()
- void add_jack_sync_page ()

Private Attributes

- Gtk::Tooltips ∗ m_tooltips

  A repository for GTK tooltip support.
- 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::CheckButton ∗ m_button_jack_transport

  Main JACK transport selection.
- Gtk::CheckButton ∗ m_button_jack_master

  Main JACK transport master selection.
- Gtk::CheckButton ∗ m_button_jack_master_cond

  Main JACK transport master-conditional selection.
- Gtk::Button ∗ m_button_jack_connect

  JACK Connect button, which we need to enable/disable for clarity and some additional safety.
- Gtk::Button ∗ m_button_jack_disconnect

  JACK Disonnect button, which we need to enable/disable for clarity and some additional safety.
- Gtk::Notebook ∗ m_notebook

  Not sure yet what this notebook is for.

10.65.1 Member Enumeration Documentation

10.65.1.1 button

```
enum seq64::options::button  [private]
```

These values are handled in options::transport_callback(). Some of them set JACK-related values in the rc_settings object, while the others set up or tear down the JACK support of sequencer64.

The JACK Transport settings are a little messy. They should be radio buttons, and control each other's settings. Currently, if the user wants to set up for JACK Master, the JACK Transport button must also be checked.

Enumerator

e_jack_transport	Turns on the "with JACK Transport" option, rc_settings :: with_jack_transport().
e_jack_master	Turns on the "with JACK Master" option, rc_settings :: with_jack_master(). If another application is already JACK Master, this will fail.
e_jack_master_cond	Turns on the "with JACK Master" option rc_settings :: with_jack_master_cond(). This option makes sequencer64 the JACK Master conditionally, that is, if no other application has claimed that role.
e_jack_midi	Turns on the "Native JACK MIDI" option rc_settings :: with_jack_midi(). This is a setting independent of the JACK Transport settings. This is use only in the "rtmidi" implementation os Sequencer64, seq64.
e_jack_start_mode_live	Doesn't directly do anything; the live mode versus song mode is set by the e_jack_start_mode_song value.
e_jack_start_mode_song	Sets the "JACK start mode" value to true, which means that sequencer64 is in song mode. This value is obtained via rc_settings :: song_start_mode(). It will eventually be the start mode that applies to either ALSA or JACK playback.
e_jack_connect	Causes the perform object's JACK initialization function, perform::init_jack(), to be called.
e_jack_disconnect	Causes the perform object's JACK deinitialization function, perform::deinit_jack(), to be called.

10.65.2 Constructor & Destructor Documentation

10.65.2.1 options()

```
seq64::options::options (
            Gtk::Window & parent,
            perform & p,
            bool showjack = false )
```

10.65.3 Member Function Documentation

10.65.3.1 perf()

```
perform& seq64::options::perf ( )  [inline], [private]
```

10.65.3.2 clock_callback_off()

```
void seq64::options::clock_callback_off (
            int bus,
            Gtk::RadioButton * button )  [private]
```

10.65.3.3 clock_callback_on()

```
void seq64::options::clock_callback_on (
            int bus,
            Gtk::RadioButton * button )  [private]
```

10.65.3.4 clock_callback_mod()

```
void seq64::options::clock_callback_mod (
            int bus,
            Gtk::RadioButton * button )  [private]
```

10.65.3.5 clock_callback_disable()

```
void seq64::options::clock_callback_disable (
            int bus,
            Gtk::RadioButton * button )  [private]
```

10.65.3.6 clock_mod_callback()

```
void seq64::options::clock_mod_callback (
            Gtk::Adjustment * adj )  [private]
```

10.65.3.7 edit_tempo_track_number()

```
void seq64::options::edit_tempo_track_number (
            Gtk::Entry * text )  [private]
```

10.65.3.8 log_tempo_track_number()

```
void seq64::options::log_tempo_track_number ( )  [private]
```

10.65.3.9 input_callback()

```
void seq64::options::input_callback (
            int bus,
            Gtk::Button * button )  [private]
```

10.65.3.10 filter_callback()

```
void seq64::options::filter_callback (
            Gtk::Button * button )  [private]
```

10.65.3.11 transport_callback()

```
void seq64::options::transport_callback (
            button type,
            Gtk::Button * button )  [private]
```

10.65.3.12 mouse_seq24_callback()

```
void seq64::options::mouse_seq24_callback (
            Gtk::RadioButton *  )  [private]
```

10.65.3.13 mouse_fruity_callback()

```
void seq64::options::mouse_fruity_callback (
            Gtk::RadioButton *  )  [private]
```

10.65.3.14 mouse_mod4_callback()

```
void seq64::options::mouse_mod4_callback (
            Gtk::CheckButton *  )  [private]
```

10.65.3.15 mouse_snap_split_callback()

```
void seq64::options::mouse_snap_split_callback (
            Gtk::CheckButton * )  [private]
```

10.65.3.16 mouse_click_edit_callback()

```
void seq64::options::mouse_click_edit_callback (
            Gtk::CheckButton * )  [private]
```

10.65.3.17 lash_support_callback()

```
void seq64::options::lash_support_callback (
            Gtk::CheckButton * )  [private]
```

10.65.3.18 add_midi_clock_page()

```
void seq64::options::add_midi_clock_page ( )  [private]
```

10.65.3.19 add_midi_input_page()

```
void seq64::options::add_midi_input_page ( )  [private]
```

10.65.3.20 add_keyboard_page()

```
void seq64::options::add_keyboard_page ( )  [private]
```

10.65.3.21 add_extended_keys_page()

```
void seq64::options::add_extended_keys_page ( )  [private]
```

10.65.3.22 add_mouse_page()

```
void seq64::options::add_mouse_page ( ) [private]
```

10.65.3.23 add_jack_sync_page()

```
void seq64::options::add_jack_sync_page ( ) [private]
```

10.65.4 Field Documentation

10.65.4.1 m_tooltips

```
Gtk::Tooltips* seq64::options::m_tooltips [private]
```

10.65.4.2 m_mainperf

```
perform& seq64::options::m_mainperf [private]
```

10.65.4.3 m_button_ok

```
Gtk::Button* seq64::options::m_button_ok [private]
```

10.65.4.4 m_button_jack_transport

```
Gtk::CheckButton* seq64::options::m_button_jack_transport [private]
```

10.65.4.5 m_button_jack_master

```
Gtk::CheckButton* seq64::options::m_button_jack_master [private]
```

10.65.4.6 m_button_jack_master_cond

```
Gtk::CheckButton* seq64::options::m_button_jack_master_cond  [private]
```

10.65.4.7 m_button_jack_connect

```
Gtk::Button* seq64::options::m_button_jack_connect  [private]
```

10.65.4.8 m_button_jack_disconnect

```
Gtk::Button* seq64::options::m_button_jack_disconnect  [private]
```

10.65.4.9 m_notebook

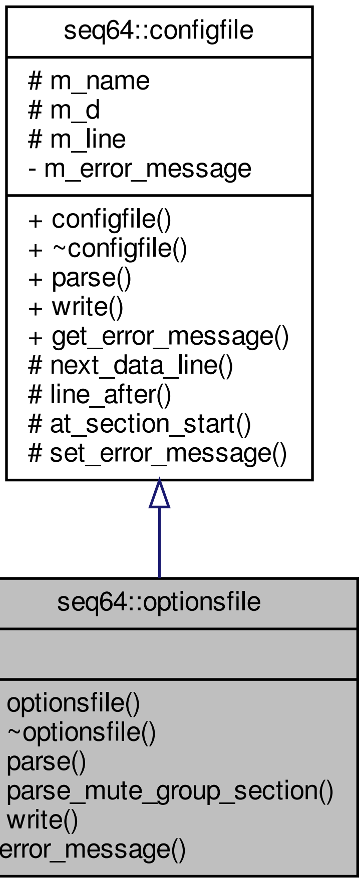
```
Gtk::Notebook* seq64::options::m_notebook  [private]
```

Must be a GTK thang.

10.66 seq64::optionsfile Class Reference

Provides a file for reading and writing the application' 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 &p)

  Parse the ∼/.seq24rc or ∼/.config/sequencer64/sequencer64.rc file.
- bool parse_mute_group_section (perform &p)

  Parses the [mute-group] section.
- bool write (const perform &p)

  This options-writing function is just about as complex as the options-reading function.

Private Member Functions

- bool error_message (const std::string &sectionname, const std::string &additional="")

  Helper function for error-handling.

Additional Inherited Members

10.66.1 Detailed Description

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

10.66.2 Constructor & Destructor Documentation

10.66.2.1 optionsfile()

```
seq64::optionsfile::optionsfile (
            const std::string & name )
```

Parameters

name	Provides the name of the options file; this is usually a full path file-specification.

10.66.2.2 ∼optionsfile()

```
seq64::optionsfile::∼optionsfile ( )
```

10.66.3 Member Function Documentation

10.66.3.1 parse()

```
bool seq64::optionsfile::parse (
            perform & p )  [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.

[extended-keys]

Additional keys (not yet represented in the Options dialog) to support additional keys for tempo-tapping, Seq32's new transport and connection functionality, and maybe a little more.

[New-keys]

Conditional support for reading Seq32 "rc" files.

[jack-transport]

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

```
-   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.
-   song_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]

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.

Parameters

p	Provides the performance object to which all of these options apply.

Returns

Returns true if the file was able to be opened for reading. Currently, there is no indication if the parsing actually succeeded.

One thing about MIDI clock values. If a device (e.g. my Korg nanoKEY2) is present in a system when Sequencer64 is exited, it will be saved in the [midi-clock] list. When unplugged, it will be read here at startup, but won't be shown. The next exit will find it removed from this list.

Also, we want to pre-allocate the number of clock entries needed, and then use the buss number to populate the list of clocks, in the odd event that the user changed the bus-order of the entries.

Implements seq64::configfile.

10.66.3.2 parse_mute_group_section()

```
bool seq64::optionsfile::parse_mute_group_section (
            perform & p )
```

This function is used both in the original reading of the "rc" file, and for reloading the original mute-group data from the "rc".

We used to throw the mute-group count value away, since it was always 1024, but it is useful if no mute groups have been created. So, if it reads 0 (instead of 1024), we will assume there are no mute-group settings. We also have to be sure to go to the next data line even if the strip-empty-mutes option is on.

Parameters

p	Provides a 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 file was able to be opened for reading, and the desired data successfully extracted.

10.66.3.3 write()

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

Parameters

p	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.

New boolean to show sequence numbers; ignored in legacy mode.

Implements seq64::configfile.

10.66.3.4 error_message()

```
bool seq64::optionsfile::error_message (
            const std::string & sectionname,
            const std::string & additional = "" )  [private]
```

It assembles a message and then passes it to set_error_message().

Parameters

sectionname	Provides the name of the section for reporting the error.
additional	Additional context information to help in finding the error.

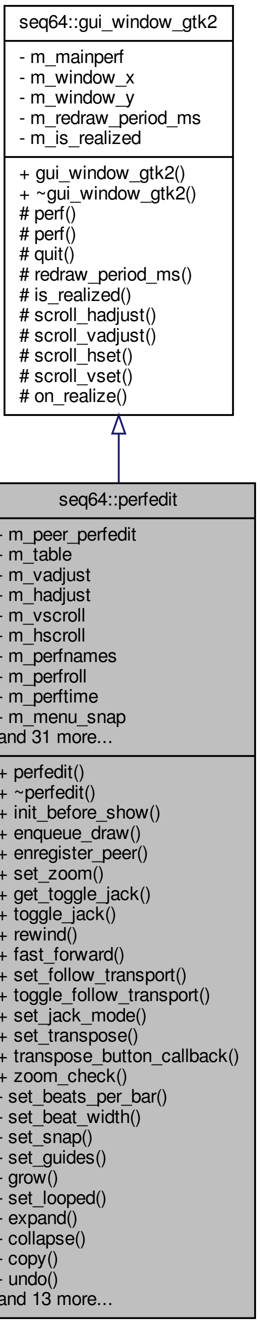
Returns

Always returns false.

10.67 seq64::perfedit Class Reference

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

Inheritance diagram for seq64::perfedit:



Public Member Functions

- perfedit (perform &p, bool second_perfedit=false, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor, has a reference to a perform object.
- virtual ∼perfedit ()

  This rote destructor does nothing.
- void init_before_show ()

This function forwards its call to the perfroll function of the same name.

- void enqueue_draw (bool forward=true)

  Helper wrapper for calling perfroll::queue_draw() for one or both perfedits.
- void enregister_peer (perfedit ∗peer)

  Register the peer perfedit object.
- void set_zoom (int z)

  Implements the horizontal zoom feature.
- bool get_toggle_jack ()

  Gets the state fo the JACK toggle button in the Song editor, when compiled with seq32 JACK support.
- void toggle_jack ()

  Sets the state fo the JACK toggle button in the Song editor, when compiled with seq32 JACK support.
- void rewind (bool press)

  Implements the seq32/stazed rewind operation.
- void fast_forward (bool press)

  Implements the seq32/stazed fast-forward operation.
- void set_follow_transport ()

  Sets the transport status when compiled for seq32 JACK support.
- void toggle_follow_transport ()

  Toggles the transport status when compiled for seq32 JACK support.
- void set_jack_mode ()

  Sets the JACK transport status, based on the status of the JACK button in the Song editor, when compiled for seq32 JACK support.
- void set_transpose (int transpose)

  Sets the value of transposition for this window.
- void transpose_button_callback (int transpose)

  The button callback for transposition for this window.

Static Public Member Functions

- static bool zoom_check (int z)

  Checks zoom values for the z/Z keystrokes used in perfroll and perftime.

Private Member Functions

- void set_beats_per_bar (int bpm)

  Sets the beats-per-measure text and value to the given value, and then calls set_guides().
- void set_beat_width (int bw)

  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 perfroll 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 redo ()

  Implement the redo feature (Ctrl-R).
- void popup_menu (Gtk::Menu ∗menu)

  Opens the given popup menu.
- void draw_sequences ()

  Forces a redraw of the sequences, though currently just the perfnames part of each sequence in the performance editor.
- bool timeout ()

  Handles a drawing timeout.
- void set_image (bool isrunning)

  Changes the image used for the pause/play button.
- void start_playing ()

  Implement the playing.
- void pause_playing ()

  Pauses the playing of the song, leaving the progress bar where it stopped.
- void stop_playing ()

  Stop the playing.
- void toggle_playing ()

  Reverses the state of playback.
- 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 redraw_period_ms().
- bool on_key_press_event (GdkEventKey ∗ev)

  This function is the callback for a key-press event.
- bool on_key_release_event (GdkEventKey ∗ev)

  This function is the callback for a key-release event.
- bool on_delete_event (GdkEventAny ∗)

  All this callback function does is return false.

Private Attributes

- perfedit ∗ m_peer_perfedit

  The partner instance of perfedit.
- Gtk::Table ∗ m_table

  A whole horde of GUI elements.
- Gtk::Adjustment ∗ m_vadjust

  Vertical adjust for piano roll.
- Gtk::Adjustment ∗ m_hadjust

  Horizontal adjust for piano roll.
- Gtk::VScrollbar ∗ m_vscroll

  Vertical scroll for piano roll.
- Gtk::HScrollbar ∗ m_hscroll

  Horizonatl scroll for piano roll.
- perfnames ∗ m_perfnames

  Pattern names in leftmost column.

- perfroll ∗ m_perfroll

  The piano roll in the song editor.
- perftime ∗ m_perftime

  The time/measures bar above roll.
- Gtk::Menu ∗ m_menu_snap

  The menu for grid-snap selection.
- Gtk::Menu ∗ m_menu_xpose

  The menu for transpose selection.
- Gtk::Button ∗ m_button_xpose

  Button to bring up transpose menu.
- Gtk::Entry ∗ m_entry_xpose

  Text edit for the transpose value.
- Gtk::Image ∗ m_image_play

  The image for the play button.
- Gtk::Button ∗ m_button_snap

  Button to bring up the snap menu.
- Gtk::Entry ∗ m_entry_snap

  Text edit for the grid-snap value.
- Gtk::Button ∗ m_button_stop

  The Stop Play button object.
- Gtk::Button ∗ m_button_play

  Implements the yellow two-bar pause button.
- Gtk::ToggleButton ∗ m_button_loop

  Button for Left-to-Right looping.
- Gtk::Button ∗ m_button_expand

  Button for Left/Right expansion.
- Gtk::Button ∗ m_button_collapse

  Button for Left/Right collapse.
- Gtk::Button ∗ m_button_copy

  Expand and copy between L/R.
- Gtk::Button ∗ m_button_grow

  Expand grid (bottom-right button).
- Gtk::Button ∗ m_button_undo

  Button to undo previous action.
- Gtk::Button ∗ m_button_redo

  Button to redo previous action.
- Gtk::ToggleButton ∗ m_button_jack

  Button to toggle JACK connection.
- Gtk::ToggleButton ∗ m_button_follow

  Button to toggle JACK following.
- Gtk::Button ∗ m_button_bpm

  Beats-per-measure menu button.
- Gtk::Entry ∗ m_entry_bpm

  Text-edit for beats-per-measure.
- Gtk::Button ∗ m_button_bw

  Beat-width menu button.
- Gtk::Entry ∗ m_entry_bw

  Text-edit for beat-width.
- Gtk::HBox ∗ m_hbox

  Horizontal box (which?) in table.
- Gtk::HBox ∗ m_hlbox

Horizontal box for buttons at top.
- Gtk::Menu ∗ m_menu_bpm

  Menus for time signature, beats per measure, beat width.
- Gtk::Menu ∗ m_menu_bw

  Drop-down menu for beat-width.
- int m_snap

  Sets the horizontal grid snap-to in units of "pulses" or "ticks".
- int m_bpm

  The current "beats per measure" value.
- int m_bw

  The current "beat width" value.
- int m_ppqn

  The current "parts per quarter note" value.
- bool m_is_running

  Holds the current status of running, for use in display the play versus pause icon.
- int m_standard_bpm

  The standard "beats per measure" of Sequencer64, which here matches the beats-per-measure displayed in the perfroll (piano roll).

Friends

- void update_perfedit_sequences ()

  This global function in the seq64 namespace calls perfedit :: draw_sequences(), if the global perfedit objects exist.

Additional Inherited Members

10.67.1 Detailed Description

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

10.67.2 Constructor & Destructor Documentation

10.67.2.1 perfedit()

```
seq64::perfedit::perfedit (
            perform & p,
            bool second_perfedit = false,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

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

Todo Offload most of the work into an initialization function like options does.

Parameters

p	Refers to the main performance object.
second_perfedit	If true, this object is the second perfedit object.
ppqn	The optionally-changed PPQN value to use for the performance editor.

10.67.2.2 ∼perfedit()

```
virtual seq64::perfedit::∼perfedit ( )  [inline], [virtual]
```

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

10.67.3 Member Function Documentation

10.67.3.1 init_before_show()

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

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

10.67.3.2 enqueue_draw()

```
void seq64::perfedit::enqueue_draw (
            bool forward = true )
```

Note that we call the children's queue_draw() functions, not enqueue_draw(), otherwise we'll get stack overflow.

Parameters

forward	If true (the default), pass the call to the peer. When passing this call to the peer, this parameter is set to false to prevent an infinite loop and the resultant stack overflow.

10.67.3.3 zoom_check()

```
static bool seq64::perfedit::zoom_check (
            int z )  [inline], [static]
```

It has to range from greater than 1 (the highest zoom-in causes an unexplained drawing artifact at this time), and not greater than four times the c_perf_scale_x value, at which point we have zoomed out so far that the measure numbers are almost completely obscured.

Parameters

z	The desired zoom value to validate.

10.67.3.4 enregister_peer()

```
void seq64::perfedit::enregister_peer (
            perfedit * peer )  [inline]
```

This function is meant to be called by mainwnd, which creates the perfedits and then makes sure they get along. Only the first call to this function will work; only one peer can be registered.

Parameters

peer	The peer perfedit object to register, if not null.

10.67.3.5 set_zoom()

```
void seq64::perfedit::set_zoom (
            int z )
```

Parameters

z	The zoom value to be set. The child zoom functions called each check that this value is valid.

10.67.3.6 get_toggle_jack()

```
bool seq64::perfedit::get_toggle_jack ( )
```

Returns

Returns the JACK button's get_active() status.

10.67.3.7 toggle_jack()

```
void seq64::perfedit::toggle_jack ( )
```

Note that this will trigger the button signal callback.

10.67.3.8 rewind()

```
void seq64::perfedit::rewind (
            bool press )  [inline]
```

The timeout is in milliseconds, and is currently hard-wired to 120.

Note the use of "&perf()" to get the address of the perform object.

Parameters

press	True if the operation is a key press, false if the operation is a key release.

10.67.3.9 fast_forward()

```
void seq64::perfedit::fast_forward (
            bool press )  [inline]
```

Parameters

press	True if the operation is a key press, false if the operation is a key release.

10.67.3.10 set_follow_transport()

```
void seq64::perfedit::set_follow_transport ( )
```

Note that this will trigger the button signal callback.

10.67.3.11 toggle_follow_transport()

```
void seq64::perfedit::toggle_follow_transport ( )
```

Note that this will trigger the button signal callback.

10.67.3.12 set_jack_mode()

```
void seq64::perfedit::set_jack_mode ( )
```

To avoid a lot of pointer dereferencing, much of the code is offloaded to perform::set_jack_mode(), which now returns a boolean.

10.67.3.13 set_transpose()

```
void seq64::perfedit::set_transpose (
            int transpose )
```

Parameters

transpose	The amount to transpose the transposable sequences. We need to add validation at some point, if the widget does not enforce that.

10.67.3.14 transpose_button_callback()

```
void seq64::perfedit::transpose_button_callback (
            int transpose )
```

Parameters

transpose	The amount to transpose the transposable sequences.

10.67.3.15 set_beats_per_bar()

```
void seq64::perfedit::set_beats_per_bar (
            int bpm )  [private]
```

The usage of is modified was faulty. Offloaded it to the perform object to make it more foolproof. See the perform::modify() function.

Parameters

bpm	Provides the beats/measure or beats/bar value to be set. This value is basically the numerator of the time signature.

10.67.3.16 set_beat_width()

```
void seq64::perfedit::set_beat_width (
            int bw )  [private]
```

The usage of is modified was faulty. Offloaded it to the perform object to make it more foolproof. See the perform::modify() function.

Parameters

bw	Provides the beat width to be set. The beat width is basically the denominator of the time signature.

10.67.3.17 set_snap()

```
void seq64::perfedit::set_snap (
            int snap )  [private]
```

Parameters

snap	Provide the snap value to be set. This value is basically the numerator of the expression "1 / snap".

10.67.3.18 set_guides()

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

See the set_snap() function.

It's a little confusing; I assigned the label "m_standard_bpm" to the value 4 in "measure_pulse = 192 ∗ 4 ∗ m_bpm / m_bw", but I am not sure I understand this equation... why the extra factor of 4? That 4 appears in "c_ppqn ∗ 4" a lot in the original code.

10.67.3.19 grow()

```
void seq64::perfedit::grow ( )  [private]
```

Make sure that setting the modified flag makes sense for this operation. It doesn't seem to modify members.

10.67.3.20 set_looped()

```
void seq64::perfedit::set_looped ( )  [private]
```

10.67.3.21 expand()

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

This action opens up a space of 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.

10.67.3.22 collapse()

```
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.

10.67.3.23 copy()

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

This action opens up a space of events between the L and R (left and right) markers, and copies the information from the same amount of events 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.

10.67.3.24 undo()

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

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

10.67.3.25 redo()

```
void seq64::perfedit::redo ( )  [private]
```

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

10.67.3.26 popup_menu()

```
void seq64::perfedit::popup_menu (
            Gtk::Menu * menu )  [private]
```

10.67.3.27 draw_sequences()

```
void seq64::perfedit::draw_sequences ( )  [private]
```

This is meant to be called when the focus of an open seqedit or eventedit window changes.

10.67.3.28 timeout()

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

It redraws "dirty" sequences in the perfroll and the perfnames objects, and shows draw progress on the perfroll. It also changes the pause/play image if the status of running has changed. This function is called frequently and continuously. It will work for both perfedit windows, if both are up.

10.67.3.29 set_image()

```
void seq64::perfedit::set_image (
            bool isrunning )  [private]
```

Parameters

isrunning	If true, the image should be the pause image. Otherwise, it should be the play image.

10.67.3.30 start_playing()

```
void seq64::perfedit::start_playing ( )  [private]
```

JACK will be used if it is present and, in the application, enabled and working. Note the new flag to let perform know that it is a pause/play request from the perfedit window. In other words, a forced Song mode.

10.67.3.31 pause_playing()

```
void seq64::perfedit::pause_playing ( )  [private]
```

Keeps the stop button enabled as a kind of rewind for ALSA. Stop in place!

10.67.3.32 stop_playing()

```
void seq64::perfedit::stop_playing ( )  [private]
```

We need to make the progress line move back to the beginning right away here.

10.67.3.33 toggle_playing()

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

Meant only to be called when the "Play" button is pressed. Currently, the GUI does not change. This function will ultimately act like a Pause/Play button, but currently the pause functionality on works (partially) for JACK transport. Currently not used.

10.67.3.34 on_realize()

```
void seq64::perfedit::on_realize ( )  [private]
```

10.67.3.35 on_key_press_event()

```
bool seq64::perfedit::on_key_press_event (
             GdkEventKey * ev )  [private]
```

By default, the space-bar starts the playing, and the Escape key stops the playing. The start/end key may be the same key (i.e. space-bar), allow toggling when the same key is mapped to both triggers. Note that we now pass false in the call to perform::playback_key_event(), if SEQ64_PAUSE_SUPPORT is compiled in. Song mode doesn't yield the pause effect we want.

Parameters

ev	Provides the key event to implement.

10.67.3.36 on_key_release_event()

```
bool seq64::perfedit::on_key_release_event (
            GdkEventKey * ev )  [private]
```

It is needed to turn off the fast-forward and rewind keys functionality when released.

Parameters

ev	Provides the key event to implement.

10.67.3.37 on_delete_event()

```
bool seq64::perfedit::on_delete_event (
            GdkEventAny *  )  [inline], [private]
```

10.67.4 Friends And Related Function Documentation

10.67.4.1 update_perfedit_sequences

```
void update_perfedit_sequences ( )  [friend]
```

It is used by other objects (seqedit and eventedit) that can modify the currently-edited sequence shown in the perfedit (song window).

10.67.5 Field Documentation

10.67.5.1 m_peer_perfedit

```
perfedit* seq64::perfedit::m_peer_perfedit  [private]
```

10.67.5.2 m_table

```
Gtk::Table* seq64::perfedit::m_table  [private]
```

Layout table for song editor.

10.67.5.3 m_vadjust

```
Gtk::Adjustment* seq64::perfedit::m_vadjust  [private]
```

10.67.5.4 m_hadjust

```
Gtk::Adjustment* seq64::perfedit::m_hadjust  [private]
```

10.67.5.5 m_vscroll

```
Gtk::VScrollbar* seq64::perfedit::m_vscroll  [private]
```

10.67.5.6 m_hscroll

```
Gtk::HScrollbar* seq64::perfedit::m_hscroll  [private]
```

10.67.5.7 m_perfnames

```
perfnames* seq64::perfedit::m_perfnames  [private]
```

10.67.5.8 m_perfroll

```
perfroll* seq64::perfedit::m_perfroll  [private]
```

10.67.5.9 m_perftime

```
perftime* seq64::perfedit::m_perftime  [private]
```

10.67.5.10 m_menu_snap

```
Gtk::Menu* seq64::perfedit::m_menu_snap  [private]
```

10.67.5.11 m_menu_xpose

```
Gtk::Menu* seq64::perfedit::m_menu_xpose  [private]
```

10.67.5.12 m_button_xpose

```
Gtk::Button* seq64::perfedit::m_button_xpose  [private]
```

10.67.5.13 m_entry_xpose

```
Gtk::Entry* seq64::perfedit::m_entry_xpose  [private]
```

10.67.5.14 m_image_play

```
Gtk::Image* seq64::perfedit::m_image_play  [private]
```

10.67.5.15 m_button_snap

```
Gtk::Button* seq64::perfedit::m_button_snap  [private]
```

10.67.5.16 m_entry_snap

```
Gtk::Entry* seq64::perfedit::m_entry_snap  [private]
```

10.67.5.17 m_button_stop

```
Gtk::Button* seq64::perfedit::m_button_stop  [private]
```

10.67.5.18 m_button_play

```
Gtk::Button* seq64::perfedit::m_button_play  [private]
```

The Play button object.

10.67.5.19 m_button_loop

```
Gtk::ToggleButton* seq64::perfedit::m_button_loop  [private]
```

10.67.5.20 m_button_expand

```
Gtk::Button* seq64::perfedit::m_button_expand  [private]
```

10.67.5.21 m_button_collapse

```
Gtk::Button* seq64::perfedit::m_button_collapse  [private]
```

10.67.5.22 m_button_copy

```
Gtk::Button* seq64::perfedit::m_button_copy  [private]
```

10.67.5.23 m_button_grow

```
Gtk::Button* seq64::perfedit::m_button_grow  [private]
```

10.67.5.24 m_button_undo

```
Gtk::Button* seq64::perfedit::m_button_undo  [private]
```

10.67.5.25 m_button_redo

```
Gtk::Button* seq64::perfedit::m_button_redo  [private]
```

10.67.5.26 m_button_jack

```
Gtk::ToggleButton* seq64::perfedit::m_button_jack [private]
```

10.67.5.27 m_button_follow

```
Gtk::ToggleButton* seq64::perfedit::m_button_follow [private]
```

10.67.5.28 m_button_bpm

```
Gtk::Button* seq64::perfedit::m_button_bpm [private]
```

10.67.5.29 m_entry_bpm

```
Gtk::Entry* seq64::perfedit::m_entry_bpm [private]
```

10.67.5.30 m_button_bw

```
Gtk::Button* seq64::perfedit::m_button_bw [private]
```

10.67.5.31 m_entry_bw

```
Gtk::Entry* seq64::perfedit::m_entry_bw [private]
```

10.67.5.32 m_hbox

```
Gtk::HBox* seq64::perfedit::m_hbox [private]
```

10.67.5.33 m_hlbox

```
Gtk::HBox* seq64::perfedit::m_hlbox [private]
```

10.67.5.34 m_menu_bpm

```
Gtk::Menu* seq64::perfedit::m_menu_bpm  [private]
```

Drop-down menu for beats/minute.

10.67.5.35 m_menu_bw

```
Gtk::Menu* seq64::perfedit::m_menu_bw  [private]
```

10.67.5.36 m_snap

```
int seq64::perfedit::m_snap  [private]
```

10.67.5.37 m_bpm

```
int seq64::perfedit::m_bpm  [private]
```

Do not confuse it with BPM (beats per minute). The numerator of the time signature.

10.67.5.38 m_bw

```
int seq64::perfedit::m_bw  [private]
```

The denominator of the time signature.

10.67.5.39 m_ppqn

```
int seq64::perfedit::m_ppqn  [private]
```

10.67.5.40 m_is_running

```
bool seq64::perfedit::m_is_running  [private]
```

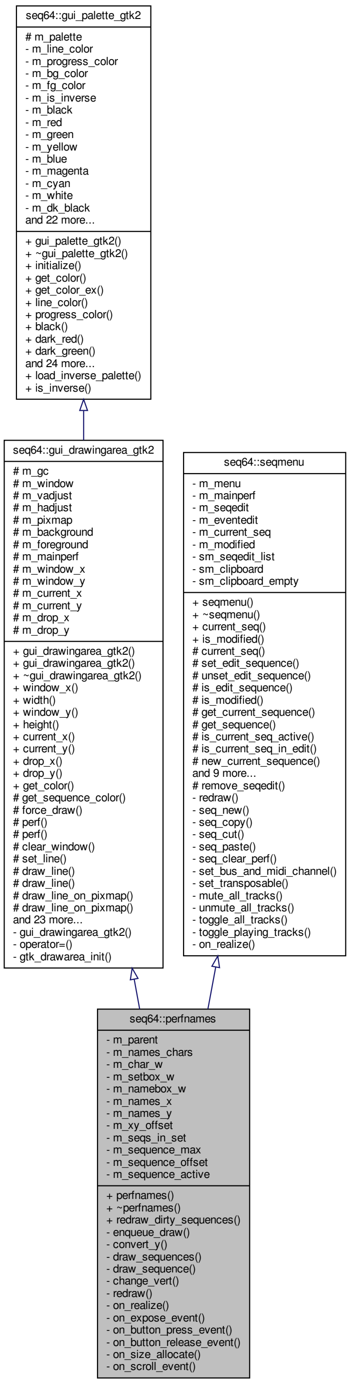
10.67.5.41 m_standard_bpm

```
int seq64::perfedit::m_standard_bpm  [private]
```

10.68 seq64::perfnames Class Reference

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

Inheritance diagram for seq64::perfnames:



Public Member Functions

- perfnames (perform &p, perfedit &parent, Gtk::Adjustment &vadjust)

Principal constructor for this user-interface object.
- virtual ∼perfnames ()

  Let's provide a do-nothing virtual destructor.
- void redraw_dirty_sequences ()

  Redraws sequences that have been modified.

Private Member Functions

- void enqueue_draw ()

  Wraps queue_draw() and forwards the call to the parent perfedit, so that it can forward it to any other perfedit that exists, and to the other sub-elements of the song editor.
- int convert_y (int y)

  Converts a y-value into a sequence number and returns it.
- void draw_sequences ()

  New function to encapsulate forced redrawing of all sequence names in the current viewport.
- void draw_sequence (int sequence)

  Draw the given sequence.
- void change_vert ()

  Change the vertial offset of a sequence/pattern.
- 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 [the right mouse button is handled in on_button_release_event()].
- bool on_button_release_event (GdkEventButton ∗ev)

  Handles a button-release for the right button, bringing up a popup menu that is identical to the right-click popup menu for a slot in the patterns panel (mainwid), and context sensitive.
- void on_size_allocate (Gtk::Allocation &)

  Handles a size-allocation event.
- bool on_scroll_event (GdkEventScroll ∗ev)

  Handle the vertical scrolling of the window.

Private Attributes

- perfedit & m_parent

  Provides a link to the perfedit that created this object.
- int m_names_chars

  Provides the number of the characters in the name box.
- int m_char_w

  Provides the "real" width of a character.
- int m_setbox_w

  Provides the width of the "set number" box.
- int m_namebox_w

  Provides the width of the "name" box.
- int m_names_x

  Provides the width of the names box, which is the width of a character for 24 characters.

- int m_names_y

    Provides the height of the names box, which is hardwired to 24 pixels.
- int m_xy_offset

    Provides the horizontal and vertical offsets of the text relative to the names box.
- const int m_seqs_in_set

    The number of sequences in a set, currently still hardwired to 32.
- const int m_sequence_max

    The maximum number of sequences, current 32 x 32 = 1024.
- int m_sequence_offset

    The offset from the 0th sequence, which is determined by the vertical view of the piano roll, controlled by the vertical scroll-bar.
- bool m_sequence_active [c_max_sequence]

    Indicates if the given sequence is active or not.

Friends

- class perfedit

Additional Inherited Members

10.68.1 Detailed Description

It inherits from gui_drawingarea_gtk2 to support the font, color, and other GUI functionality, and from seqmenu to support the right-click Edit/New/Cut right-click menu.

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).

10.68.2 Constructor & Destructor Documentation

10.68.2.1 perfnames()

```
seq64::perfnames::perfnames (
            perform & p,
            perfedit & parent,
            Gtk::Adjustment & vadjust )
```

Weird is that the window (x,y) are set to (c_names_x, 100), when c_names_y is 22 (now 24) in globals.h.

Parameters

p	Provides a reference to the main performance object of the application.
parent	Provides a reference to the object that contains this object, so that this object can tell the parent to queue up a drawing operation.
vadjust	Provides the vertical scrollbar object needed so that perfnames can respond to scrollbar cursor/thumb movement.

10.68.2.2 ∼perfnames()

```
virtual seq64::perfnames::∼perfnames ( ) [inline], [virtual]
```

10.68.3 Member Function Documentation

10.68.3.1 redraw_dirty_sequences()

```
void seq64::perfnames::redraw_dirty_sequences ( )
```

10.68.3.2 enqueue_draw()

```
void seq64::perfnames::enqueue_draw ( ) [private]
```

The parent perfedit will call perfnames::queue_draw() on behalf of this object, and it will pass a perfnames↩ ::enqueue_draw() to the peer perfedit's perfnames, if the peer exists.

10.68.3.3 convert_y()

```
int seq64::perfnames::convert_y (
             int y ) [private]
```

Used in figuring out which sequence to mute/unmute in the performance editor.

Parameters

y	The y value (within the vertical limits of the perfnames column to the left of the performance editor's piano roll.

Returns

Returns the sequence number corresponding to the y value.

10.68.3.4 draw_sequences()

```
void seq64::perfnames::draw_sequences ( ) [private]
```

10.68.3.5 draw_sequence()

```
void seq64::perfnames::draw_sequence (
            int seqnum )  [private]
```

This function has to be prepared to handle an almost endless list of sequences, including unused ones, to draw them all with compatible styles. The sequences are grouped by set-number. The set-number occurs every 32 sequences in the leftmost column of the window.

1. Render the set number, or a blank box, in leftmost column. If the y height of the first draw_rectangle is m_names_y + 1, then we get a black line for the blank tracks, looks ugly.
2. Make sure that the rectangle drawn with the proper background colors for various combinations of muting and highlighting, otherwise just the name is properly colored.
3. Render the column with the name of the sequence. The channel number ranges from 1 to 16, but SMF 0 is indicated on-screen by a channel number of 0. We get the label format from the perform object, for consistency across windows.

Parameters

seqnum	Index to the sequence information to be drawn.

10.68.3.6 change_vert()

```
void seq64::perfnames::change_vert ( )  [private]
```

10.68.3.7 redraw()

```
void seq64::perfnames::redraw (
            int sequence )  [inline], [private], [virtual]
```

This function is a virtual function of seqmenu that must be overridden in this class.

Parameters

sequence	Provides the number of the sequence to be redrawn.

Implements seq64::seqmenu.

10.68.3.8 on_realize()

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

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

10.68.3.9 on_expose_event()

```
bool seq64::perfnames::on_expose_event (
             GdkEventExpose * ev )  [private]
```

It draws all of the sequences that will be visible.

We could actually optimize this a tiny bit, to save some additions in the for loop.

Parameters

ev	The expose event, not used.

Returns

Always returns true.

10.68.3.10 on_button_press_event()

```
bool seq64::perfnames::on_button_press_event (
             GdkEventButton * ev )  [private]
```

Two operations are supported by left-clicking on the sequence/track name:

```
-   Normal.  Toggles the mute status of the sequence that is clicked.
-   Shift.  Toggles the mutes status of all other sequences, making
    this operation an easy way to preview a single sequence in the
    performance editor, then bring back the rest of the tracks.
```

Parameters

ev	The mouse button event.

Returns

Always returns true.

10.68.3.11 on_button_release_event()

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

Parameters

p0	The button event.

Returns

Always returns false.

10.68.3.12 on_size_allocate()

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

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

Parameters

a	The allocation event. It is passed to the base-class on_size_allocate() function, and then m_window_x and m_window_y are set to the width and height, respectively, of the allocation.

10.68.3.13 on_scroll_event()

```
bool seq64::perfnames::on_scroll_event (
            GdkEventScroll * ev )  [private]
```

The vertical value is incremented or decremented by the amount of the step increment, and the page is clamped to the new value.

Parameters

ev	The scrolling event.

Returns

Always returns true.

10.68.4 Friends And Related Function Documentation

10.68.4.1 perfedit

```
friend class perfedit  [friend]
```

10.68.5 Field Documentation

10.68.5.1 m_parent

```
perfedit& seq64::perfnames::m_parent  [private]
```

We want to support two perfedit windows, but the children of perfedit will have to communicate changes requiring a redraw through the parent.

10.68.5.2 m_names_chars

```
int seq64::perfnames::m_names_chars  [private]
```

Pretty much hardwired to 24 at present.

10.68.5.3 m_char_w

```
int seq64::perfnames::m_char_w  [private]
```

This value is obtained from a font-renderer accessor function.

10.68.5.4 m_setbox_w

```
int seq64::perfnames::m_setbox_w  [private]
```

This used to be hardwired to 6 $*$ 2 (character-width times two).

10.68.5.5 m_namebox_w

```
int seq64::perfnames::m_namebox_w  [private]
```

This used to be a weird calculation based on character width.

10.68.5.6 m_names_x

```
int seq64::perfnames::m_names_x  [private]
```

10.68.5.7 m_names_y

```
int seq64::perfnames::m_names_y  [private]
```

This value was once 22 pixels, but we need a little extra room for our new font. This extra room is compatible enough with the old font, as well.

10.68.5.8 m_xy_offset

```
int seq64::perfnames::m_xy_offset  [private]
```

Currently hardwired.

10.68.5.9 m_seqs_in_set

```
const int seq64::perfnames::m_seqs_in_set  [private]
```

Belay that, we now get it from user_settings.

10.68.5.10 m_sequence_max

```
const int seq64::perfnames::m_sequence_max  [private]
```

10.68.5.11 m_sequence_offset

```
int seq64::perfnames::m_sequence_offset  [private]
```

10.68.5.12 m_sequence_active

```
bool seq64::perfnames::m_sequence_active[c_max_sequence]  [private]
```

If this really is the true meaning of this value, we ought to get it directly from the sequence if we can.

10.69 seq64::perform Class Reference

This class supports the performance mode.

Public Types

- enum action_t {
  ACTION_NONE,
  ACTION_SEQ_TOGGLE,
  ACTION_GROUP_MUTE,
  ACTION_BPM,
  ACTION_SCREENSET,
  ACTION_GROUP_LEARN,
  ACTION_C_STATUS }

  In many cases, when we check a key action that perform wil do, it is sufficient to return a boolean.
- enum record_tempo_op_t {
  RECORD_TEMPO_LOG_EVENT,
  RECORD_TEMPO_ON,
  RECORD_TEMPO_OFF }

  Provides settings for tempo recording.
- enum mute_op_t {
  MUTE_TOGGLE,
  MUTE_OFF,
  MUTE_ON }

  Provides settings for muting.
- enum ff_rw_button_t {
  FF_RW_REWIND,
  FF_RW_NONE,
  FF_RW_FORWARD }

  Provides setting for the fast-forward and rewind functionality.

Public Member Functions

- perform (gui_assistant &mygui, int ppqn=SEQ64_USE_DEFAULT_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.
- bool is_modified () const

  'Getter' function for member m_is_modfied
- void modify ()

  'Setter' function for member m_is_modified This setter only sets the modified-flag to true.
- int ppqn () const

  'Getter' function for member m_ppqn
- midibpm bpm () const

  'Getter' function for member m_bpm
- int sequence_count () const

  'Getter' function for member m_sequence_count It is better to call this getter before bothering to even try to use a sequence.
- int sequence_high () const

  'Getter' function for member m_sequence_high
- int sequence_max () const

  'Getter' function for member m_sequence_max
- int group_max () const

  'Getter' function for member m_max_groups
- bool is_control_status () const

  'Getter' function for member m_control_status

- bool midi_mute_group_present () const

    'Getter' function for member m_midi_mute_group_present
- void set_edit_sequence (int seqnum)

    'Setter' function for member m_edit_sequence
- void unset_edit_sequence (int seqnum)

    'Setter' function for member m_edit_sequence
- bool is_edit_sequence (int seqnum) const

    'Getter' function for member m_edit_sequence
- int get_beats_per_bar () const

    'Getter' function for member m_beats_per_bar
- void set_beats_per_bar (int bpm)

    'Setter' function for member m_beats_per_bar
- int get_beat_width () const

    'Getter' function for member m_beat_width
- void set_beat_width (int bw)

    'Setter' function for member m_beat_width
- int get_tempo_track_number () const

    'Getter' function for member m_tempo_track_number
- void set_tempo_track_number (int tempotrack)

    'Setter' function for member m_tempo_track_number
- void clocks_per_metronome (int cpm)

    'Setter' function for member m_clocks_per_metronome
- int clocks_per_metronome () const

    'Getter' function for member m_clocks_per_metronome
- void set_32nds_per_quarter (int tpq)

    'Setter' function for member m_32nds_per_quarter
- int get_32nds_per_quarter () const

    'Getter' function for member m_32nds_per_quarter
- void us_per_quarter_note (long upqn)

    'Setter' function for member m_us_per_quarter_note
- long us_per_quarter_note () const

    'Getter' function for member m_us_per_quarter_note
- 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 Obviously, this is a dangerous function, but we've got ya covered.
- void filter_by_channel (bool flag)

    'Setter' function for member m_master_bus.filter_by_channel()
- bool is_running () const

    'Getter' function for member m_is_running Could also be called "is_playing()".
- bool is_pattern_playing () const

    'Setter' function for member m_is_pattern_playing
- void is_pattern_playing (bool flag)

    'Setter' function for member m_is_pattern_playing
- bool toggle_song_start_mode ()

'Setter' function for member m_song_start_mode
- void song_start_mode (bool flag)

  'Setter' function for member m_song_start_mode
- bool song_start_mode () const

  'Getter' function for member m_song_start_mode
- bool is_jack_running () const

  'Getter' function for member m_jack_asst.is_running() This function is useful for announcing the status of JACK in user-interface items that only have access to the perform object.
- bool is_jack_master () const

  'Getter' function for member m_jack_asst.is_master() Also now includes is_jack_running(), since one cannot be JACK Master if JACK is not running.
- void enregister (performcallback ∗pfcb)

  Adds a pointer to an object to be notified by this perform object.
- void toggle_jack_mode ()
- bool set_jack_mode (bool mode)

  Encapsulates behavior needed by perfedit.
- bool get_toggle_jack () const

  'Getter' function for member m_jack_asst.get_jack_mode()
- void set_jack_stop_tick (midipulse tick)

  'Setter' function for member m_jack_asst.set_jack_stop_tick()
- unsigned short combine_bytes (midibyte b0, midibyte b1)

  Combines bytes into an unsigned-short value.
- void FF_rewind ()

  Implements the fast-forward or rewind functionality imported from seq32.
- bool FF_RW_timeout ()

  Convenience function.
- void start_from_perfedit (bool flag)

  'Setter' function for member m_start_from_perfedit
- bool start_from_perfedit () const

  'Getter' function for member m_start_from_perfedit
- void set_follow_transport (bool flag)

  'Getter' function for member m_jack_asst.set_follow_transport()
- bool get_follow_transport () const

  'Getter' function for member m_jack_asst.get_follow_transport()
- void toggle_follow_transport ()

  'Setter' function for member m_jack_asst.toggle_follow_transport()
- bool follow_progress () const

  Convenience function for following progress in seqedit.
- void set_reposition (bool postype=true)

  'Getter' function for member m_reposition
- ff_rw_button_t ff_rw_type ()

  'Getter' function for member m_FF_RW_button_type
- void ff_rw_type (ff_rw_button_t button_type)

  'Getter' function for member m_FF_RW_button_type
- void rewind (bool press)

  Sets the rewind status.
- void fast_forward (bool press)

  Sets the fast-forward status.
- void reposition (midipulse tick)

  Encapsulates some repositioning code needed to move the position to the mouse pointer location in perfroll.
- void set_sequence_input (bool active, sequence ∗s)

'Getter' function for member m_master_bus->set_sequence_input()
- void set_recording (bool rec_active, bool thru_active, sequence ∗s)

  Encapsulates code used by seqedit::record_change_callback().
- void set_recording (bool rec_active, int seq, bool toggle=false)

  Encapsulates code used by seqedit::record_change_callback().
- void set_quantized_recording (bool rec_active, sequence ∗s)

  Sets quantized recording in the way used by seqedit.
- void set_quantized_recording (bool rec_active, int seq, bool toggle=false)

  Sets quantized recording.
- void set_overwrite_recording (bool overwrite_active, int seq, bool toggle=false)

  Set recording for overwrite.
- void set_thru (bool rec_active, bool thru_active, sequence ∗s)

  Encapsulates code used by seqedit::thru_change_callback().
- void set_thru (bool thru_active, int seq, bool toggle=false)

  Encapsulates code used by seqedit::thru_change_callback().
- bool selected_trigger (int seqnum, midipulse droptick, midipulse &tick0, midipulse &tick1)

  Encapsulates getting the trigger limits without putting the burden on the caller.
- bool clear_all ()

  Clears all of the patterns/sequences.
- void launch (int ppqn)

  Calls the MIDI buss and JACK initialization functions and the input/output thread-launching functions.
- void finish ()

  The rough opposite of launch(); it doesn't stop the threads.
- void new_sequence (int seq)

  Creates a new pattern/sequence for the given slot, and sets the new pattern's master MIDI bus address.
- void add_sequence (sequence ∗seq, int perf)

  Adds a pattern/sequence pointer to the list of patterns.
- void delete_sequence (int seq)

  Deletes a pattern/sequence by number.
- bool is_sequence_in_edit (int seq)

  Check if the pattern/sequence, given by number, has an edit in progress.
- void print_busses () const

  Shows all the triggers of all the sequences.
- midipulse get_tick () const

  'Getter' function for member m_tick
- void set_tick (midipulse tick)

  This version for song-recording not only logs m_tick, it also does JACK positioning (if applicable), calls the master bus's continue_from() function, and sets m_current_tick as well.
- midipulse get_jack_tick () const

  'Getter' function for member m_jack_tick
- void set_jack_tick (midipulse tick)

  'Setter' function for member m_jack_tick
- void set_left_tick (midipulse tick, bool setstart=true)

  Set the left marker at the given tick.
- midipulse get_left_tick () const

  'Getter' function for member m_left_tick
- void set_start_tick (midipulse tick)

  'Setter' function for member m_starting_tick
- midipulse get_start_tick () const

  'Setter' function for member m_starting_tick
- void set_right_tick (midipulse tick, bool setstart=true)

Set the right marker at the given tick.
- midipulse get_right_tick () const

  'Getter' function for member m_right_tick
- double left_right_size () const

  Convenience function for JACK support when loop in song mode.
- bool is_active (int seq) const

  Checks the pattern/sequence for activity.
- void apply_song_transpose ()

  Calls the apply_song_transpose() function for all active sequences.
- void set_transpose (int t)

  'Setter' function for member m_transpose For sanity's sake, the values are restricted to +-64.
- int get_transpose () const

  'Getter' function for member m_transpose
- midibpm get_beats_per_minute ()

  'Getter' function for member m_master_bus.get_beats_per_minute Retrieves the BPM setting of the master MIDI buss.
- bool reload_mute_groups (std::string &errmessage)

  Reloads the mute groups from the "rc" file.
- bool clear_mute_groups ()

  Clears all the group-mute items, whether they came from the "rc" file or from the most recently-loaded Sequencer64 MIDI file.
- void set_sequence_control_status (int status)

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

  If the given status is present in the c_status_snapshot, the playing state is restored.
- void unset_queued_replace (bool clearbits=true)

  Helper function that clears the queued-replace feature.
- void sequence_playing_toggle (int seq)

  If the given sequence is active, then it is toggled as per the current value of m_control_status.
- void sequence_playing_change (int seq, bool on)

  Turn the playing of a sequence on or off.
- void set_keep_queue (bool activate)

  Sets or unsets the keep-queue functionality, to be used by the new "Q" button in the main window.
- bool is_keep_queue () const

  Returns true if the c_status_queue bit is set.
- void sequence_playing_on (int seq)

  Calls sequence_playing_change() with a value of true.
- void sequence_playing_off (int seq)

  Calls sequence_playing_change() with a value of false.
- void mute_all_tracks (bool flag=true)

  Mutes/unmutes all tracks in the current set of active patterns/sequences.
- void toggle_all_tracks ()

  Toggles the mutes status of all tracks in the current set of active patterns/sequences.
- bool armed_saved () const

  'Getter' function for member m_armed_saved
- void toggle_playing_tracks ()

  Toggles the mutes status of all playing (currently unmuted) tracks in the current set of active patterns/sequences on all screen-sets.
- void mute_screenset (int ss, bool flag=true)

  Mutes/unmutes all tracks in the desired screen-set.
- void output_func ()

Performance output function.

- void input_func ()

  This function is called by input_thread_func().
- void set_group_mute_state (int gtrack, bool muted)

  This function sets the mute state of an element in the m_mute_group array.
- bool get_group_mute_state (int gtrack)

  The opposite of set_group_mute_state(), it gets the value of the desired track.
- int mute_group_offset (int track)

  A helper function to calculate the index into the mute-group array, based on the desired track.
- int screenset_offset () const

  'Getter' function for member m_screenset_offset
- int slot_number (int s)

  Translates a pattern number to a slot number re the current screenset offset.
- 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.
- void save_current_screenset (int repseq)

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

  Clears the m_screenset_state[] array.
- std::string key_name (unsigned k) const

  Here follows a few forwarding functions for the keys_perform-derived classes.
- keys_perform::SlotMap & get_key_events ()

  Forwarding function for key events.
- int get_key_count (unsigned k) const

  Returns the number of times the given key appears in the SlotMap, either 0 or 1.
- keys_perform::SlotMap & get_key_groups ()

  Forwarding function for key groups.
- keys_perform::RevSlotMap & get_key_events_rev ()

  Forwarding function for reverse key events.
- keys_perform::RevSlotMap & get_key_groups_rev ()

  Forwarding function for reverse key groups.
- bool show_ui_sequence_key () const

  'Getter' function for member m_show_ui_sequency_key Provides access to keys().show_ui_sequence_key().
- void show_ui_sequence_key (bool flag)

  'Setter' function for member m_show_ui_sequency_key
- bool show_ui_sequence_number () const

  'Getter' function for member m_show_ui_sequency_number Provides access to keys().show_ui_sequence_number().
- void show_ui_sequence_number (bool flag)

  'Getter' function for member m_show_ui_sequency_number
- unsigned lookup_keyevent_key (int seqnum)

  Gets the event key for the given sequence.
- unsigned lookup_slot_key (int slotnum)

  Like lookup_keyevent_key(), but assumes the slot number has already been correctly calculated.
- int lookup_keyevent_seq (unsigned keycode)

  Gets the sequence number for the given event key.
- unsigned lookup_keygroup_key (int groupnum)

  Gets the group key for the given sequence.

- int lookup_keygroup_group (unsigned keycode)

  Gets the group number for the given group key.
- void start_playing (bool songmode=false)

  Encapsulates a series of calls used in mainwnd.
- void pause_playing (bool songmode=false)

  Pause playback, so that progress bars stay where they are, and playback always resumes where it left off, at least in ALSA mode, which doesn't have to worry about being a "slave".
- void stop_playing ()

  Encapsulates a series of calls used in mainwnd.
- void start_key (bool songmode=false)

  Invoke the start key functionality.
- void pause_key (bool songmode=false)

  Invoke the pause key functionality.
- void stop_key ()

  Invoke the stop key functionality.
- void learn_toggle ()

  Encapsulates some calls used in mainwnd.
- midibpm decrement_beats_per_minute ()

  Encapsulates some calls used in mainwnd.
- midibpm increment_beats_per_minute ()

  Encapsulates some calls used in mainwnd.
- midibpm page_decrement_beats_per_minute ()

  Provides additional coarse control over the BPM value, which comes into force when the Page-Up/Page-Down keys are pressed.
- midibpm page_increment_beats_per_minute ()

  Provides additional coarse control over the BPM value, which comes into force when the Page-Up/Page-Down keys are pressed.
- int decrement_screenset (int amount=1)

  Encapsulates some calls used in mainwnd.
- int increment_screenset (int amount=1)

  Encapsulates some calls used in mainwnd.
- bool highlight (const sequence &seq) const

  True if a sequence is empty and should be highlighted.
- bool is_smf_0 (const sequence &seq) const

  True if the sequence is an SMF 0 sequence.
- const sequence ∗ get_sequence (int seq) const

  Retrieves the actual sequence, based on the pattern/sequence number.
- sequence ∗ get_sequence (int seq)

  Retrieves the actual sequence, based on the pattern/sequence number.
- void sequence_key (int seq)

  Handle a sequence key to toggle the playing of an active pattern in the selected screen-set.
- std::string sequence_label (const sequence &seq)

  Provides a way to format the sequence parameters string for display in the mainwid or perfnames modules.
- std::string sequence_label (int seqnumb)

  A pass-through to the other sequence_label() function.
- std::string sequence_title (const sequence &seq)

  Creates the sequence title, adjusting it for scaling down.
- std::string main_window_title ()

  Creates the main window title.
- std::string sequence_window_title (const sequence &seq)

  Creates a sequence ("seqedit") window title, a longer version of sequence_title().

- void set_input_bus (bussbyte bus, bool input_active)

  Sets the input bus, and handles the special "key labels on sequence" and "sequence numbers on sequence" functionality.
- void set_clock_bus (bussbyte bus, clock_e clocktype)

  Sets the clock value, as specified in the Options / MIDI Clocks tab.
- bool mainwnd_key_event (const keystroke &k)

  Provided for mainwnd :: on_key_press_event() and mainwnd :: on_key_release_event() to call.
- bool keyboard_control_press (unsigned key)

  Still need to work on this one.
- bool keyboard_group_c_status_press (unsigned key)

  Categories of keyboard actions:
- bool keyboard_group_c_status_release (unsigned key)
- bool keyboard_group_press (unsigned key)
- bool keyboard_group_release (unsigned key)
- action_t keyboard_group_action (unsigned key)
- bool perfroll_key_event (const keystroke &k, int drop_sequence)

  Provided for perfroll :: on_key_press_event() and perfroll :: on_key_release_event() to call.
- bool playback_key_event (const keystroke &k, bool songmode=false)

  New function provided to unify the stop/start (space/escape) behavior of the various windows where playback can be started, paused, or stopped.
- void clear_sequence_triggers (int seq)

  Clears the patterns/sequence for the given sequence, if it is active.
- void print_triggers () const

  Shows all the triggers of all the sequences.
- void move_triggers (bool 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 (int track=SEQ64_ALL_TRACKS)

  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 pop_trigger_redo ()

  For every active sequence, call that sequence's pop_trigger_redo() function.
- bool get_trigger_state (int seqnum, midipulse tick) const

  Pass-along to sequence::get_trigger_state().
- void add_trigger (int seqnum, midipulse tick)

  Adds a trigger on behalf of a sequence.
- void delete_trigger (int seqnum, midipulse tick)

  Delete the existing specified trigger.
- void add_or_delete_trigger (int seqnum, midipulse tick)

  Add a new trigger if nothing is selected, otherwise delete the existing trigger.
- void split_trigger (int seqnum, midipulse tick)

  Convenience function for perfroll's split-trigger functionality.
- void paste_trigger (int seqnum, midipulse tick)

  Convenience function for perfroll's paste-trigger functionality.
- void paste_or_split_trigger (int seqnum, midipulse tick)

  Convenience function for perfroll's paste-or-split-trigger functionality.
- bool intersect_triggers (int seqnum, midipulse tick)

  Finds the trigger intersection.

- midipulse get_max_trigger () const

    Locates the largest trigger value among the active sequences.
- bool is_dirty_main (int seq)

    Checks the pattern/sequence for main-dirtiness.
- bool is_dirty_edit (int seq)

    Checks the pattern/sequence for edit-dirtiness.
- bool is_dirty_perf (int seq)

    Checks the pattern/sequence for perf-dirtiness.
- bool is_dirty_names (int seq)

    Checks the pattern/sequence for names-dirtiness.
- bool is_exportable (int seq) const

    Indicates that the desired sequence is active, unmuted, and has a non-zero trigger count.
- int set_screenset (int ss)

    Sets the m_screenset value (the index or ID of the current screen-set).
- int screenset () const

    'Getter' function for member m_screenset
- int get_playing_screenset () const

    'Getter' function for member m_playscreen
- bool toggle_other_seqs (int seqnum, bool isshiftkey)

    This code handles the use of the Shift key to toggle the mute state of all other sequences.
- bool toggle_other_names (int seqnum, bool isshiftkey)

    This code handles the use of the Shift key to toggle the mute state of all other sequences.
- bool are_any_armed ()

    Indicates if any sequences are armed (playing).
- void max_sets (int sets)

    'Setter' function for member m_max_sets This setter is needed to modify the value after reading the "user" file.
- void seqs_in_set (int seqs)

    'Setter' function for member m_seqs_in_set This setter modifies the current value based on the current values of the settings found in the user_settings module.
- bool song_recording () const
- bool song_record_snap () const
- bool resume_note_ons () const
- void resume_note_ons (bool f)
- bool select_trigger (int dropseq, midipulse droptick)

    Selectes a trigger for the given sequence.
- void unselect_all_triggers ()

    Calls sequence::unselect_triggers() for all active sequences.
- const std::string & get_bank_name (int bank) const

    A better name for get_screen_set_notepad(), adapted from Kepler34.
- void set_looping (bool looping)

    'Setter' function for member m_looping
- int get_sequence_color (int seqnum) const

    Deals with the colors used to represent specific sequences.
- void set_sequence_color (int seqnum, int c)
- bool have_undo () const

    'Getter' function for member m_have_undo
- void set_have_undo (bool undo)

    'Setter' function for member m_have_undo Note that, if the undo parameter is true, then we mark the performance as modified.
- bool have_redo () const

    'Getter' function for member m_have_redo

- void set_have_redo (bool redo)

  'Setter' function for member m_have_redo
- edit_mode_t seq_edit_mode (int seq) const
- void seq_edit_mode (int seq, edit_mode_t ed)

  A pass-along function to set the edit-mode of the given sequence.
- const std::string & current_screenset_notepad () const

  Returns the notepad text for the current screen-set.
- void set_screenset_notepad (int screenset, const std::string &note, bool is_load_modification=false)

  Copies the given string into m_screenset_notepad[].
- void set_screenset_notepad (const std::string &note)

  Sets the notepad text for the current screen-set.
- void start (bool 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 song_recording_stop ()

  Calls sequence::song_recording_stop(m_current_tick) for all sequences.
- void song_recording (bool f)
- void song_record_snap (bool f)
- bool playback_mode ()

  'Getter' function for member m_playback_mode
- void playback_mode (bool playbackmode)

  'Setter' function for member m_playback_mode
- bool is_group_learning ()

  'Getter' function for member m_mode_group_learn
- void set_beats_per_minute (midibpm bpm)

  Sets the value of the BPM into the master MIDI buss, after making sure it is squelched to be between 20 and 500.
- void panic ()

  Similar to all_notes_off(), but also sends Note Off events directly to the active busses.

Private Member Functions

- void ppqn (int p)

  'Setter' function for member m_ppqn
- void collapse ()

  Convenience function for perfedit's collapse functionality.
- void copy ()

  Convenience function for perfedit's copy functionality.
- void expand ()

  Convenience function for perfedit's expand functionality.
- midi_control & midi_control_toggle (int ctl)

  Retrieves a reference to a value from m_midi_cc_toggle[].
- midi_control & midi_control_on (int ctl)

  Retrieves a reference to a value from m_midi_cc_on[].
- midi_control & midi_control_off (int ctl)

  Retrieves a reference to a value from m_midi_cc_off[].

- bool midi_control_event (const event &ev)

  This function encapsulates code in input_func() to make it easier to read and understand.
- bool midi_control_record (const event &ev)

  Checks the event to see if it is a c_midi_control_record event, and performs the requested action (toggle, on, off) if so.
- bool handle_midi_control (int control, bool state)

  Handle the MIDI Control values that provide some automation for the application.
- bool handle_midi_control_ex (int control, midi_control::action a, int v)

  Provides operation of the new MIDI controls.
- bool handle_midi_control_event (const event &ev, int ctrl, int offset=0)

  Code extracted from midi_control_event() to be re-used for handling shorter lists of events.
- const std::string & get_screenset_notepad (int screenset) const

  Retrieves the given string from m_screenset_notepad[].
- bool any_group_unmutes () const

  'Getter' function for member m_mute_group[]
- void print_group_unmutes () const

  This function is a way to dump the mute-group settings in a way independent of the code in the optionsfile module, for debugging.
- void mute_group_tracks ()

  If m_mode_group is true, then this function operates.
- void select_and_mute_group (int g_group)

  Select a mute group and then mutes the track in the group.
- void set_song_mute (mute_op_t op)

  Provides for various settings of the song-mute status of all sequences in the song.
- void set_playing_screenset ()

  Sets the screen-set that is active, based on the value of m_screenset.
- 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 gmute)

  If we're in group-learn mode, then this function gets the playing statuses of all of the sequences in the current play-screen, and copies them into the desired mute-group.
- 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.
- bool load_mute_group (int gmute, int gm [c_max_groups])

  Combines select_group_mute() and set_group_mute_state() so that the optionsfile class can load the groups without altering the m_mute_group_selected item; doing that is a bit misleading.
- bool save_mute_group (int gmute, int gm [c_max_groups]) const

  The converse of load_mute_group().
- void set_and_copy_mute_group (int group)

  When in group-learn mode, for active sequences, the mute-group settings are set based on the playing status of each sequence.
- bool activate ()

  Performs a controlled activation of the jack_assistant and other JACK modules.
- void position_jack (bool state, midipulse tick=0)

  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 unqueue_sequences (int current_seq)

Does a toggle-queueing for all of the sequences in the current screenset, for all sequences that are on, and for the currently hot-keyed sequence.

- void all_notes_off ()

  For all active patterns/sequences, turn off its playing notes.
- void set_active (int seq, bool active)

  Sets or unsets the active state of the given pattern/sequence number.
- void set_was_active (int seq)

  Sets was-active flags: main, edit, perf, and names.
- void reset_sequences (bool pause=false)

  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 (midipulse tick)

  Plays all notes to the current tick.
- void set_orig_ticks (midipulse tick)

  For every pattern/sequence that is active, sets the "original tick" value for the pattern.
- int max_active_set () const

  Checks the whole universe of sequences to determine the current last-active set, that is, the highest set that has any active sequences in it.
- void launch_input_thread ()

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

  Creates the output thread using output_thread_func().
- bool init_jack_transport ()

  Initializes JACK support, if SEQ64_JACK_SUPPORT is defined.
- bool deinit_jack_transport ()

  Tears down the JACK infrastructure.
- bool seq_in_playing_screen (int seq)

  A helper function for determining if the mode group is in force, the playing screenset is the same as the current screenset, and the sequence is in the range of the playing screenset.
- void is_modified (bool flag)

  'Setter' function for member m_is_modified
- bool valid_midi_control_seq (int seq) const

  Checks the parameter against c_midi_controls_extended.
- int max_sets () const

  'Getter' function for member m_max_sets
- bool is_screenset_valid (int screenset) const

  Checks the screenset against m_max_sets.
- void is_running (bool running)

  'Setter' function for member m_is_running
- int screenset_offset (int ss)

  Calculates the screen-set offset index.
- bool is_seq_valid (int seq) const

  Provides common code to check for the bounds of a sequence number.
- bool is_mseq_valid (int seq) const

  Validates the sequence number, which is important since they're currently used as array indices.
- bool install_sequence (sequence ∗seq, int seqnum)

  A private helper function for add_sequence() and new_sequence().
- void inner_start (bool state)

  Locks on m_condition_var.
- void inner_stop (bool midiclock=false)

  Unconditionally, and without locking, clears the running status and resets the sequences.

- int clamp_track (int track) const

  Provides common code to keep the track value valid.
- int clamp_group (int group) const

  Provides common code to keep the group value valid even in variset mode.
- void set_key_event (unsigned keycode, int sequence_slot)

  At construction time, this function sets up one keycode and one event slot.
- void set_key_group (unsigned keycode, int group_slot)

  At construction time, this function sets up one keycode and one group slot.
- bool log_current_tempo ()

  Used by callers to insert tempo events.
- bool create_master_bus ()

  Creates the mastermidibus.
- void preallocate_clocks (int busscount)

  Pre-allocates the desired number of clocks.
- void add_clock (clock_e clocktype)

  Saves the clock settings read from the "rc" file so that they can be passed to the mastermidibus after it is created.
- void set_clock (bussbyte bus, clock_e clocktype)

  Sets a single clock item, if in the currently existing range.
- clock_e get_clock (bussbyte bus) const

  Gets a single clock item, if in the currently existing range.
- void add_input (bool flag)

  Saves the input settings read from the "rc" file so that they can be passed to the mastermidibus after it is created.
- void set_input (bussbyte bus, bool inputing)

  Sets a single input item, if in the currently existing range.
- bool get_input (bussbyte bus) const

  'Getter' function for member m_master_inputs[bus]
- bool is_input_system_port (bussbyte bus)

  'Getter' function for member m_master_bus->is_input_system_port(bus)
- void midi_mute_group_present (bool flag)

  'Setter' function for member m_midi_mute_group_present

Private Attributes

- bool m_song_start_mode

  If true, playback is done in Song mode, not Live mode.
- bool m_start_from_perfedit

  Indicates that, no matter what the current Song/Live setting, the playback was started from the perfedit window.
- bool m_reposition

  It seems that this member, if true, forces a repositioning to the left (L) tick marker.
- float m_excell_FF_RW

  Provides an "acceleration" factor for the fast-forward and rewind functionality.
- ff_rw_button_t m_FF_RW_button_type

  Indicates whether the fast-forward or rewind key is in effect in the perfedit window.
- bool m_mute_group [c_max_sequence]

  Mute group support.
- bool m_mute_group_rc [c_max_sequence]

  Preserves the mute groups from the "rc" file, so that they won't necessarily be overwritten by the mute groups contained in a Sequencer64 MIDI file.
- bool m_armed_saved

  Indicates if the m_saved_armed_statuses[] values are the saved state of the sequences, and can be restored.

- bool m_armed_statuses [c_max_sequence]

  Holds the "global" saved status of the playing tracks, for restoration after saving.
- int m_seqs_in_set

  We have replaced c_seqs_in_set with this member, which defaults to the value of c_seqs_in_set, but is grabbed from user_settings now.
- int m_max_groups

  Since we can increase the number of sequences in a set, we need to be able to decrease the number of sets or groups we can store.
- std::vector< bool > m_tracks_mute_state

  Holds the current mute states of each track.
- bool m_mode_group

  If true, indicates that a mode group is selected, and playing statuses will be "memorized".
- bool m_mode_group_learn

  If true, indicates that a group learn is selected, which also "memorizes" a mode group, and notifies subscribers of a group-learn change.
- int m_mute_group_selected

  Selects a group to mute.
- bool m_midi_mute_group_present

  If true, indicates that non-zero mute-groups were present in this MIDI file.
- sequence ∗ m_seqs [c_max_sequence]

  Provides a "vector" of patterns/sequences.
- bool m_seqs_active [c_max_sequence]

  Each boolean value in this array is set to true if a sequence is active, meaning that it will be used to hold some kind of MIDI data, even if only Meta events.
- bool m_was_active_main [c_max_sequence]

  Each boolean value in this array is set to true if a sequence was active, meaning that it was found to be active at the time we were setting it to inactive.
- bool m_was_active_edit [c_max_sequence]

  Each boolean value in this array is set to true if a sequence was active, meaning that it was found to be active at the time we were setting it to inactive.
- bool m_was_active_perf [c_max_sequence]

  Each boolean value in this array is set to true if a sequence was active, meaning that it was found to be active at the time we were setting it to inactive.
- bool m_was_active_names [c_max_sequence]

  Each boolean value in this array is set to true if a sequence was active, meaning that it was found to be active at the time we were setting it to inactive.
- bool m_sequence_state [c_max_sequence]

  Saves the current playing state of each pattern.
- std::vector< bool > m_screenset_state

  Saves the current playing state only for the current set.
- int m_queued_replace_slot

  A value not equal to -1 (it ranges from 0 to 32) ndicates we're now using the saved screen-set state to control the queue-replace (queue-solo) status of sequence toggling.
- int m_transpose

  Holds the global MIDI transposition value.
- pthread_t m_out_thread

  Provides information for managing pthreads.
- pthread_t m_in_thread

  Provides a "handle" to the input thread.
- bool m_out_thread_launched

  Indicates that the output thread has been started.
- bool m_in_thread_launched

Indicates that the input thread has been started.

- bool m_is_running

  Indicates that playback is running.
- bool m_is_pattern_playing

  Indicates that a pattern is playing.
- bool m_inputing

  Indicates that events are being written to the MIDI input busses in the input thread.
- bool m_outputing

  Indicates that events are being written to the MIDI output busses in the output thread.
- bool m_looping

  Indicates that status of the "loop" button in the performance editor.
- bool m_song_recording

  Indicates to record live sequence-trigger changes into the Song data.
- bool m_song_record_snap

  Snap recorded playback changes to the sequence length.
- bool m_resume_note_ons

  Indicates to resume notes if the sequence is toggled after a Note On.
- double m_current_tick

  The global current tick, moved out from the output function so that position can be set.
- bool m_playback_mode

  Specifies the playback mode.
- int m_ppqn

  Holds the current PPQN for usage in various actions.
- midibpm m_bpm

  Holds the current BPM (beats per minute) for later usage.
- int m_beats_per_bar

  Holds the beats/bar value as obtained from the MIDI file.
- int m_beat_width

  Holds the beat width value as obtained from the MIDI file.
- int m_tempo_track_number

  Holds the number of the official tempo track for this performance.
- int m_clocks_per_metronome

  Augments the beats/bar and beat-width with the additional values included in a Time Signature meta event.
- int m_32nds_per_quarter

  Augments the beats/bar and beat-width with the additional values included in a Time Signature meta event.
- long m_us_per_quarter_note

  Augments the beats/bar and beat-width with the additional values included in a Tempo meta event.
- mastermidibus $*$ m_master_bus

  Provides our MIDI buss.
- bool m_filter_by_channel

  Provides storage for this "rc" configuration option so that the perform object can set it in the master buss once that has been created.
- std::vector$<$ clock_e $>$ m_master_clocks

  Saves the clock settings obtained from the "rc" (options) file so that they can be loaded into the mastermidibus once it is created.
- std::vector$<$ bool $>$ m_master_inputs

  Saves the input settings obtained from the "rc" (options) file so that they can be loaded into the mastermidibus once it is created.
- midipulse m_one_measure

  Holds the "one measure's worth" of pulses (ticks), which is normally m_ppqn $*$ 4.
- midipulse m_left_tick

Holds the position of the left (L) marker, and it is first defined as 0.
- midipulse m_right_tick

  Holds the position of the right (R) marker, and it is first defined as the end of the fourth measure.
- midipulse m_starting_tick

  Holds the starting tick for playing.
- midipulse m_tick

  MIDI Clock support.
- midipulse m_jack_tick

  Let's try to save the last JACK pad structure tick for re-use with resume after pausing.
- bool m_usemidiclock

  More MIDI clock support.
- bool m_midiclockrunning

  More MIDI clock support.
- int m_midiclocktick

  More MIDI clock support.
- int m_midiclockpos

  More MIDI clock support.
- bool m_dont_reset_ticks

  Support for pause, which does not reset the "last tick" when playback stops/starts.
- std::string m_screenset_notepad [c_max_sets]

  Used in the mainwnd class to set the notepad text for the given set.
- midi_control m_midi_cc_toggle [c_midi_controls_extended]

  Provides the settings of MIDI Toggle, as read from the "rc" file.
- midi_control m_midi_cc_on [c_midi_controls_extended]

  Provides the settings of MIDI On, as read from the "rc" file.
- midi_control m_midi_cc_off [c_midi_controls_extended]

  Provides the settings of MIDI Off, as read from the "rc" file.
- int m_control_status

  Holds the OR'ed control status values.
- int m_screenset

  Indicates the number of the currently-selected screen-set.
- int m_screenset_offset

  Holds the current sequence-number offset for the current screen-set.
- int m_playscreen

  Playing screen support.
- int m_playscreen_offset

  Playing screen sequence number offset.
- int m_max_sets

  A replacement for the c_max_sets constant.
- int m_sequence_count

  Keeps track of created sequences, whether or not they are active.
- int m_sequence_max

  A replacement for the c_max_sequence constant.
- int m_sequence_high

  Indicates the highest-number sequence.
- int m_edit_sequence

  Hold the number of the currently-in-edit sequence.
- bool m_is_modified

  It may be a good idea to eventually centralize all of the dirtiness of a performance here.
- condition_var m_condition_var

  A condition variable to protect playback.

- jack_assistant m_jack_asst

  A wrapper object for the JACK support of this application.
- bool m_have_undo
- std::vector< int > m_undo_vect

  Holds the "track" numbers or the "all tracks" values for undo operations.
- bool m_have_redo

  Used for redo track modification support.
- std::vector< int > m_redo_vect

  Holds the "track" numbers or the "all tracks" values for redo operations.
- std::vector< performcallback ∗ > m_notify
- gui_assistant & m_gui_support

  Support for a wide range of GUI-related operations.

Static Private Attributes

- static midi_control sm_mc_dummy

  Provides a dummy, inactive midi_control object to handle out-of-range midi_control indicies.

Friends

- class jack_assistant
- class keybindentry
- class mainwnd
- class midifile
- class wrkfile
- class optionsfile
- class options
- class perfedit
- class perfroll
- class sequence
- void ∗ input_thread_func (void ∗myperf)

  Set up the performance, and set the process to realtime privileges.
- void ∗ output_thread_func (void ∗myperf)

  Global functions defined in perform.cpp.
- int jack_sync_callback (jack_transport_state_t state, jack_position_t ∗pos, void ∗arg)
- int jack_transport_callback (jack_nframes_t nframes, void ∗arg)

  Implemented second patch for JACK Transport from freddix/seq24 GitHub project.
- void jack_shutdown (void ∗arg)
- void jack_timebase_callback (jack_transport_state_t state, jack_nframes_t nframes, jack_position_t ∗pos, int new_pos, void ∗arg)

  The JACK timebase function defined here sets the JACK position structure.
- long get_current_jack_position (void ∗arg)

  This function gets the current JACK position.

10.69.1 Detailed Description

It has way too many data members. Might be ripe for refactoring. That has its own dangers, of course.

One thing to do soon is remove the need to having GUI classes as friends. Will make some necessary setters public.

10.69.2 Member Enumeration Documentation

10.69.2.1 action_t

```
enum seq64::perform::action_t
```

But, in some cases, we need to indicate what was changed (e.g. via a keystroke). This enumeration provides return values that a (GUI) caller can use to decided which values to get and then change the user-interface to indicate the new value.

See the keyboard_group_action() function and the "[keyboard-control]" and "[keyboard-group]" configuration sections of the "rc" file.

Enumerator

ACTION_NONE	The keystroke was not handled by perform.
ACTION_SEQ_TOGGLE	For perform::sequence_playing_toggle().
ACTION_GROUP_MUTE	See mainwnd::on_key_press_event(). ???
ACTION_BPM	Applies to any BPM change, including tap.
ACTION_SCREENSET	The keystroke altered the active set.
ACTION_GROUP_LEARN	See mainwnd::on_key_press_event(). ???
ACTION_C_STATUS	For replace, queue, snapshot, oneshot.

10.69.2.2 record_tempo_op_t

```
enum seq64::perform::record_tempo_op_t
```

Currently not used, though the functionality of logging and recording tempo is in place.

Enumerator

RECORD_TEMPO_LOG_EVENT	
RECORD_TEMPO_ON	
RECORD_TEMPO_OFF	

10.69.2.3 mute_op_t

```
enum seq64::perform::mute_op_t
```

Enumerator

MUTE_TOGGLE	
MUTE_OFF	
MUTE_ON	

10.69.2.4 ff_rw_button_t

```
enum seq64::perform::ff_rw_button_t
```

Enumerator

FF_RW_REWIND	
FF_RW_NONE	
FF_RW_FORWARD	

10.69.3 Constructor & Destructor Documentation

10.69.3.1 perform()

```
seq64::perform::perform (
            gui_assistant & mygui,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

Also note that we have a little issue with the fact that various sequences (patterns) can potentially have different beats/measure and beat-width values.

Currently, when reading the MIDI file, the beats/minute value is obtained from the MIDI file, if present, and this value is passed to perform::set_beats_per_minute(), which forwards it to the master MIDI buss and JACK assistant objects. This Tempo setting comes from both the Tempo meta event in track 0, and from the Seq24's c_bpm SeqSpec section! This setting is now also made for the two Time Signature values.

But note that Sequencer64 now scales the c_bpm value so that two extra digits of precision can be saved with the MIDI file. We went throughout the code, changing BPM from an integer to a double.

Parameters

mygui	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 m_gui_support member using the gui() accessor function.
ppqn	The default, choosable, or actual PPQN value.

10.69.3.2 ∼perform()

```
seq64::perform::∼perform ( )
```

Finally, any active or inactive (but allocated) patterns/sequences are deleted, and their pointers nullified.

Note that we could use m_sequence_high to replace m_sequence_max in the for-loop, but who cares, we are exiting!

10.69.4 Member Function Documentation

10.69.4.1 is_modified() [1/2]

```
bool seq64::perform::is_modified ( ) const  [inline]
```

10.69.4.2 modify()

```
void seq64::perform::modify ( )  [inline]
```

The setter that will, is_modified(), is private. No one but perform and its friends should falsify this flag.

10.69.4.3 ppqn() [1/2]

```
int seq64::perform::ppqn ( ) const  [inline]
```

10.69.4.4 bpm()

```
midibpm seq64::perform::bpm ( ) const  [inline]
```

10.69.4.5 sequence_count()

```
int seq64::perform::sequence_count ( ) const  [inline]
```

In many cases at startup, or when loading a file, there are no sequences yet, and still the code calls functions that try to access them.

10.69.4.6 sequence_high()

```
int seq64::perform::sequence_high ( ) const  [inline]
```

10.69.4.7 sequence_max()

```
int seq64::perform::sequence_max ( ) const  [inline]
```

10.69.4.8 group_max()

```
int seq64::perform::group_max ( ) const  [inline]
```

10.69.4.9 is_control_status()

```
bool seq64::perform::is_control_status ( ) const  [inline]
```

Returns

Returns true if the m_control_status value is non-zero, which means that there is a queue, replace, or snapshot functionality in progress.

10.69.4.10 midi_mute_group_present() [1/2]

```
bool seq64::perform::midi_mute_group_present ( ) const  [inline]
```

10.69.4.11 set_edit_sequence()

```
void seq64::perform::set_edit_sequence (
             int seqnum )  [inline]
```

Parameters

seqnum	Pass in -1 to disable the edit-sequence number unconditionally. Use unset_edit_sequence() to disable it if it matches the current edit-sequence number.

10.69.4.12 unset_edit_sequence()

```
void seq64::perform::unset_edit_sequence (
             int seqnum )  [inline]
```

Disables the edit-sequence number if it matches the parameter.

Parameters

seqnum	The sequence number of the sequence to unset.

10.69.4.13 is_edit_sequence()

```
bool seq64::perform::is_edit_sequence (
            int seqnum ) const  [inline]
```

Parameters

seqnum	Tests the parameter against m_edit_sequence. Returns true if that member is not -1, and the parameter matches it.

10.69.4.14 get_beats_per_bar()

```
int seq64::perform::get_beats_per_bar ( ) const  [inline]
```

10.69.4.15 set_beats_per_bar()

```
void seq64::perform::set_beats_per_bar (
            int bpm )  [inline]
```

Parameters

bpm	Provides the value for beats/measure. Also used to set the beats/measure in the JACK assistant object.

10.69.4.16 get_beat_width()

```
int seq64::perform::get_beat_width ( ) const  [inline]
```

10.69.4.17 set_beat_width()

```
void seq64::perform::set_beat_width (
            int bw )  [inline]
```

Parameters

bw	Provides the value for beat-width. Also used to set the beat-width in the JACK assistant object.

10.69.4.18 get_tempo_track_number()

```
int seq64::perform::get_tempo_track_number ( ) const  [inline]
```

10.69.4.19 set_tempo_track_number()

```
void seq64::perform::set_tempo_track_number (
             int tempotrack )  [inline]
```

Parameters

tempotrack	Provides the value for beat-width. Also used to set the beat-width in the JACK assistant object.

10.69.4.20 clocks_per_metronome() [1/2]

```
void seq64::perform::clocks_per_metronome (
             int cpm )  [inline]
```

10.69.4.21 clocks_per_metronome() [2/2]

```
int seq64::perform::clocks_per_metronome ( ) const  [inline]
```

10.69.4.22 set_32nds_per_quarter()

```
void seq64::perform::set_32nds_per_quarter (
             int tpq )  [inline]
```

10.69.4.23 get_32nds_per_quarter()

```
int seq64::perform::get_32nds_per_quarter ( ) const  [inline]
```

10.69.4.24 us_per_quarter_note() [1/2]

```
void seq64::perform::us_per_quarter_note (
             long upqn )  [inline]
```

10.69.4.25 us_per_quarter_note() [2/2]

```
long seq64::perform::us_per_quarter_note ( ) const  [inline]
```

10.69.4.26 gui() [1/2]

```
const gui_assistant& seq64::perform::gui ( ) const  [inline]
```

10.69.4.27 gui() [2/2]

```
gui_assistant& seq64::perform::gui ( )  [inline]
```

10.69.4.28 keys() [1/2]

```
const keys_perform& seq64::perform::keys ( ) const  [inline]
```

10.69.4.29 keys() [2/2]

```
keys_perform& seq64::perform::keys ( )  [inline]
```

10.69.4.30 master_bus()

```
mastermidibus& seq64::perform::master_bus ( )  [inline]
```

10.69.4.31 filter_by_channel()

```
void seq64::perform::filter_by_channel (
             bool flag )  [inline]
```

10.69.4.32 is_running() [1/2]

```
bool seq64::perform::is_running ( ) const  [inline]
```

10.69.4.33 is_pattern_playing() [1/2]

```
bool seq64::perform::is_pattern_playing ( ) const  [inline]
```

10.69.4.34 is_pattern_playing() [2/2]

```
void seq64::perform::is_pattern_playing (
             bool flag )  [inline]
```

10.69.4.35 toggle_song_start_mode()

```
bool seq64::perform::toggle_song_start_mode ( )  [inline]
```

10.69.4.36 song_start_mode() [1/2]

```
void seq64::perform::song_start_mode (
             bool flag )  [inline]
```

10.69.4.37 song_start_mode() [2/2]

```
bool seq64::perform::song_start_mode ( ) const  [inline]
```

10.69.4.38 is_jack_running()

```
bool seq64::perform::is_jack_running ( ) const  [inline]
```

10.69.4.39 is_jack_master()

```
bool seq64::perform::is_jack_master ( ) const  [inline]
```

10.69.4.40 enregister()

```
void seq64::perform::enregister (
            performcallback * pfcb )  [inline]
```

Parameters

pfcb	Provides the pointer to the performance callback.

10.69.4.41 toggle_jack_mode()

```
void seq64::perform::toggle_jack_mode ( )  [inline]
```

10.69.4.42 set_jack_mode()

```
bool seq64::perform::set_jack_mode (
            bool jack_button_active )
```

Note that we moved some of the code from perfedit::set_jack_mode() [the seq32 version] to this function.

Parameters

jack_button_active	Indicates if the perfedit JACK button shows it is active.

Returns

Returns true if JACK is running currently, and false otherwise.

10.69.4.43 get_toggle_jack()

```
bool seq64::perform::get_toggle_jack ( ) const  [inline]
```

10.69.4.44 set_jack_stop_tick()

```
void seq64::perform::set_jack_stop_tick (
            midipulse tick )  [inline]
```

10.69.4.45 combine_bytes()

```
unsigned short seq64::perform::combine_bytes (
            midibyte b0,
            midibyte b1 )
```

http://www.blitter.com/~russtopia/MIDI/~jglatt/tech/midispec/wheel.htm

Two data bytes follow the status. The two bytes should be combined together to form a 14-bit value. The first data byte's bits 0 to 6 are bits 0 to 6 of the 14-bit value. The second data byte's bits 0 to 6 are really bits 7 to 13 of the 14-bit value. In other words, assuming that a C program has the first byte in the variable First and the second data byte in the variable Second, here's how to combine them into a 14-bit value (actually 16-bit since most computer CPUs deal with 16-bit, not 14-bit, integers).

I think Kepler64 got the bytes backward.

Parameters

b0	The first byte to be combined.
b1	The second byte to be combined.

Returns

Returns the bytes basically OR'd together.

10.69.4.46 FF_rewind()

```
void seq64::perform::FF_rewind ( )
```

It changes m_tick by a quarter of the number of ticks in a standard measure, with m_excell_FF_RW (defaults to one) to factor the difference.

10.69.4.47 FF_RW_timeout()

```
bool seq64::perform::FF_RW_timeout ( )
```

This function is used in the free function version of FF_RW_timeout() as a callback to the gtk_timeout() function. It multiplies m_excell_FF_RW by 1.1 as long as one of the fast-forward or rewind keys is held, and is less than 60.

Returns

Returns true if one of the fast-forward or rewind keys was held, leaving m_excell_FF_RW at the last value it had. Otherwise, it resets the value to 1, and returns false.

10.69.4.48 start_from_perfedit() [1/2]

```
void seq64::perform::start_from_perfedit (
             bool flag )  [inline]
```

10.69.4.49 start_from_perfedit() [2/2]

```
bool seq64::perform::start_from_perfedit ( ) const  [inline]
```

10.69.4.50 set_follow_transport()

```
void seq64::perform::set_follow_transport (
             bool flag )  [inline]
```

10.69.4.51 get_follow_transport()

```
bool seq64::perform::get_follow_transport ( ) const  [inline]
```

10.69.4.52 toggle_follow_transport()

```
void seq64::perform::toggle_follow_transport ( )  [inline]
```

10.69.4.53 follow_progress()

```
bool seq64::perform::follow_progress ( ) const  [inline]
```

10.69.4.54 set_reposition()

```
void seq64::perform::set_reposition (
            bool postype = true )  [inline]
```

10.69.4.55 ff_rw_type() [1/2]

```
ff_rw_button_t seq64::perform::ff_rw_type ( )  [inline]
```

10.69.4.56 ff_rw_type() [2/2]

```
void seq64::perform::ff_rw_type (
            ff_rw_button_t button_type )  [inline]
```

10.69.4.57 rewind()

```
void seq64::perform::rewind (
            bool press )  [inline]
```

Parameters

press	If true, the status is set to FF_RW_REWIND, otherwise it is set to FF_RW_NONE.

10.69.4.58 fast_forward()

```
void seq64::perform::fast_forward (
            bool press )  [inline]
```

Parameters

press	If true, the status is set to FF_RW_FORWARD, otherwise it is set to FF_RW_NONE.

10.69.4.59 reposition()

```
void seq64::perform::reposition (
            midipulse tick )
```

Used only in perfroll :: on_key_press_event() to implement the Seq32 pointer-position feature.

Parameters

tick	Provides the position value to be set.

10.69.4.60 set_sequence_input()

```
void seq64::perform::set_sequence_input (
            bool active,
            sequence * s )  [inline]
```

10.69.4.61 set_recording() [1/2]

```
void seq64::perform::set_recording (
            bool record_active,
            bool thru_active,
            sequence * s )
```

Parameters

record_active	Provides the current status of the Record button.
thru_active	Provides the current status of the Thru button.
s	The sequence that the seqedit window represents. This pointer is checked.

10.69.4.62 set_recording() [2/2]

```
void seq64::perform::set_recording (
            bool record_active,
            int seq,
            bool toggle = false )
```

However, this function depends on the sequence, not the seqedit, for obtaining the thru status.

Parameters

record_active	Provides the current status of the Record button.
seq	The sequence number; the resulting pointer is checked.
toggle	If true, ignore the first flag and let the sequence toggle its setting. Passed along to sequence::set_input_recording().

10.69.4.63 set_quantized_recording() [1/2]

```
void seq64::perform::set_quantized_recording (
            bool record_active,
            sequence * s )
```

Parameters

record_active	The setting desired for the quantized-recording flag.
s	Provides the pointer to the sequence to operate upon. Checked for validity.

10.69.4.64 set_quantized_recording() [2/2]

```
void seq64::perform::set_quantized_recording (
            bool record_active,
            int seq,
            bool toggle = false )
```

This isn't quite consistent with setting regular recording, which uses sequence::set_input_recording().

Parameters

record_active	Provides the current status of the Record button.
seq	The sequence number; the resulting pointer is checked.
toggle	If true, ignore the first flag and let the sequence toggle its setting. Passed along to sequence::set_input_recording().

10.69.4.65 set_overwrite_recording()

```
void seq64::perform::set_overwrite_recording (
            bool overwrite_active,
            int seq,
            bool toggle = false )
```

Todo Might probably as well create(bool rec_active, bool thru_active, sequence ∗ s).

Pull request #150:

```
Ask for a reset explicitly upon toggle-on, since we don't have the GUI
to control for progress.
```

Parameters

overwrite_active	Provides the current status of the overwrite mode.
seq	The sequence number; the resulting pointer is checked.
toggle	If true, ignore the first flag and let the sequence toggle its setting. Passed along to sequence::set_overwrite_rec().

10.69.4.66 set_thru() [1/2]

```
void seq64::perform::set_thru (
            bool record_active,
            bool thru_active,
            sequence * s )
```

Parameters

record_active	Provides the current status of the Record button.
thru_active	Provides the current status of the Thru button.
s	The sequence that the seqedit window represents. This pointer is checked.

10.69.4.67 set_thru() [2/2]

```
void seq64::perform::set_thru (
            bool thru_active,
            int seq,
            bool toggle = false )
```

However, this function depends on the sequence, not the seqedit, for obtaining the recording status.

Parameters

thru_active	Provides the current status of the Thru button.
seq	The sequence number; the resulting pointer is checked.
toggle	If true, ignore the first flag and let the sequence toggle its setting. Passed along to sequence::set_input_thru().

10.69.4.68 selected_trigger()

```
bool seq64::perform::selected_trigger (
            int seqnum,
            midipulse droptick,
            midipulse & tick0,
            midipulse & tick1 )
```

The more code moved out of the user-interface, the better.

Parameters

	seqnum	The number of the sequence of interest.
	droptick	The tick location, basically where the mouse was clicked.
out	*tick0*	The output location for the start of the trigger.
out	*tick1*	The output location for the end of the trigger.

Returns

Returns true if the sequence is valid and we can select the trigger.

10.69.4.69 clear_all()

```
bool seq64::perform::clear_all ( )
```

The mainwnd module calls this function. Note that perform now handles the "is modified" flag on behalf of all external objects, to centralize and simplify the dirtying of a MIDI tune.

Anything else to clear? What about all the other sequence flags? We can beef up delete_sequence() for them, at some point.

Added stazed code from 1.0.5 to abort clearing if any of the sequences are in editing.

Returns

Returns true if the clear-all operation could be performed. If false, then at least one active sequence was in editing mode.

10.69.4.70 launch()

```
void seq64::perform::launch (
            int ppqn )
```

This function is called in main(). We collected all the calls here as a simplification, and renamed it because it is more than just initialization. This function must be called after the perform constructor and after the configuration file and command-line configuration overrides. The original implementation, where the master buss was an object, was too inflexible to handle a JACK implementation.

Parameters

ppqn	Provides the PPQN value, which is either the default value (192) or is read from the "user" configuration file.

Todo We probably need a bpm parameter for consistency at some point.

10.69.4.71 finish()

```
void seq64::perform::finish ( )
```

A minor simplification for the main() routine, hides the JACK support macro. We might need to add code to stop any ongoing outputing.

Also gets the settings made/changed while the application was running from the mastermidibase class to here. This action is the converse of calling the set_port_statuses() function defined in the mastermidibase module.

10.69.4.72 new_sequence()

```
void seq64::perform::new_sequence (
             int seq )
```

Then it activates the pattern [this is done in the install_sequence() function]. It doesn't deal with thrown exceptions.

This function is called by the seqmenu and mainwid objects to create a new sequence. We now pass this sequence to install_sequence() to better handle potential memory leakage, and to make sure the sequence gets counted. Also, adding a new sequence from the user-interface is a significant modification, so the "is modified" flag gets set.

Change Note ca 2016-05-15 If enabled, wire in the MIDI buss override.

Parameters

seq	The prospective sequence number of the new sequence.

10.69.4.73 add_sequence()

```
void seq64::perform::add_sequence (
             sequence * seq,
             int prefnum )
```

No check is made for a null pointer, but the install_sequence() call will make sure such a pointer is officially logged.

This function checks for the preferred sequence number. This is the number that was specified by the Sequence Number meta-event for the current track. If the preferred sequence number is in the valid range (0 to m_sequence↩
max) and it is not active, add it and activate it. Otherwise, iterate through all patterns from prefnum to m↩
sequence_max and add and activate the first one that is not active, and then finish.

Finally, note that this function is used only by midifile, when reading in a MIDI song. Therefore, the "is modified" flag is *not* set by this function; loading a sequence from a file is not a modification that should lead to a prompt for saving the file later.

Todo Shouldn't we wrap around the sequence list if we can't find an empty sequence slot after prefnum?

Todo This function needs some deeper analysis against the original, in my opinion.

Warning

The logic of the if-statement in this function was such that *prefnum* 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

seq	The pointer to the pattern/sequence to add.
prefnum	The preferred sequence number of the pattern, as explained above. If this value is out-of-range, then it is basically ignored.

10.69.4.74 delete_sequence()

```
void seq64::perform::delete_sequence (
            int seq )
```

We now also solidify the deletion by setting the pointer to null after deletion, so it will blow up if accidentally accessed. The final act is to raise the "is modified" flag, since deleting an existing sequence is always a significant modification.

Now, this function obviously sets the "active" flag for the sequence to false. But there are a few other flags that are not modified; shouldn't we also falsify them here?

Parameters

seq	The sequence number of the sequence to be deleted. It is validated.

10.69.4.75 is_sequence_in_edit()

```
bool seq64::perform::is_sequence_in_edit (
            int seq )
```

Parameters

seq	Provides the sequence number to be checked.

Returns

Returns truen if the sequence's get_editing() call returns true. Otherwise, false is returned, which can also indicate an illegal sequence number.

10.69.4.76 print_busses()

```
void seq64::perform::print_busses ( ) const
```

10.69.4.77 get_tick()

```
midipulse seq64::perform::get_tick ( ) const  [inline]
```

10.69.4.78 set_tick()

```
void seq64::perform::set_tick (
            midipulse tick )
```

Todo Do we really need m_current_tick???

10.69.4.79 get_jack_tick()

```
midipulse seq64::perform::get_jack_tick ( ) const  [inline]
```

10.69.4.80 set_jack_tick()

```
void seq64::perform::set_jack_tick (
            midipulse tick )  [inline]
```

Parameters

tick	Provides the current JACK tick (pulse) value to set.

10.69.4.81 set_left_tick()

```
void seq64::perform::set_left_tick (
            midipulse tick,
            bool setstart = true )
```

We let the caller determine if this setting is a modification. If the left tick is later than the right tick, the right tick is move to one measure past the left tick.

Todo The perform::m_one_measure member is currently hardwired to m_ppqn∗4.

Parameters

tick	The tick (MIDI pulse) at which to place the left tick. If the left tick is greater than or equal to the right tick, then the right ticked is moved forward by one "measure's length" (m_ppqn ∗ 4) past the left tick.
setstart	If true (the default, and long-standing implicit setting), then the starting tick is also set to the left tick.

10.69.4.82 get_left_tick()

```
midipulse seq64::perform::get_left_tick ( ) const [inline]
```

10.69.4.83 set_start_tick()

```
void seq64::perform::set_start_tick (
            midipulse tick ) [inline]
```

Parameters

tick	Provides the starting JACK tick (pulse) value to set.

10.69.4.84 get_start_tick()

```
midipulse seq64::perform::get_start_tick ( ) const [inline]
```

10.69.4.85 set_right_tick()

```
void seq64::perform::set_right_tick (
            midipulse tick,
            bool setstart = true )
```

This setting is made only if the tick parameter is at or beyond the first measure. We let the caller determine is this setting is a modification.

Parameters

tick	The tick (MIDI pulse) at which to place the right tick. If less than or equal to the left tick setting, then the left tick is backed up by one "measure's worth" (m_ppqn $*$ 4) worth of ticks from the new right tick.
setstart	If true (the default, and long-standing implicit setting), then the starting tick is also set to the left tick, if that got changed.

10.69.4.86 get_right_tick()

```
midipulse seq64::perform::get_right_tick ( ) const  [inline]
```

10.69.4.87 left_right_size()

```
double seq64::perform::left_right_size ( ) const  [inline]
```

Returns

Returns the difference between the right and left tick, cast to double.

10.69.4.88 is_active()

```
bool seq64::perform::is_active (
            int seq ) const  [inline]
```

Parameters

seq	The pattern number. It is checked for invalidity. This can lead to "too many" (i.e. redundant) checks, but we're trying to centralize such checks in this function.

Returns

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

10.69.4.89 apply_song_transpose()

```
void seq64::perform::apply_song_transpose ( )
```

10.69.4.90 set_transpose()

```
void seq64::perform::set_transpose (
             int t )  [inline]
```

10.69.4.91 get_transpose()

```
int seq64::perform::get_transpose ( ) const  [inline]
```

10.69.4.92 get_beats_per_minute()

```
midibpm seq64::perform::get_beats_per_minute ( )  [inline]
```

This result should be the same as the value of the m_bpm member. This function returns that value in a roundabout way.

Returns

Returns the value of beats/minute from the master buss.

10.69.4.93 reload_mute_groups()

```
bool seq64::perform::reload_mute_groups (
             std::string & errmessage )
```

Parameters

errmessage	A pass-back parameter for any error message the file-processing might cause.

Returns

Returns true if the reload succeeded.

10.69.4.94 clear_mute_groups()

```
bool seq64::perform::clear_mute_groups ( )
```

Side-effect(s) If true is returned, the modify flag is set, so that the user has the option to save a MIDI file that contained mute-groups that are no longer wanted.

Returns

Returns true if any of the statuses changed from true to false.

10.69.4.95 set_sequence_control_status()

```
void seq64::perform::set_sequence_control_status (
             int status )
```

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

Parameters

status	The status to be used.

10.69.4.96 unset_sequence_control_status()

```
void seq64::perform::unset_sequence_control_status (
             int status )
```

Then the given status is reversed in m_control_status.

If the given status includes c_status_queue, this is a signal to stop queuing (which is already in place elsewhere). It also unsets the new queue-replace feature.

Parameters

status	The status to be used.

10.69.4.97 unset_queued_replace()

```
void seq64::perform::unset_queued_replace (
             bool clearbits = true )
```

This also clears the queue mode; we shall see if this disrupts any user's workflow.

Parameters

clearbits	If true (the default), then clear the queue and replace status bits. If the user is simply replacing the current replace pattern with another pattern, we pass false for this parameter.

10.69.4.98 sequence_playing_toggle()

```
void seq64::perform::sequence_playing_toggle (
            int seq )
```

If m_control_status is c_status_queue, then the sequence's toggle_queued() function is called. This is the "mod queue" implementation.

Otherwise, if it is c_status_replace, then the status is unset, and all sequences are turned off. Then the sequence's toggle-playing() function is called, which should turn it back on. This is the "mod replace" implementation; it is like a Solo. But can it be undone?

This function is called in sequence_key() to implement a toggling of the sequence of the pattern slot in the current screen-set that is represented by the keystroke.

This function is also called in midi_control_event() if the control number represents a sequence number in a screen-set, that is, it ranges from 0 to

1. This value should be offset by the current screen-set number, m_screenset_offset, before passing it to this function.

This function now also supports the new queued-replace (queued-solo) feature.

Parameters

seq	The sequence number of the sequence to be potentially toggled. This value must be a valid and active sequence number. If in queued-replace mode, and if this pattern number is different from the currently-stored number (m_queued_replace_slot), then we clear the currently stored set of patterns and set new stored patterns.

10.69.4.99 sequence_playing_change()

```
void seq64::perform::sequence_playing_change (
            int seq,
            bool on )
```

Used for the implementation of sequence_playing_on() and sequence_playing_off().

Kepler34's version seems slightly different, may need more study.

Parameters

seq	The number of the sequence to be turned off.
on	True if the sequence is to be turned on, false if it is to be turned off.

10.69.4.100 set_keep_queue()

```
void seq64::perform::set_keep_queue (
            bool activate )
```

10.69.4.101 is_keep_queue()

```
bool seq64::perform::is_keep_queue ( ) const
```

10.69.4.102 sequence_playing_on()

```
void seq64::perform::sequence_playing_on (
            int seq ) [inline]
```

Parameters

seq	The sequence number of the sequence to turn on.

10.69.4.103 sequence_playing_off()

```
void seq64::perform::sequence_playing_off (
            int seq ) [inline]
```

Parameters

seq	The sequence number of the sequence to turn off.

10.69.4.104 mute_all_tracks()

```
void seq64::perform::mute_all_tracks (
            bool flag = true )
```

Covers tracks from 0 to m_sequence_max.

We have to also set the sequence's playing status, in opposition to the mute status, in order to see the sequence status change on the user-interface. HMMMMMM.

Parameters

flag	If true (the default), the song-mute of the sequence is turned on. Otherwise, it is turned off.

10.69.4.105 toggle_all_tracks()

```
void seq64::perform::toggle_all_tracks ( )
```

Covers tracks from 0 to m_sequence_max.

Note that toggle_playing() now has two default parameters used by the new song-recording feature, which are currently not used here.

10.69.4.106 armed_saved()

```
bool seq64::perform::armed_saved ( ) const  [inline]
```

10.69.4.107 toggle_playing_tracks()

```
void seq64::perform::toggle_playing_tracks ( )
```

Covers tracks from 0 to m_sequence_max. The statuses are preserved for restoration.

Note that this function operates only in Live mode; it is too confusing to use in Song mode. Also note that toggle↩ _playing() now has two default parameters used by the new song-recording feature, which are currently not used here.

10.69.4.108 mute_screenset()

```
void seq64::perform::mute_screenset (
            int ss,
            bool flag = true )
```

Parameters

ss	The screen-set to be operated upon.
flag	If true (the default), the song-mute of the sequence is turned on. Otherwise, it is turned off.

10.69.4.109 output_func()

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

This function is called by the free function output_thread_func(). Here's how it works:

```
-   It runs while m_outputing is true.
-   MORE TO COME.  Yeah, a lot more to come.  It is a complex
    function.
```

Change Note ca 2016-01-26 Hurray, seq24 is coming back to life! We see that there is a fix for clock tick drift here, which relies on using long and long long values. See the Changelog for seq24 0.9.3.

Warning

Valgrind shows that output_func() is being called before the JACK client pointer is being initialized!!!

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.

Now we want to trigger every c_thread_trigger_width_us, and it took us delta_us to play(). Also known as the "sleeping_us".

Check MIDI clock adjustment. Note that we replaced "60000000.0f / m_ppqn / bpm" with a call to a function. We also removed the "f" specification from the constants.

10.69.4.110 input_func()

```
void seq64::perform::input_func ( )
```

It handles certain MIDI input events.

Stazed:

```
http://www.blitter.com/~russtopia/MIDI/~jglatt/tech/midispec/ssp.htm

Example: If a Song Position value of 8 is received, then a sequencer
(or drum box) should cue playback to the third quarter note of the
song.  (8 MIDI beats * 6 MIDI clocks per MIDI beat = 48 MIDI Clocks.
Since there are 24 MIDI Clocks in a quarter note, the first quarter
occurs on a time of 0 MIDI Clocks, the second quarter note occurs upon
the 24th MIDI Clock, and the third quarter note occurs on the 48th
MIDI Clock).

8 MIDI beats * 6 MIDI clocks per MIDI beat = 48 MIDI Clocks.
```

EVENT_MIDI_START:

```
Starts the MIDI Time Clock.  Kepler34 does "stop();
set_playback_mode(false); start();" in its version of this event.
This sets the playback mode to Live mode. This behavior seems
reasonable, though function names Sequencer64 uses are different.
```

EVENT_MIDI_CONTINUE:

```
MIDI continue: start from current position.  This is sent immediately
after EVENT_MIDI_SONG_POS, and is used for starting from other than
beginning of the song, or for starting from previous location at
EVENT_MIDI_STOP. Again, converted to Kepler34 mode of setting the
playback mode to Live mode.
```

EVENT_MIDI_STOP:

```
Do nothing, just let the system pause.  Since we're not getting ticks
after the stop, the song won't advance when start is received, we'll
reset the position. Or, when continue is received, we won't reset the
position.  We do an inner_stop(); the m_midiclockpos member holds the
stop position in case the next event is "continue".  This feature is
not in Kepler34.
```

EVENT_MIDI_CLOCK:

```
MIDI beat clock (MIDI timing clock or simply MIDI clock) is a clock
signal broadcast via MIDI to ensure that MIDI-enabled devices stay in
synchronization. It is not MIDI timecode.  Unlike MIDI timecode, MIDI
beat clock is tempo-dependent. Clock events are sent at a rate of 24
ppqn (pulses per quarter note). Those pulses maintain a synchronized
tempo for synthesizers that have BPM-dependent voices and for
arpeggiator synchronization.  Location information can be specified
using MIDI Song Position Pointer.  Many simple MIDI devices ignore
this message.
```

EVENT_MIDI_SONG_POS:

```
MIDI song position pointer message tells a MIDI device to cue to a
point in the MIDI sequence to be ready to play.  This message consists
of three bytes of data. The first byte, the status byte, is 0xF2 to
flag a song position pointer message. Two bytes follow the status
byte.  These two bytes are combined in a 14-bit value to show the
position in the song to cue to. The top bit of each of the two bytes
is not used.  Thus, the value of the position to cue to is between
0x0000 and 0x3FFF. The position represents the MIDI beat, where a
sequence always starts on beat zero and each beat is a 16th note.
Thus, the device will cue to a specific 16th note.  Also see the
combine_bytes() function.
```

EVENT_MIDI_SYSEX:

```
These messages are system-wide messages.  We filter system-wide
messages.  If the master MIDI buss is dumping, set the timestamp of
the event and stream it on the sequence.  Otherwise, use the event
data to control the sequencer, if it is valid for that action.

"Dumping" is set when a seqedit window is open and the user has
clicked the "record MIDI" or "thru MIDI" button.  In this case, if the
seq32 support is in force, dump to it, else stream the event, with
possibly multiple sequences set.  Otherwise, handle an incoming MIDI
control event.

Also available (but macroed out) is Stazed's parse_sysex() function.
It seems specific to certain Yamaha devices, but might prove useful
later.
```

For events less than or equal to SysEx, we call midi_control_event() to handle the MIDI controls that Sequencer64 supports. (These are configurable in the "rc" configuration file.)

10.69.4.111 set_group_mute_state()

```
void seq64::perform::set_group_mute_state (
            int gtrack,
            bool muted )
```

The index value is the track number offset by the number of the selected mute group (which is equivalent to a set number) times the number of sequences in a set. This function is used in midifile and optionsfile when parsing the file to get the initial mute-groups.

Bug We were not using the group track value if it was zero, but that is a legitimate value.

Parameters

gtrack	The number of the track to be muted/unmuted.
muted	This boolean indicates the state to which the track should be set.

10.69.4.112 get_group_mute_state()

```
bool seq64::perform::get_group_mute_state (
            int gtrack )
```

Uses the mute_group_offset() function. This function is used in midifile and optionsfile when writing the file to get the initial mute-groups.

Bug We were not using the group track value if it was zero, but that is a legitimate value.

Parameters

gtrack	The number of the track for which the state is to be obtained. Like set_group_mute_state(), this value is offset by adding m_mute_group_selected ∗ m_seqs_in_set.

Returns

Returns the desired m_mute_group[] value.

10.69.4.113 mute_group_offset()

```
int seq64::perform::mute_group_offset (
            int trackoffset )
```

Remember that the mute-group array, m_mute_group[c_max_sequence], determines which tracks are muted/unmuted. Also remember that m_mute_group_selected now determines which "seqs-in-set" set is selected.

Old definition:

```
return clamp_track(track) + m_mute_group_selected * m_seqs_in_set;
```

Parameters

trackoffset	The number of the desired track. This is basically one of the hot-key related values. Traditionally, this value ranges from 0 to 31 (c_seqs_in_set-1), but now the variset mode is supported.

Returns

Returns a track value from 0 to 1023 if the group is valid for the current seqs-in-set count and a mute-group has been selected. Otherwise, a SEQ64_NO_MUTE_GROUP_SELECTED (-1) is returned. The caller must check this value before using it.

10.69.4.114 screenset_offset() [1/2]

```
int seq64::perform::screenset_offset ( ) const  [inline]
```

10.69.4.115 slot_number()

```
int seq64::perform::slot_number (
            int s )  [inline]
```

Parameters

s	Provides the sequence number of interest. This value should range from 0 to 1023 (c_max_seqs).

Returns

Returns the "normalized" value. Do not use it if less than zero.

10.69.4.116 save_playing_state()

```
void seq64::perform::save_playing_state ( )
```

Inactive patterns get the value set to false. Used in unsetting the snapshot status (c_status_snapshot).

10.69.4.117 restore_playing_state()

```
void seq64::perform::restore_playing_state ( )
```

Used in unsetting the snapshot status (c_status_snapshot).

10.69.4.118 save_current_screenset()

```
void seq64::perform::save_current_screenset (
            int repseq )
```

Inactive patterns get the value set to false. Used in saving the screen-set state during the queued-replace (queued-sol) operation, which occurs when the c_status_replace is performed while c_status_queue is active.

Parameters

repseq	Provides the number of the pattern for which the replace functionality is invoked. This pattern will set to "playing" whether it is on or off, so that it can stay active while toggling between "solo" and "playing with the rest of the patterns".

10.69.4.119 clear_current_screenset()

```
void seq64::perform::clear_current_screenset ( )
```

Needed when disabling the queue mode.

10.69.4.120 key_name()

```
std::string seq64::perform::key_name (
             unsigned k ) const  [inline]
```

Parameters

k	The key number for which to return the string name of the key.

10.69.4.121 get_key_events()

```
keys_perform::SlotMap& seq64::perform::get_key_events ( )  [inline]
```

10.69.4.122 get_key_count()

```
int seq64::perform::get_key_count (
             unsigned k ) const  [inline]
```

Parameters

k	The key value to be checked.

10.69.4.123 get_key_groups()

```
keys_perform::SlotMap& seq64::perform::get_key_groups ( )  [inline]
```

10.69.4.124 get_key_events_rev()

```
keys_perform::RevSlotMap& seq64::perform::get_key_events_rev ( )  [inline]
```

10.69.4.125 get_key_groups_rev()

```
keys_perform::RevSlotMap& seq64::perform::get_key_groups_rev ( )  [inline]
```

10.69.4.126 show_ui_sequence_key() [1/2]

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

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

10.69.4.127 show_ui_sequence_key() [2/2]

```
void seq64::perform::show_ui_sequence_key (
            bool flag )  [inline]
```

Parameters

flag	Provides the flag to set into keys().show_ui_sequence_key().

10.69.4.128 show_ui_sequence_number() [1/2]

```
bool seq64::perform::show_ui_sequence_number ( ) const  [inline]
```

Used in mainwid, optionsfile, and perform.

10.69.4.129 show_ui_sequence_number() [2/2]

```
void seq64::perform::show_ui_sequence_number (
            bool flag )  [inline]
```

Parameters

flag	Provides the value to set into keys().show_ui_sequence_number().

10.69.4.130 lookup_keyevent_key()

```
unsigned seq64::perform::lookup_keyevent_key (
            int seqnum )
```

If we're not in legacy mode, then we adjust for the screenset, so that screensets greater than 0 can also show the correct key name, instead of a question mark (or blank).

Legacy seq24 already responds to the toggling of the mute state via the shortcut keys even if screenset $>$ 0, but it shows the question mark.

Todo In the context of pattern keys, we should replace c_seqs_in_set with a better-named value; if sets are actually larger than that, due to the "sets" option, then we simply repeat the pattern here using a modifier key ["shifted", see lookup_slot_key()]; in other words, we're stuck on using 32 pattern hot-keys.

Parameters

seqnum	The number of the sequence for which to return the event key.

Returns

Returns the desired key. If there is no such value, then the space (' ') character is returned. It used to be the question mark.

10.69.4.131 lookup_slot_key()

```
unsigned seq64::perform::lookup_slot_key (
            int slot )
```

Parameters

slot	The number of the pattern/sequence for which to return the event key. This value can range from 0 to c_seqs_in_set - 1 up to (3 $*$ c_seqs_in_set) - 1, since we can support 32 hotkeys, plus these hot-keys "shifted" once and twice. This value is relative to m_screeset_offset, and then is modded re c_seqs_in_set, so that it always ranges from 0 to 31.

Returns

Returns the desired key. This will always work, due to the mod operation.

10.69.4.132 lookup_keyevent_seq()

```
int seq64::perform::lookup_keyevent_seq (
            unsigned keycode )  [inline]
```

The inverse of lookup_keyevent_key().

Parameters

keycode	The number of the event key for which to return the configured sequence number.

Returns

Returns the desired sequence. If there is no such value, then a sequence number of 0 is returned.

10.69.4.133 lookup_keygroup_key()

```
unsigned seq64::perform::lookup_keygroup_key (
            int groupnum )  [inline]
```

Parameters

groupnum	The number of the group for which to return the group key.

Returns

Returns the desired key. If there is no such value, then the default character is returned.

10.69.4.134 lookup_keygroup_group()

```
int seq64::perform::lookup_keygroup_group (
            unsigned keycode )  [inline]
```

The inverse of lookup_keygroup_key().

Parameters

keycode	The number of the group key for which to return the configured sequence number.

Returns

Returns the desired group number. If there is no such value, then a group number of 0 is returned.

10.69.4.135 start_playing()

```
void seq64::perform::start_playing (
            bool songmode = false )
```

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. Note that the complementary function, stop_playing(), is an inline function defined in the header file.

The perform::start() function passes its boolean flag to perform::inner_start(), which sets the playback mode to that flag; if that flag is false, that turns off "song" mode. So that explains why mute/unmute is disabled.

Playback use cases:

```
 These use cases are meant to apply to either a Seq32 or a regular build
 of Sequencer64, eventually.  Currently, the regular build does not have
 a concept of a "global" perform song-mode flag.

 -#  mainwnd.
     -#  Play.  If the perform song-mode is "Song", then use that mode.
         Otherwise, use "Live" mode.
     -#  Stop.  This action is modeless here.  In ALSA, it will cause
         a rewind (but currently seqroll doesn't rewind until Play is
         clicked, a minor bug).
     -#  Pause.  Same processing as Play or Stop, depending on current
         status.  When stopping, the progress bars in seqroll and
         perfroll remain at their current point.
 -#  perfedit.
     -#  Play.  Override the current perform song-mode to use "Song".
     -#  Stop.  Revert the perfedit setting, in case play is restarted
         or resumed via mainwnd.
     -#  Pause.  Same processing as Play or Stop, depending on current
         status.
  -# ALSA versus JACK.  One issue here is that, if JACK isn't "running"
     at all (i.e. we are in ALSA mode), then we cannot be JACK Master.
```

Helgrind shows a read/write race condition in m_start_from_perfedit bewteen jack_transport_callback() and start←
_playing() here. Is inline function access of a boolean atomic?

Parameters

songmode	Indicates if the caller wants to start the playback in Song mode (sometimes erroneously referred to as "JACK mode"). In the seq32 code at GitHub, this flag was identical to the "global_jack_start_mode" flag, which is true for Song mode, and false for Live mode. False disables Song mode, and is the default, which matches seq24. Generally, we pass true in this parameter if we're starting playback from the perfedit window. It alters the m_start_from_perfedit member, not the m_song_start_mode member (which replaces the global flag now).

10.69.4.136 pause_playing()

```
void seq64::perform::pause_playing (
             bool songmode = false )
```

Currently almost the same as stop_playing(), but expanded as noted in the comments so that we ultimately have more granular control over what happens. We're researching the whole sequence of stopping and starting, and it can be tricky to make correct changes.

We still need to make restarting pick up at the same place in ALSA mode; in JACK mode, JACK transport takes care of that feature.

Change Note ca 2016-10-11 User layk noted this call, and it makes sense to not do this here, since it is unknown at this point what the actual status is. Note that we STILL need to FOLLOW UP on calls to pause_playing() and stop_playing() in perfedit, mainwnd, etc.

is_pattern_playing(false);

But what about is_running()?

Parameters

songmode	Indicates that, if resuming play, it should play in Song mode (true) or Live mode (false). See the comments for the start_playing() function.

10.69.4.137 stop_playing()

```
void seq64::perform::stop_playing ( )
```

Stops playback, turns off the (new) m_dont_reset_ticks flag, and set the "is-pattern-playing" flag to false. With stop, reset the start-tick to either the left-tick or the 0th tick (to be determined, currently resets to 0).

10.69.4.138 start_key()

```
void seq64::perform::start_key (
             bool songmode = false )
```

Meant to be used by GUIs to unify the treatment of keys versus buttons. Also handy in the extended MIDI controls that people have requested.

Parameters

songmode	The live/play mode parameter to be passed along to the key processor. Defaults to false (live mode).

10.69.4.139 pause_key()

```
void seq64::perform::pause_key (
             bool songmode = false )
```

Meant to be used by GUIs to unify the treatment of keys versus buttons. Also handy in the extended MIDI controls that people have requested.

Parameters

songmode	The live/play mode parameter to be passed along to the key processor, when starting playback. Defaults to false (live mode).

10.69.4.140 stop_key()

```
void seq64::perform::stop_key ( )
```

Meant to be used by GUIs to unify the treatment of keys versus buttons. Also handy in the extended MIDI controls that people have requested.

10.69.4.141 learn_toggle()

```
void seq64::perform::learn_toggle ( ) [inline]
```

10.69.4.142 decrement_beats_per_minute()

```
midibpm seq64::perform::decrement_beats_per_minute ( )
```

Actually does a lot of work in those function calls.

Returns

Returns the resultant BPM, as a convenience.

10.69.4.143 increment_beats_per_minute()

```
midibpm seq64::perform::increment_beats_per_minute ( )
```

Actually does a lot of work in those function calls.

Returns

Returns the resultant BPM, as a convenience.

10.69.4.144 page_decrement_beats_per_minute()

```
midibpm seq64::perform::page_decrement_beats_per_minute ( )
```

Encapsulates some calls used in mainwnd. Actually does a lot of work in those function calls.

Returns

Returns the resultant BPM, as a convenience.

10.69.4.145 page_increment_beats_per_minute()

```
midibpm seq64::perform::page_increment_beats_per_minute ( )
```

Encapsulates some calls used in mainwnd. Actually does a lot of work in those function calls.

Returns

Returns the resultant BPM, as a convenience.

10.69.4.146 decrement_screenset()

```
int seq64::perform::decrement_screenset (
            int amount = 1 )
```

The value set here will represent the "active" screen-set in multi-window mode.

Parameters

amount	Indicates the amount the screenset is to be decremented. The default value is 1.

Returns

Returns the decremented screen-set value.

10.69.4.147 increment_screenset()

```
int seq64::perform::increment_screenset (
            int amount = 1 )
```

The value set here will represent the "active" screen-set in multi-window mode.

Parameters

amount	Indicates the amount the screenset is to be incremented. The default value is 1.

Returns

Returns the incremented screen-set value.

10.69.4.148 highlight()

```
bool seq64::perform::highlight (
            const sequence & seq ) const  [inline]
```

This setting is currently a build-time option, but could be made a run-time option later.

Parameters

seq	Provides a reference to the desired sequence.

10.69.4.149 is_smf_0()

```
bool seq64::perform::is_smf_0 (
            const sequence & seq ) const  [inline]
```

Parameters

seq	Provides a reference to the desired sequence.

10.69.4.150 get_sequence() [1/2]

```
const sequence* seq64::perform::get_sequence (
            int seq ) const  [inline]
```

This is the const version. Note that it is more efficient to call this function and check the result than to call is_active() and then call this function.

Parameters

seq	The prospective sequence number.

Returns

Returns the value of m_seqs[seq] if seq is valid. Otherwise, a null pointer is returned.

10.69.4.151 get_sequence() [2/2]

```
sequence* seq64::perform::get_sequence (
            int seq )  [inline]
```

This is the non-const version. Note that it is more efficient to call this function and check the result than to call is_active() and then call this function.

Parameters

seq	The prospective sequence number.

Returns

Returns the value of m_seqs[seq] if seq is valid. Otherwise, a null pointer is returned.

10.69.4.152 sequence_key()

```
void seq64::perform::sequence_key (
             int seq )
```

This function is use in mainwnd when toggling the mute/unmute setting using keyboard keys.

Parameters

seq	The sequence's control-key number, which is relative to the current screen-set.

10.69.4.153 sequence_label() [1/2]

```
std::string seq64::perform::sequence_label (
             const sequence & seq )
```

This string goes on the bottom-left of those user-interface elements.

The format of this string is something like the following example, depending on the "show sequence numbers" option. The values shown are, in this order, sequence number (if allowed), buss number, channel number, beats per bar, and beat width.

```
        No sequence number:     31-16 4/4
        Sequence number:        9  31-16 4/4
```

```
The sequence number and buss number are re 0, while the channel number is
displayed re 1, unless it is an SMF 0 null channel (0xFF), in which case
it is 0.

        "%-3d%d-%d %d/%d"  (old)
```

Note

Later, we could add the sequence hot-key to this string, though showing that is not much use in perfnames. Also, this function is a stilted mix of direct access and access through sequence number.

Parameters

seq	Provides the reference to the sequence, use for getting the sequence parameters to be written to the label string.

Returns

Returns the filled in label if the sequence is active. Otherwise, an empty string is returned.

10.69.4.154 sequence_label() [2/2]

```
std::string seq64::perform::sequence_label (
            int seqnum )
```

Parameters

seq	Provides the reference to the sequence, use for getting the sequence parameters to be written to the label string.

Returns

Returns the filled in label if the sequence is active. Otherwise, an empty string is returned.

10.69.4.155 sequence_title()

```
std::string seq64::perform::sequence_title (
            const sequence & seq )
```

This title is used in the slots to show the (possibly shortened) pattern title. Note that the sequence title will also show the sequence length, in measures, if the show_ui_sequence_key() option is active.

Parameters

seq	Provides the reference to the sequence, use for getting the sequence parameters to be written to the label string.

Returns

Returns the filled in label if the sequence is active. Otherwise, an empty string is returned.

10.69.4.156 main_window_title()

```
std::string seq64::perform::main_window_title ( )
```

Unlike the disabled code in mainwnd::update_window_title(), this code does not (yet) handle conversions to UTF-8.

Returns

Returns the filled-in main window title.

10.69.4.157 sequence_window_title()

```
std::string seq64::perform::sequence_window_title (
            const sequence & seq )
```

Parameters

seq	Provides the reference to the sequence, use for getting the sequence parameters to be written to the string.

Returns

Returns the filled in label if the sequence is active. Otherwise, an incomplete string is returned.

10.69.4.158 set_input_bus()

```
void seq64::perform::set_input_bus (
            bussbyte bus,
            bool active )
```

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

Note that the mastermidibus::set_input() function passes the setting along to the input busarray.

Tricky Code See the bus parameter. We should provide two separate functions for this feature, but it is already combined into one input-callback function with a lot of other functionality in the options module.

Parameters

bus	If this value is greater than SEQ64_DEFAULT_BUSS_MAX (32), then it is treated as a user-interface flag (PERFORM_KEY_LABELS_ON_SEQUENCE or PERFORM_NUM_LABELS_ON_SEQUENCE) that causes all the sequences to be dirtied, and thus get redrawn with the new user-interface setting.
active	Indicates whether the buss or the user-interface feature is active or inactive.

10.69.4.159 set_clock_bus()

```
void seq64::perform::set_clock_bus (
            bussbyte bus,
            clock_e clocktype )
```

Note that the call to mastermidibus::set_clock() also sets the clock in the output busarray.

Parameters

bus	The bus index to be set.
clocktype	Indicates whether the buss or the user-interface feature is e_clock_off, e_clock_pos, e_clock_mod, or (new) e_clock_disabled.

10.69.4.160 mainwnd_key_event()

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

This function handles the keys for the functions of replace, queue, keep-queue, snapshots, toggling mute groups, group learn, and playing screenset. For further keystroke processing, see mainwnd :: on_key_press_event().

Keys not handled here are handled in mainwnd, where GUI elements exist to manage these items:

```
-   bpm up & down
-   screenset up & down
-   mute group key
-   mute group learn
```

seq24 handles the following keys in two "on_key" events:

Release:

```
-   Replace unset
-   Queue unset
-   Snapshot 1 and snapshot 2 unset
-   Group learn unset
```

Press:

```
-   BPM dn and BMP up *
-   Replace set
-   Queue and keep-queue set
-   Snapshot 1 and snapshot 2 set
-   Screen-set dn and screen-set up *
-   Set playing screen-set
-   Group on and group off
-   Group learn set
-   Select and mute the group *
-   Start and stop keys *
-   Pattern mute/unmute keys *
```

Note that the asterisk indicates we handle it elsewhere. Screen-set down and up are handled in mainwnd by calling decrement_screenset() and increment_screenset(), and mainwid::set_screenset(). But that latter call is not made when MIDI control is in force, which might be an ISSUE.

Parameters

k	The keystroke object to be handled.

Returns

Returns true if the key was handled.

10.69.4.161 keyboard_control_press()

```
bool seq64::perform::keyboard_control_press (
            unsigned key )
```

10.69.4.162 keyboard_group_c_status_press()

```
bool seq64::perform::keyboard_group_c_status_press (
            unsigned key )
```

- [xxxxxxxxx]
  - perform::c_status "events".
    - c_status_replace.
    - c_status_queue.
    - c_status_snapshot.
    - c_status_oneshot.
    - Used by:
      - mainwnd::on_key_press_event() [perform::mainwnd_key_event()]
  - perform groups
    - On.
    - Off.
    - Learn.
    - Used by:
      - mainwnd::on_key_press_event() [perform::mainwnd_key_event()]
  - perform::playback_key_event().
  - perform::set_playing_screenset().
    - Start.
    - Stop.
    - Pause.
  - GUI framework specific

10.69.4.163 keyboard_group_c_status_release()

```
bool seq64::perform::keyboard_group_c_status_release (
             unsigned key )
```

10.69.4.164 keyboard_group_press()

```
bool seq64::perform::keyboard_group_press (
             unsigned key )
```

10.69.4.165 keyboard_group_release()

```
bool seq64::perform::keyboard_group_release (
             unsigned key )
```

10.69.4.166 keyboard_group_action()

```
perform::action_t seq64::perform::keyboard_group_action (
             unsigned key )
```

10.69.4.167 perfroll_key_event()

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

It handles the Ctrl keys for cut, copy, paste, and undo.

The "is modified" flag is raised if something is deleted, but we cannot yet handle the case where we undo all the changes. So, for now, we play it safe with the user, even if the user gets annoyed because he knows that he undid all the changes.

Parameters

k	The keystroke object to be handled.
drop_sequence	Provides the index of the sequence whose selected trigger is to be cut, copied, or pasted. Undo and redo are now supported.

Returns

Returns true if the key was handled.

10.69.4.168 playback_key_event()

```
bool seq64::perform::playback_key_event (
            const keystroke & k,
            bool songmode = false )
```

To be used in mainwnd, perfedit, and seqroll.

The start/end key may be the same key (e.g. Space) to allow toggling when the same key is mapped to both triggers.

Checking is_running() may not work completely in JACK.

Change Note layk 2016-10-11 Issue #42 to prevent inadvertent step-edit in sequence :: stream_event(). We did it slightly different to save a little code; also found a spot that was missed.

Parameters

k	Provides the encapsulated keystroke to check.
songmode	Provides the "jack flag" needed by the mainwnd, seqroll, and perfedit windows. Defaults to false, which disables Song mode, and enables Live mode. But using Song mode seems to make the pause key not work in the performance editor.

Returns

Returns true if the keystroke matched the start, stop, or (new) pause keystrokes. Generally, no further keystroke processing is needed in this case.

10.69.4.169 clear_sequence_triggers()

```
void seq64::perform::clear_sequence_triggers (
            int seq )
```

Parameters

seq	Provides the desired sequence. The is_active() function validates this value.

10.69.4.170 print_triggers()

```
void seq64::perform::print_triggers ( ) const
```

10.69.4.171 move_triggers()

```
void seq64::perform::move_triggers (
            bool direction )
```

Parameters

direction	Specifies the desired direction; false = left, true = right.

10.69.4.172 copy_triggers()

```
void seq64::perform::copy_triggers ( )
```

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

10.69.4.173 push_trigger_undo()

```
void seq64::perform::push_trigger_undo (
            int track = SEQ64_ALL_TRACKS )
```

Too bad we cannot yet keep track of all the undoes for the sake of properly handling the "is modified" flag.

This function now has a new parameter. Not added to this function is the seemingly redundant undo-push the seq32 code does; is this actually a seq42 thing?

Also, there is still an issue with our undo-handling for a single track. See pop_trigger_undo().

Parameters

track	A new parameter (found in the stazed seq32 code) that allows this function to operate on a single track. A parameter value of SEQ64_ALL_TRACKS (-1, the default) implements the original behavior.

10.69.4.174 pop_trigger_undo()

```
void seq64::perform::pop_trigger_undo ( )
```

Todo Look at seq32/src/perform.cpp and the perform :: push_trigger_undo(track) function, which has a track parameter that has a -1 values the supports all tracks. It requires two new vectors (one for undo, one for redo), two new flags (likewise). We've put this code in place, no longer macroed out, now permanent.

10.69.4.175 pop_trigger_redo()

```
void seq64::perform::pop_trigger_redo ( )
```

10.69.4.176 get_trigger_state()

```
bool seq64::perform::get_trigger_state (
            int seqnum,
            midipulse tick ) const
```

Parameters

seqnum	The index to the desired sequence.
tick	The time-location at which to get the trigger state.

Returns

Returns true if the sequence indicated by *seqnum* exists and it's trigger state is true.

10.69.4.177 add_trigger()

```
void seq64::perform::add_trigger (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	Indicates the sequence that needs to have its trigger handled.
tick	The MIDI pulse number at which the trigger should be handled.

10.69.4.178 delete_trigger()

```
void seq64::perform::delete_trigger (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	Indicates the sequence that needs to have its trigger handled.
tick	The MIDI pulse number at which the trigger should be handled.

10.69.4.179 add_or_delete_trigger()

```
void seq64::perform::add_or_delete_trigger (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	Indicates the sequence that needs to have its trigger handled.
tick	The MIDI pulse number at which the trigger should be handled.

10.69.4.180 split_trigger()

```
void seq64::perform::split_trigger (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	Indicates the sequence that needs to have its trigger split.
tick	The MIDI pulse number at which the trigger should be split.

10.69.4.181 paste_trigger()

```
void seq64::perform::paste_trigger (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	Indicates the sequence that needs to have its trigger pasted.
tick	The MIDI pulse number at which the trigger should be pasted.

10.69.4.182 paste_or_split_trigger()

```
void seq64::perform::paste_or_split_trigger (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	Indicates the sequence that needs to have its trigger handled.
tick	The MIDI pulse number at which the trigger should be handled.

10.69.4.183 intersect_triggers()

```
bool seq64::perform::intersect_triggers (
            int seqnum,
            midipulse tick )
```

Parameters

seqnum	The number of the sequence in question.
tick	The time-location desired.

Returns

Returns true if the sequence exists and the sequence::intersect_triggers() function returned true.

10.69.4.184 get_max_trigger()

```
midipulse seq64::perform::get_max_trigger ( ) const
```

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?

10.69.4.185 is_dirty_main()

```
bool seq64::perform::is_dirty_main (
            int seq )
```

See the sequence::is_dirty_main() function.

Parameters

seq	The pattern number. It is checked for validity.

Returns

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

10.69.4.186 is_dirty_edit()

```
bool seq64::perform::is_dirty_edit (
            int seq )
```

Parameters

seq	The pattern number. It is checked for validity.

Returns

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

10.69.4.187 is_dirty_perf()

```
bool seq64::perform::is_dirty_perf (
            int seq )
```

Parameters

seq	The pattern number. It is checked for validity.

Returns

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

10.69.4.188 is_dirty_names()

```
bool seq64::perform::is_dirty_names (
            int seq )
```

Parameters

seq	The pattern number. It is checked for validity.

Returns

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

10.69.4.189 is_exportable()

```
bool seq64::perform::is_exportable (
             int seq ) const
```

Parameters

seq	The index of the desired sequence.

Returns

Returns true if the sequence has the three properties noted above.

10.69.4.190 set_screenset()

```
int seq64::perform::set_screenset (
             int ss )
```

It's not clear that we need to set the "is modified" flag just because we changed the screen-set, so we don't.

This function is called when incrementing and decrementing the screenset. Its counterpart, set_playing_screenset(), is called when the hot-key or the MIDI control for setting the screenset is called.

As a new feature, we would like to queue-mute the previous screenset, and queue-unmute the newly-selected screenset. Still working on getting it right. Aborted.

Parameters

ss	The index of the desired new screen-set. It is forced to range from 0 to m_max_sets - 1. The clamping seems weird, but hews to seq24. What it does is let the user wrap around the screen-sets in the user interface. The value set here will represent the "active" screen-set in multi-window mode.

Returns

Returns the actual final value of the screen-set that was set, i.e. the m_screenset member value.

10.69.4.191 screenset()

```
int seq64::perform::screenset ( ) const  [inline]
```

10.69.4.192 get_playing_screenset()

```
int seq64::perform::get_playing_screenset ( ) const  [inline]
```

10.69.4.193 toggle_other_seqs()

```
bool seq64::perform::toggle_other_seqs (
             int seqnum,
             bool isshiftkey )
```

See mainwid::on_button_release_event(). If the Shift key is pressed, toggle the mute state of all other sequences. Inactive sequences are skipped.

Parameters

seqnum	The sequence that is being clicked on. It must be active in order to allow toggling.
isshiftkey	Indicates if the shift-key functionality for toggling all of the other sequences is active.

Returns

Returns true if the full toggling was able to be performed.

10.69.4.194 toggle_other_names()

```
bool seq64::perform::toggle_other_names (
             int seqnum,
             bool isshiftkey )
```

See perfnames::on_button_press_event(). If the Shift key is pressed, toggle the mute state of all other sequences. Inactive sequences are skipped.

Parameters

seqnum	The sequence that is being clicked on. It must be active in order to allow toggling.
isshiftkey	Indicates if the shift-key functionality for toggling all of the other sequences is active.

Returns

Returns true if the toggling was able to be performed.

10.69.4.195 are_any_armed()

```
bool seq64::perform::are_any_armed ( )
```

Returns

Returns true if even one sequence is armed.

10.69.4.196 max_sets() [1/2]

```
void seq64::perform::max_sets (
             int sets )  [inline]
```

Other than that, it should not be used. We may find a way to enforce that, later.

10.69.4.197 seqs_in_set()

```
void seq64::perform::seqs_in_set (
             int seqs )  [inline]
```

10.69.4.198 song_recording() [1/2]

```
bool seq64::perform::song_recording ( ) const  [inline]
```

10.69.4.199 song_record_snap() [1/2]

```
bool seq64::perform::song_record_snap ( ) const  [inline]
```

10.69.4.200 resume_note_ons() [1/2]

```
bool seq64::perform::resume_note_ons ( ) const  [inline]
```

10.69.4.201 resume_note_ons() [2/2]

```
void seq64::perform::resume_note_ons (
             bool f )  [inline]
```

10.69.4.202 select_trigger()

```
bool seq64::perform::select_trigger (
             int dropseq,
             midipulse droptick )
```

Parameters

dropseq	The sequence number that was in play for the location of the mouse in the (for example) perfedit roll.
droptick	The location of the mouse horizonally in the perfroll.

Returns

Returns true if a trigger was there to select, and was selected.

10.69.4.203 unselect_all_triggers()

```
void seq64::perform::unselect_all_triggers ( )
```

10.69.4.204 get_bank_name()

```
const std::string& seq64::perform::get_bank_name (
             int bank ) const  [inline]
```

However, we will still refer to them as "sets".

10.69.4.205 set_looping()

```
void seq64::perform::set_looping (
             bool looping )  [inline]
```

Parameters

looping	The boolean value to set for looping, used in the performance editor.

10.69.4.206 get_sequence_color()

```
int seq64::perform::get_sequence_color (
             int seqnum ) const  [inline]
```

We don't want perform knowing the details of the palette color, just treat it as an integer.

10.69.4.207 set_sequence_color()

```
void seq64::perform::set_sequence_color (
             int seqnum,
             int c )  [inline]
```

10.69.4.208 have_undo()

```
bool seq64::perform::have_undo ( ) const  [inline]
```

10.69.4.209 set_have_undo()

```
void seq64::perform::set_have_undo (
             bool undo )  [inline]
```

Once it is set, it remains set, unless cleared by saving the file.

10.69.4.210 have_redo()

```
bool seq64::perform::have_redo ( ) const  [inline]
```

10.69.4.211 set_have_redo()

```
void seq64::perform::set_have_redo (
             bool redo )  [inline]
```

10.69.4.212 seq_edit_mode() [1/2]

```
edit_mode_t seq64::perform::seq_edit_mode (
             int seq ) const  [inline]
```

10.69.4.213 seq_edit_mode() [2/2]

```
void seq64::perform::seq_edit_mode (
             int seq,
             edit_mode_t ed )  [inline]
```

Was private, but a class can have too many friends.

Parameters

seq	Provides the sequence number. If the sequence is not active (available), then nothing is done.
ed	Provides the edit mode, which is "note" or "drum", and which determines if the duration of events matters (note) or not (drum).

10.69.4.214 current_screenset_notepad()

```
const std::string& seq64::perform::current_screenset_notepad ( ) const  [inline]
```

10.69.4.215 set_screenset_notepad() [1/2]

```
void seq64::perform::set_screenset_notepad (
            int screenset,
            const std::string & notepad,
            bool is_load_modification = false )
```

Parameters

screenset	The ID number of the screen-set, an index into the m_screenset_notepad[] array.
notepad	Provides the string date 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. Fixed.
is_load_modification	If true (the default is false), we do not want to set the modify flag, otherwise the user is prompted to save even if no changes have occurred.

10.69.4.216 set_screenset_notepad() [2/2]

```
void seq64::perform::set_screenset_notepad (
            const std::string & note )  [inline]
```

Parameters

note	The string value to set into the notepad text.

10.69.4.217 start()

```
void seq64::perform::start (
            bool songmode )
```

Question Should we also call song_start_mode(songmode) here?

Parameters

songmode	If true, playback is to be in Song mode. Otherwise, it is to be in Live mode.

10.69.4.218 stop()

```
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?

Stazed:

```
This function's sole purpose was to prevent inner_stop() from being
called internally when JACK was running... potentially twice.
inner_stop() was called by output_func() when JACK sent a
JackTransportStopped message. If seq42 initiated the stop, then
stop_jack() was called which then triggered the JackTransportStopped
message to output_func() which then triggered the bool stop_jack to
call inner_stop().  The output_func() call to inner_stop() is only
necessary when some other JACK client sends a jack_transport_stop
message to JACK, not when it is initiated by seq42.  The method of
relying on JACK to call inner_stop() when internally initiated caused
a (very) obscure apparent freeze if you press and hold the start/stop
key if set to toggle. This occurs because of the delay between
JackTransportStarting and JackTransportStopped if both triggered in
rapid succession by holding the toggle key down.  The variable
global_is_running gets set false by a delayed inner_stop() from JACK
after the start (true) is already sent. This means the global is set
to true when JACK is actually off (false). Any subsequent presses to
the toggle key send a stop message because the global is set to true.
Because JACK is not running, output_func() is not running to send the
inner_stop() call which resets the global to false. Thus an apparent
freeze as the toggle key endlessly sends a stop, but inner_stop()
never gets called to reset. Whoo! So, to fix this we just need to
call inner_stop() directly rather than wait for JACK to send a
delayed stop, only when running. This makes the whole purpose of this
stop() function unneeded. The check for m_jack_running is commented
out and this function could be removed. It is being left for future
generations to ponder!!!
```

10.69.4.219 start_jack()

```
void seq64::perform::start_jack ( ) [inline]
```

10.69.4.220 stop_jack()

```
void seq64::perform::stop_jack ( ) [inline]
```

10.69.4.221 song_recording_stop()

```
void seq64::perform::song_recording_stop ( )
```

Should be called only when not recording the performance data. This is a Kepler34 feature.

10.69.4.222 song_recording() [2/2]

```
void seq64::perform::song_recording (
            bool f )  [inline]
```

10.69.4.223 song_record_snap() [2/2]

```
void seq64::perform::song_record_snap (
            bool f )  [inline]
```

10.69.4.224 playback_mode() [1/2]

```
bool seq64::perform::playback_mode ( )  [inline]
```

10.69.4.225 playback_mode() [2/2]

```
void seq64::perform::playback_mode (
            bool playbackmode )  [inline]
```

Parameters

playbackmode	The value of the playback mode flag to be set.

10.69.4.226 is_group_learning()

```
bool seq64::perform::is_group_learning ( )  [inline]
```

10.69.4.227 set_beats_per_minute()

```
void seq64::perform::set_beats_per_minute (
            midibpm bpm )
```

Replaces perform::set_bpm() from seq24.

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

It's not clear that we need to set the "is modified" flag just because we changed the beats per minute. This setting does get saved to the MIDI file, with the c_bpmtag.

Parameters

bpm	Provides the beats/minute value to be set. It is clamped, if necessary, between the values SEQ64_MINIMUM_BPM to SEQ64_MAXIMUM_BPM. They provide a wide range of speeds, well beyond what normal music needs.

10.69.4.228 panic()

```
void seq64::perform::panic ( )
```

Adapted from Oli Kester's Kepler34 project.

10.69.4.229 ppqn() [2/2]

```
void seq64::perform::ppqn (
             int p )  [inline], [private]
```

10.69.4.230 collapse()

```
void seq64::perform::collapse ( )  [inline], [private]
```

10.69.4.231 copy()

```
void seq64::perform::copy ( )  [inline], [private]
```

10.69.4.232 expand()

```
void seq64::perform::expand ( )  [inline], [private]
```

10.69.4.233 midi_control_toggle()

```
midi_control & seq64::perform::midi_control_toggle (
             int ctl )  [private]
```

Recall that the midi_control object specifies if a control is active, inversely-active, what status byte initiates it, what data byte initiates it, and the min/max values. Note that the status byte determines what category of event it is (e.g. note on/off versus a continuous controller), and the data byte indicates the note value or the type of continous controller.

Parameters

ctl	Provides the index to pass to valid_midi_control_seq() to obtain a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

Returns

Returns the "toggle" value if the control value is valid, or a reference to sm_mc_dummy otherwise.

10.69.4.234 midi_control_on()

```
midi_control & seq64::perform::midi_control_on (
            int ctl )  [private]
```

Parameters

ctl	Provides the index to pass to valid_midi_control_seq() to obtain a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

Returns

Returns the "on" value if the control value is valid, and a reference to sm_mc_dummy otherwise.

10.69.4.235 midi_control_off()

```
midi_control & seq64::perform::midi_control_off (
            int ctl )  [private]
```

Parameters

ctl	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object.

Returns

Returns the "off" value if the control value is valid, and a reference to sm_mc_dummy otherwise.

10.69.4.236 midi_control_event()

```
bool seq64::perform::midi_control_event (
            const event & ev )  [private]
```

Here is the processing involved in this function .... TODO.

Incorporates pull request #24, arnaud-jacquemin, issue #23 "MIDI controller toggles wrong pattern".

Note that the event::get_status() function returns a value with the channel nybble stripped off.

Parameters

ev	Provides the MIDI event to potentially trigger a control action.

Returns

Returns true if the event was actually handled. TODO.

10.69.4.237 midi_control_record()

```
bool seq64::perform::midi_control_record (
             const event & ev )  [private]
```

This function is used for a quick check while recording, so we don't have scan 84 items before adding a musical MIDI event, but still can detect a recording-status change command.

We handle record, but also need to handle quan_record and thru. midi_control_event() iterates through all values. We need to "iterate" between the record, quan_record, and thru values only.

Parameters

ev	Provides the MIDI event to potentially trigger a recording-control action.

Returns

Returns true if the event was an active recording control event.

10.69.4.238 handle_midi_control()

```
bool seq64::perform::handle_midi_control (
             int ctl,
             bool state )  [private]
```

```
        c_midi_control_mod_replace
        c_midi_control_mod_snapshot
        c_midi_control_mod_queue
        c_midi_control_mod_gmute
        c_midi_control_mod_glearn
```

```
Other values supported:
        c_midi_control_bpm_up
        c_midi_control_bpm_dn
        c_midi_control_ss_up
        c_midi_control_ss_dn
        c_midi_control_play_ss


We have added the following extended values:


        c_midi_control_playback     (for pause/toggle, start, and stop)
        c_midi_control_song_record  (for performance record toggle/on/off)
        c_midi_control_solo         (for toggle, on, or off)
        c_midi_control_thru         (see record below)
        c_midi_control_bpm_page_up
        c_midi_control_bpm_page_dn
        c_midi_control_ss_set
        c_midi_control_record       (see thru above)
        c_midi_control_quan_record  (quantized record, see thru above)
        c_midi_control_reset_seq    (resets the sequence)


The extended values will actually be handled by a new function,
handle_midi_control_ex().

c_midi_control_solo probably will need a parameter.

Values from 32 through 2*32 are normalized by subtracting 32 and passed to
the select_and_mute_group() function.  Otherwise, the following apply:

We also reserve a few control values above that for expansion.
```

Parameters

ctl	The MIDI control value to use to perform an operation.
state	The state of the control, used with the following values:

Returns

Returns true if the event was handled. Mostly rote, for conformance with the newer handle_midi_control_ex() function.

10.69.4.239 handle_midi_control_ex()

```
bool seq64::perform::handle_midi_control_ex (
             int ctl,
             midi_control::action a,
             int v )  [private]
```

Parameters

ctl	The MIDI control value to use to perform an operation.
a	The action of the control.
v	The value of the control (ie.: note velocity / control change value). Also called a "parameter" in the comments.

Returns

Returns true if the control was an extended control and was acted on.

10.69.4.240 handle_midi_control_event()

```
bool seq64::perform::handle_midi_control_event (
            const event & ev,
            int ctl,
            int offset = 0 )  [private]
```

Parameters

ev	Provides the MIDI event to potentially trigger a control action.
ctl	The specific MIDI control to check.
offset	The offset into the control list, used only for changing the playing status of a sequence/pattern in the current screen-set.

Returns

Returns true if the event was matched and handled.

10.69.4.241 get_screenset_notepad()

```
const std::string & seq64::perform::get_screenset_notepad (
            int screenset ) const  [private]
```

Parameters

screenset	The ID number of the screen-set, an index into the m_screenset_notepad[] 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.

10.69.4.242 any_group_unmutes()

```
bool seq64::perform::any_group_unmutes ( ) const  [private]
```

Returns

Returns true if there are any unmute statuses in the mute-group array. If they're all zero, we don't need to save them.

10.69.4.243 print_group_unmutes()

```
void seq64::perform::print_group_unmutes ( ) const  [private]
```

10.69.4.244 mute_group_tracks()

```
void seq64::perform::mute_group_tracks ( )  [private]
```

It loops through every screen-set. In each screen-set, it acts on each active sequence. If the active sequence is in the current "in-view" screen-set (m_screenset as opposed to m_playscreen, and its m_track_mute_state[] is true, then the sequence is turned on, otherwise it is turned off. The result is that the in-view screen-set is activated as per the mute states, while all other screen-sets are muted.

Change Note tdeagan 2015-12-22 via git pull. Replaced m_playscreen with m_screenset.

We are disabling Tim's fix for a bit in order to make sure we're doing what Seq24 does with the playing set key. (Home).

It seems to us that the for (g) clause should have g range from 0 to m_max_sets, not m_seqs_in_set. Done.

10.69.4.245 select_and_mute_group()

```
void seq64::perform::select_and_mute_group (
             int group )  [private]
```

Called in perform and in mainwnd.

Parameters

group	Provides the group number for the group to be muted.

10.69.4.246 set_song_mute()

```
void seq64::perform::set_song_mute (
             mute_op_t op )  [private]
```

The sequence::set_song_mute() and toggle_song_mute() functions do all the work, including mp-dirtying the sequence.

We've modified this function to call mute_all_tracks() and toggle_all_tracks() in order to consolidate the code and (cough cough) fix a bug in this functionality from the mainwnd menu.

Question Do we want to replace the call to toggle_all_tracks() with a call to toggle_playing_tracks()?

Parameters

op	Provides the "flag" that indicates if this function is to set mute on, off, or to toggle the mute status.

10.69.4.247 set_playing_screenset()

```
void seq64::perform::set_playing_screenset ( )  [private]
```

This function is called when one of the snapshot keys is pressed.

For each value up to m_seqs_in_set (32), the index of the current sequence in the current screen-set (m_playscreen) is obtained. If the sequence is active and the sequence actually exists, it is processed; null sequences are no longer flagged as an error, they are just ignored.

Modifies m_playscreen, m_playscreen_offset, stores the current playing-status of each sequence in m_tracks_↩ mute_state[], and then calls mute_group_tracks(), turns on unmuted tracks in the current screen-set.

Basically, this function retrieves and saves the playing status of the sequences in the current play-screen, sets the play-screen to the current screen-set, and then mutes the previous play-screen. It is called via the c_midi_control↩ _play_ss value or via the set-playing-screen-set keystroke.

10.69.4.248 set_mode_group_mute()

```
void seq64::perform::set_mode_group_mute ( )  [inline], [private]
```

10.69.4.249 unset_mode_group_mute()

```
void seq64::perform::unset_mode_group_mute ( )  [inline], [private]
```

10.69.4.250 select_group_mute()

```
void seq64::perform::select_group_mute (
             int mutegroup )  [private]
```

Then, no matter what, it makes the desired mute-group the selected mute-group. Compare to set_and_copy_↩ mute_group().

One thing to note is that, once saved, then, if used, it is applied to the current screen-set, even if it is not the screen-set whose playing status were saved.

Also note that this function now supports variset mode, via screen_offset().

Parameters

mutegroup	The number of the desired mute group, clamped to be between 0 and m_seqs_in_set-1. Obviously, it is the set whose state is to be stored, if in group-learn mode.

10.69.4.251 set_mode_group_learn()

```
void seq64::perform::set_mode_group_learn ( )  [private]
```

This function is called via a MIDI control c_midi_control_mod_glearn and via the group-learn keystroke.

10.69.4.252 unset_mode_group_learn()

```
void seq64::perform::unset_mode_group_learn ( )  [private]
```

Then unsets the group-learn mode flag. This function is called via a MIDI control c_midi_control_mod_glearn, via the group-learn keystroke, and in mainwnd::on_key_press_event(), to end the group-learn mode.

Shouldn't this function also call this one, to perfectly complement set_mode_group_learn: unset_mode_group_↩ mute(). Too tricky.

10.69.4.253 load_mute_group()

```
bool seq64::perform::load_mute_group (
            int gmute,
            int gm[c_max_groups] )  [private]
```

In addition, a copy is saved in a second mute-group array in case we want to avoid "corrupting" the "rc" mute-groups with mute-groups from the MIDI file.

It also uses the constant c_seqs_in_set instead of the variable m_seqs_in_set so that the loading always handles 32 x 32 = 1024 settings.

Replaces "set_group_mute_state(g, gm[s] != 0)" and mute_group_offset(), which depend on the configured "seqs-in-set" value. Here, we are always tied to the legacy 32 x 32 sizes, to load and save to the configuration.

Parameters

gmute	The mute-group to load. If out-of-range (0 to c_max_groups), no setting is made. There's no need to call clamp_group(); it is useful in playing, not in loading the configuration.
gm	The array of c_seqs_in_set values to be used for the load. The pointer is not checked.

Returns

Returns true if the group was valid.

10.69.4.254 save_mute_group()

```
bool seq64::perform::save_mute_group (
            int gmute,
            int gm[c_max_groups] ) const  [private]
```

However, it has a wrinkle in what it saves. First, if there are no unmuted patterns in any of the mute-groups, then the original mute-groups read from the "rc" file are saved back. Second, this saving is also done if the e_mute_↩ group_preserve flag is set. If the e_mute_group_stomp flag is set, then the active mute-group statuses are written to the "rc" file.

Parameters

gmute	The mute-group to save. If out-of-range (0 to c_max_groups), no saving is done.
gm	The array of c_seqs_in_set values to be used for the save. The pointer is not checked.

Returns

Returns true if the group was valid.

10.69.4.255 set_and_copy_mute_group()

```
void seq64::perform::set_and_copy_mute_group (
            int mutegroup )  [private]
```

Then the mute-group is stored in m_tracks_mute_state[], which holds states for only the number of sequences in a set.

Compare to select_group_mute(); its main difference is that it will at least copy the states even if not in group-learn mode. And, if in group-learn mode, it will grab the playing states of the sequences before copying them.

This function is used only once, in select_and_mute_group(). It used to be called just select_mute_group(), but that's too easy to confuse with select_group_mute().

Change Note tdeagan 2015-12-22 via git pull: git pull `https://github.com/TDeagan/sequencer64.↩ git` mute_groups m_screenset replaces m_playscreen_offset.

Parameters

mutegroup	Provides the mute-group to select.

10.69.4.256 activate()

```
bool seq64::perform::activate ( )  [private]
```

Currently does work only for JACK; the activate() calls for other APIs just return true without doing anything.

10.69.4.257 position_jack()

```
void seq64::perform::position_jack (
            bool songmode,
            midipulse tick = 0 )  [private]
```

Parameters

songmode	If true, playback is to be in Song mode. Otherwise, it is to be in Live mode.
tick	Provides the pulse position to be set. The default value is 0.

10.69.4.258 off_sequences()

```
void seq64::perform::off_sequences ( )  [private]
```

Replaces "for (int s = 0; s < m_sequence_max; ++s)"

10.69.4.259 unqueue_sequences()

```
void seq64::perform::unqueue_sequences (
            int current_seq )  [private]
```

This function supports the new queued-replace feature. This feature is activated when the keep-queue feature is turned on via its hot-key, and then the replace hot-key is used on a pattern. When that happens, the current sequence is queued to be toggled, and all unmuted sequences are queued to toggle off at the same time. Thus, this is a kind of queued-solo feature.

This function assumes we have called save_current_screenset() first, so that the soloing can be exactly toggled. Only sequences that were initially on should be toggled.

Parameters

current_seq	This number is that of the sequence/pattern whose hot-key was struck. We don't want to toggle this one off, just on.

10.69.4.260 all_notes_off()

```
void seq64::perform::all_notes_off ( )  [private]
```

Then flush the master MIDI buss.

10.69.4.261 set_active()

```
void seq64::perform::set_active (
             int seq,
             bool active )  [private]
```

If setting it active, the sequence::number() setter is called. It won't modify the sequence's internal copy of the sequence number if it has already been set.

Parameters

seq	Provides the prospective sequence number.
active	True if the sequence is to be set to the active state.

10.69.4.262 set_was_active()

```
void seq64::perform::set_was_active (
             int seq )  [private]
```

Why do we need this routine?

Parameters

seq	The pattern number. It is checked for validity.

10.69.4.263 reset_sequences()

```
void seq64::perform::reset_sequences (
             bool pause = false )  [private]
```

Note that these calls are folded into one member function of the sequence class. Finally, flush the master MIDI buss.

Could use a member function pointer to avoid having to code two loops. We did it.

Parameters

pause	Try to prevent notes from lingering on pause if true. By default, it is false.

10.69.4.264 play()

```
void seq64::perform::play (
             midipulse tick )  [private]
```

Starts the playing of all the patterns/sequences.

This function just runs down the list of sequences and has them dump their events. It skips sequences that have no playable MIDI events.

Note how often the "sp" (sequence) pointer was used. It was worth offloading all these calls to a new sequence function. Hence the new sequence::play_queue() function.

Finally, we stop the looping at m_sequence_high rather than m_sequence_max, to save a little time.

Parameters

tick	Provides the tick at which to start playing. This value is also copied to m_tick.

10.69.4.265 set_orig_ticks()

```
void seq64::perform::set_orig_ticks (
            midipulse tick )  [private]
```

This is really the "last tick" value, so we renamed sequence::set_orig_tick() to sequence::set_last_tick().

Parameters

tick	Provides the last-tick value to be set for each sequence that is active.

10.69.4.266 max_active_set()

```
int seq64::perform::max_active_set ( ) const  [private]
```

Returns

Returns the value of the highest active set. A value of 0 represents the first set. If no sequences are active, then -1 is returned.

10.69.4.267 launch_input_thread()

```
void seq64::perform::launch_input_thread ( )  [private]
```

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

10.69.4.268 launch_output_thread()

```
void seq64::perform::launch_output_thread ( )  [private]
```

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

10.69.4.269 init_jack_transport()

```
bool seq64::perform::init_jack_transport ( )  [private]
```

Who calls this routine? The main() routine of the application [via launch()], and the options module, when the Connect button is pressed.

Returns

Returns the result of the init() call; true if JACK sync is now running. If JACK support is not built into the application, then this function returns false, to indicate that JACK is (definitely) not running.

10.69.4.270 deinit_jack_transport()

```
bool seq64::perform::deinit_jack_transport ( )  [private]
```

Called by launch() and in the options module, when the Disconnect button is pressed. This function operates only while Sequencer64 is not outputing, otherwise we have a race condition that can lead to a crash.

Returns

Returns the result of the init() call; false if JACK sync is now no longer running. If JACK support is not built into the application, then this function returns true, to indicate that JACK is (definitely) not running.

10.69.4.271 seq_in_playing_screen()

```
bool seq64::perform::seq_in_playing_screen (
             int seq )  [private]
```

Parameters

seq	Provides the index of the desired sequence.

Returns

Returns true if the sequence adheres to the conditions noted above.

10.69.4.272 is_modified() [2/2]

```
void seq64::perform::is_modified (
            bool flag )  [inline], [private]
```

Parameters

flag	The value of the modified flag to be set.

10.69.4.273 valid_midi_control_seq()

```
bool seq64::perform::valid_midi_control_seq (
            int seq ) const  [inline], [private]
```

We were checking against c_midi_track_ctrl as well, but that was a bug. This function is meant to check that the supplied sequence number does not exceed the value of c_midi_controls_extended (32 $*$ 2 + 10 + 10 = 84). The track (sequence or pattern) controls rangoe from 0 to 64. Next come the "c_midi_control" values: bpm_up, bpm_dn, ..., play_ss, plus some extended controls that are relatively new, and, lastly, c_midi_controls_extended itself.

Parameters

seq	The sequence number value that should be inside the c_midi_controls_extended range. This value can specify not only a sequence number, but larger control values as well, so the function and parameter are mildly mis-named.

Returns

Returns true if the sequence number is valid for accessing the MIDI control values. For this function, no error print-out is generated.

10.69.4.274 max_sets() [2/2]

```
int seq64::perform::max_sets ( ) const  [inline], [private]
```

10.69.4.275 is_screenset_valid()

```
bool seq64::perform::is_screenset_valid (
            int screenset ) const  [inline], [private]
```

Parameters

screenset	The prospective screenset value.

Returns

Returns true if the parameter is valid. For this function, no error print-out is generated.

10.69.4.276 is_running() [2/2]

```
void seq64::perform::is_running (
             bool running )  [inline], [private]
```

Parameters

running	The value of the running flag to be set.

10.69.4.277 screenset_offset() [2/2]

```
int seq64::perform::screenset_offset (
             int ss )  [inline], [private]
```

It supports variset mode (which is active if m_seqs_in_set != c_seq_in_set).

Parameters

ss	Provides the screen-set number, ranging from 0 to c_max_sets-1. This value is not validated, for speed.

Returns

Returns the product of *ss* and m_seqs_in_set.

10.69.4.278 is_seq_valid()

```
bool seq64::perform::is_seq_valid (
             int seq ) const  [private]
```

Also see the function is_mseq_valid(), which also checks the pointer stored in the m_seq[] array.

We considered checking the *seq* param against sequence_count(), but this function is called while creating sequences that add to that count, so we continue checking against the "container" size. Also, it is possible to have holes in the array representing inactive sequences, so that sequencer_count() would be too limiting.

Parameters

seq	The sequencer number, in interval [0, m_sequence_max).

Returns

Returns true if the sequence number is valid.

10.69.4.279 is_mseq_valid()

```
bool seq64::perform::is_mseq_valid (
            int seq ) const  [private]
```

It also evaluates the m_seq[seq] pointer value.

Note

Since we can have holes in the sequence array, where there are inactive sequences, we check if the sequence is even active before emitting a message about a null pointer for the sequence. We only want to see messages that indicate actual problems.

Parameters

seq	Provides the sequence number to be checked. It is checked for validity. We cannot compare the sequence number versus the sequence_count(), because the current implementation can have inactive holes (with null pointers) interspersed with active pointers.

Returns

Returns true if the sequence number is valid as per is_seq_valid(), and the sequence pointer is not null.

10.69.4.280 install_sequence()

```
bool seq64::perform::install_sequence (
            sequence * seq,
            int seqnum )  [private]
```

It is common code and using it prevents inconsistences. It assumes values have already been checked. It does not set the "is modified" flag, since adding a sequence by loading a MIDI file should not set it. Compare new_sequence(), used by mainwid and seqmenu, with add_sequence(), used by midifile.

Parameters

seq	The pointer to the pattern/sequence to add.
seqnum	The sequence number of the pattern to be added. Not validated, to save some time.

Returns

Returns true if a sequence was removed, or the sequence was successfully added. In other words, if a real change in sequence pointers occurred. It is up to the caller to decide if the change warrants setting the "is modified" flag.

10.69.4.281 inner_start()

```
void seq64::perform::inner_start (
            bool songmode )  [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.

Minor issue:

```
 In ALSA mode, restarting the sequence moves the progress bar to the
 beginning of the sequence, even if just pausing.  This is fixed by
 compiling with SEQ64_PAUSE_SUPPORT, which disables calling
 off_sequences() when starting playback from the song editor /
 performance window.
```

Parameters

songmode	Sets the playback mode, and, if true, turns off all of the sequences before setting the is-running condition.

10.69.4.282 inner_stop()

```
void seq64::perform::inner_stop (
            bool midiclock = false )  [private]
```

Sets m_usemidiclock to the given value. Note that we do need to set the running flag to false here, even when JACK is running. Otherwise, JACK starts ping-ponging back and forth between positions under some circumstances.

However, if JACK is running, we do not want to reset the sequences... this causes the progress bar for each sequence to move to near the end of the sequence.

Parameters

midiclock	If true, indicates that the MIDI clock should be used.

10.69.4.283 clamp_track()

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

Fixed the bug we found, where we checked for track > m_seqs_in_set, instead of using the >= operator. Supports variset mode.

Parameters

track	The track value to be checked and rectified as necessary.

Returns

Returns the track parameter, clamped between 0 and m_seqs_in_set-1, inclusive.

10.69.4.284 clamp_group()

```
int seq64::perform::clamp_group (
            int group ) const  [private]
```

Fixed the bug we found, where we checked for track > m_seqs_in_set, instead of using the >= operator. We now compare against the new c_max_groups value (32). But, if the set-size is larger, then we have fewer mute groups available.

Parameters

group	The group value to be checked and rectified as necessary.

Returns

Returns the group parameter, clamped between 0 and c_max_sets-1, inclusive. We use c_max_groups rather than m_max_sets because the new varisets feature reduces the number of sets (in general); this check is basically a sanity check. Additionally, if varisets mode is in force (i.e. there are more than 32 sequences in a set), the group number is clamped to the maximum number of sets under that constraint.

10.69.4.285 set_key_event()

```
void seq64::perform::set_key_event (
            unsigned keycode,
            int sequence_slot )  [inline], [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.

Parameters

keycode	The keycode for which to set the sequence slot.
sequence_slot	The sequence slot to be set.

10.69.4.286 set_key_group()

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

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window. Compare it to the set_key←
_events() function.

Parameters

keycode	The keycode for which to set the group slot.
group_slot	The group slot to be set.

10.69.4.287 log_current_tempo()

```
bool seq64::perform::log_current_tempo ( )  [private]
```

Note that, if the current tick position is past the end of pattern 0's length, then the length of the tempo track pattern (0 by default) is increased in order to hold the tempo event.

Note that we allow the user to change the tempo track from the default of 0 to any pattern from 0 to 1023. This is done in the File / Options / MIDI Clock tab, and is saved to the "rc" file.

Returns

Returns true if the tempo-track sequence exists.

10.69.4.288 create_master_bus()

```
bool seq64::perform::create_master_bus ( )  [private]
```

We need to delay creation until launch time, so that settings can be obtained before determining just how to set up the application.

Once the master buss is created, we then copy the clocks and input setting that were read from the "rc" file, via the mastermidibus :: set_port_statuses() function, to use in determining whether to initialize and connect the input ports at start-up. Seq24 wouldn't connect unconditionally, and Sequencer64 shouldn't, either.

However, the devices actually on the system at start time might be different from what was saved in the "rc" file after the last run of Sequencer64.

For output, both apps have always connected to all ports automatically. But we want to support disabling some output ports, both in the "rc" file and via the operating system indicating that it cannot open an output port. So how do we get the port-settings from the OS? Probably at initialization time. See the mastermidibus constructor for PortMidi.

Returns

Returns true if the creation succeeded, or if the buss already exists.

10.69.4.289 preallocate_clocks()

```
void seq64::perform::preallocate_clocks (
            int busscount )  [inline], [private]
```

This function and calls to set_clock() are a more fool-proof option for reading the clocks from the "rc" file. Might eventually do this for inputs as well. LATER.

10.69.4.290 add_clock()

```
void seq64::perform::add_clock (
            clock_e clocktype )  [inline], [private]
```

Parameters

clocktype	The clock value read from the "rc" file.

10.69.4.291 set_clock()

```
void seq64::perform::set_clock (
            bussbyte bus,
            clock_e clocktype )  [inline], [private]
```

Mostly meant for use by the Options / MIDI Input tab.

10.69.4.292 get_clock()

```
clock_e seq64::perform::get_clock (
            bussbyte bus ) const  [inline], [private]
```

Meant for use by the optionsfile::write() function.

clock_e get_clock (bussbyte bus) const { return bus < bussbyte(m_master_clocks.size()) ? m_master_clocks[bus] : e_clock_off ; } STILL THINKING ABOUT THIS. *'Getter' function* for member *m_master_bus->get_clock(bus)*;

10.69.4.293 add_input()

```
void seq64::perform::add_input (
            bool flag )  [inline], [private]
```

Parameters

flag	The input flag read from the "rc" file.

10.69.4.294 set_input()

```
void seq64::perform::set_input (
             bussbyte bus,
             bool inputing )  [inline], [private]
```

Mostly meant for use by the Options / MIDI Input tab.

10.69.4.295 get_input()

```
bool seq64::perform::get_input (
             bussbyte bus ) const  [inline], [private]
```

Changed from:

```
return not_nullptr(m_master_bus) ?
    m_master_bus->get_input(bus) : false ;
```

bool get_input (bussbyte bus) const { return bus < bussbyte(m_master_inputs.size()) ? m_master_inputs[bus] : false ; } STILL THINKING ABOUT THIS. *'Getter' function* for member *m_master_bus->get_input(bus)*;

10.69.4.296 is_input_system_port()

```
bool seq64::perform::is_input_system_port (
             bussbyte bus )  [inline], [private]
```

10.69.4.297 midi_mute_group_present() [2/2]

```
void seq64::perform::midi_mute_group_present (
             bool flag )  [inline], [private]
```

10.69.5 Friends And Related Function Documentation

10.69.5.1 jack_assistant

```
friend class jack_assistant  [friend]
```

10.69.5.2 keybindentry

```
friend class keybindentry  [friend]
```

10.69.5.3 mainwnd

```
friend class mainwnd  [friend]
```

10.69.5.4 midifile

```
friend class midifile  [friend]
```

10.69.5.5 wrkfile

```
friend class wrkfile  [friend]
```

10.69.5.6 optionsfile

```
friend class optionsfile  [friend]
```

10.69.5.7 options

```
friend class options  [friend]
```

10.69.5.8 perfedit

```
friend class perfedit  [friend]
```

10.69.5.9 perfroll

```
friend class perfroll  [friend]
```

10.69.5.10 sequence

```
friend class sequence  [friend]
```

10.69.5.11 input_thread_func

```
void* input_thread_func (
             void * myperf )  [friend]
```

Parameters

myperf	Provides the perform object instance that is to be used. Its output_func() is called. Currently, this parameter is not validated, for speed.

Returns

Always returns nullptr.

10.69.5.12 output_thread_func

```
void* output_thread_func (
            void * myperf )  [friend]
```

Set up the performance, set the process to realtime privileges, and then start the output function.

Parameters

myperf	Provides the perform object instance that is to be used. Its output_func() is called. Currently, this parameter is not validated, for speed.

Returns

Always returns nullptr.

10.69.5.13 jack_sync_callback

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

10.69.5.14 jack_transport_callback

```
int jack_transport_callback (
            jack_nframes_t nframes,
            void * arg )  [friend]
```

Added the following function. This function is supposed to allow seq24/sequencer64 to follow JACK transport.

For more advanced ideas, see the MetronomeJack::process_callback() function in the klick project. It plays a metronome tick after calculating if it needs to or not. (Maybe we could use it to provide our own tick for recording patterns.)

If debugging is enabled in the build, then this function outputs the current JACK position information every couple of seconds, which can be useful to examine the interactions with other JACK clients.

The code enabled via USE_JACK_BBT_OFFSET sets the JACK position fieldl bbt_offset to 0. It doesn't seem to have any effect, though it can be seen when calling show_position() in the jack_transport_callback() function.

Stazed:

```
This process callback is called by JACK whether stopped or rolling.
Assuming every JACK cycle...  "...client supplied function that is
called by the engine anytime there is work to be done".  There seems to
be no definition of '...work to be done'.  nframes = buffer_size -- is
not used.
```

Parameters

nframes	Unused.
arg	Used for debug output now. Note that this function will be called very often, and this pointer will currently not be used unless debugging is turned on.

Returns

Returns 0 on success, non-zero on error.

10.69.5.15 jack_shutdown

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

10.69.5.16 jack_timebase_callback

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

The original version of the function worked properly with Hydrogen, but not with Klick. The new code seems to work with both. More testing and clarification is needed. This new code was "discovered" in the source-code for the "SooperLooper" project:

```
http://essej.net/sooperlooper/
```

The first difference with the new code is that it handles the case where the JACK position is moved (new_pos == true). If this is true, and the JackPositionBBT bit is off in pos->valid, then the new BBT value is set.

The second set of differences are in the "else" clause. In the new code, it is very simple: calculate the new tick value, back it off by the number of ticks in a beat, and perhaps go to the first beat of the next bar.

In the old code (complex!), the simple BBT adjustment is always made. This changes (perhaps) the beats_per_bar, beat_type, etc. We need to make these settings use the actual global values for beats set for Sequencer64. Then, if transitioning from JackTransportStarting to JackTransportRolling (instead of checking new_pos!), the BBT values (bar, beat, and tick) are finally adjusted. Here are the steps, with old and new steps noted:

```
-#  Calculate the "delta" ticks based on the current frame, the
    ticks_per_beat, the beats_per_minute, and the frame_rate.  The old
    code saves this in a local, the new code assigns it to pos->tick.
-#  Old code: save this delta as a positive value.
-#  Figure out the settings and modify bar, beat, tick, and
    bar_start_tick.  The old and new code seem to have the same intent,
    but it seems like the new code is faster and also correct.
    -   Old code:  Calculations are made by division and mod
        operations.
    -   New code:  Calculations are made by increments and decrements
        in a while loop.
```

Stazed:

The call to jack_timebase_callback() to supply JACK with BBT, etc. would occasionally fail when the pos information had zero or some garbage in the pos.frame_rate variable. This would occur when there was a rapid change of frame position by another client... i.e. qjackctl. From the JACK API:

```
pos address of the position structure for the next cycle; pos->frame
will be its frame number. If new_pos is FALSE, this structure contains
extended position information from the current cycle.  If TRUE, it
contains whatever was set by the requester.  The timebase_callback's
task is to update the extended information here."
```

The "If TRUE" line seems to be the issue. It seems that qjackctl does not always set pos.frame_rate so we get garbage and some strange BBT calculations that display in qjackctl. So we need to set it here and just use m_↩
jack_frame_rate for calculations instead of pos.frame_rate.

Parameters

state	Indicates the current state of JACK transport.
nframes	The number of JACK frames in the current time period.
pos	Provides the position structure to be filled in, the address of the position structure for the next cycle; pos->frame will be its frame number. If new_pos is FALSE, this structure contains extended position information from the current cycle. If TRUE, it contains whatever was set by the requester. The timebase_callback's task is to update the extended information here.
new_pos	TRUE (non-zero) for a newly requested pos, or for the first cycle after the timebase_callback is defined. This is usually 0 in Sequencer64 at present, and 1 if one, say, presses "rewind" in qjackctl.
arg	Provides the jack_assistant pointer, currently unchecked for nullity.

Todo Shouldn't we process the first clause ONLY if new_pos is true?

10.69.5.17 get_current_jack_position

```
long get_current_jack_position (
             void * arg )  [friend]
```

The Seq32 version also uses its tempo map to adjust this, but Sequencer64 currently does not.

Warning

Currently valgrind flags j->client() as uninitialized.

Parameters

arg	Provides the putative jack_assistant pointer, assumed to be not null.

Returns

Returns the calculated tick position if no errors occur. Otherwise, returns 0.

10.69.6 Field Documentation

10.69.6.1 sm_mc_dummy

```
midi_control seq64::perform::sm_mc_dummy  [static], [private]
```

Instantiate the dummy midi_control object, which is used in lieu of a null pointer.

We're taking code that basically works already, in the sense that it never seems to access a null pointer. So we're not even risking data transfers between this dummy object and the ones we really want to use.

However, it would be nice to be able to detect any errors that occur. How?

10.69.6.2 m_song_start_mode

```
bool seq64::perform::m_song_start_mode  [private]
```

This is a replacement for the global setting, but is essentially a global setting itself, and is saved to and restored from the "rc" configuration file. Sometimes called "JACK start mode", it used to be a JACK setting, but now applies to any playback. Do not confuse this setting with m_playback_mode, which has a similar meaning but is more transitory. Probably, the concept needs some clean-up.

10.69.6.3 m_start_from_perfedit

```
bool seq64::perform::m_start_from_perfedit  [private]
```

10.69.6.4 m_reposition

```
bool seq64::perform::m_reposition  [private]
```

10.69.6.5 m_excell_FF_RW

```
float seq64::perform::m_excell_FF_RW  [private]
```

It starts out at 1.0, and can range up to 60.0, being multiplied by 1.1 by the FF/RW timeout function.

10.69.6.6 m_FF_RW_button_type

```
ff_rw_button_t seq64::perform::m_FF_RW_button_type  [private]
```

It has values of FF_RW_REWIND, FF_RW_NONE, or FF_RW_FORWARD. This was a free (global in a namespace) int in perfedit.

10.69.6.7 m_mute_group

```
bool seq64::perform::m_mute_group[c_max_sequence]  [private]
```

This value determines whether a particular track will be muted or unmuted, and it can handle all tracks available in the application (currently c_max_sets $*$ c_seqs_in_set, i.e. 1024). Note that the current state of playing can be "learned", and stored herein as the desired state for the track.

10.69.6.8 m_mute_group_rc

```
bool seq64::perform::m_mute_group_rc[c_max_sequence]  [private]
```

10.69.6.9 m_armed_saved

```
bool seq64::perform::m_armed_saved  [private]
```

10.69.6.10 m_armed_statuses

```
bool seq64::perform::m_armed_statuses[c_max_sequence]  [private]
```

10.69.6.11 m_seqs_in_set

```
int seq64::perform::m_seqs_in_set  [private]
```

This change requires some arrays to be dynamically allocated (vectors). This cannot be a constant, because we may need to change it after creating the perform object.

10.69.6.12 m_max_groups

```
int seq64::perform::m_max_groups  [private]
```

This value is the maximum number of sequences we can store (c_max_sequence) divided by the number of sequences in a set.

Groups are a set of sequence-states. They are held in a linear array of size c_max_sequence, subdivided into groups of size m_seqs_in_set.

10.69.6.13 m_tracks_mute_state

```
std::vector<bool> seq64::perform::m_tracks_mute_state  [private]
```

Unlike the m_mute_group[] array, this holds the current state, rather than the state desired by activating a mute group, and it applies to only one screen-set.

```
bool m_tracks_mute_state[c_seqs_in_set];
```

Please be aware that vector<bool> might be optimized to use bits, and so taking the address of an element of this vector will not work. But we don't need that kind of access, so we are safe here. We might try using a char at some point, to see how performance is affected.

10.69.6.14 m_mode_group

```
bool seq64::perform::m_mode_group  [private]
```

This value starts out true. It is altered by the c_midi_control_mod_gmute handler or when the keys().group_off() or the keys().group_on() keys are struck.

10.69.6.15 m_mode_group_learn

```
bool seq64::perform::m_mode_group_learn  [private]
```

10.69.6.16 m_mute_group_selected

```
int seq64::perform::m_mute_group_selected  [private]
```

A "group" is essentially a "set" that is selected for the saving and restoring of the status of all patterns in that set. We're going to add a value of -1 (SEQ64_NO_MUTE_GROUP_SELECTED) to indicate the value should not be used.

10.69.6.17 m_midi_mute_group_present

```
bool seq64::perform::m_midi_mute_group_present  [private]
```

We need to know if valid mute-groups are present when deciding whether or not to write them to the "rc" file.

10.69.6.18 m_seqs

```
sequence* seq64::perform::m_seqs[c_max_sequence]  [private]
```

Todo First, make the sequence array a vector, and second, put all of these flags into a structure and access those members indirectly.

10.69.6.19 m_seqs_active

```
bool seq64::perform::m_seqs_active[c_max_sequence]  [private]
```

This array can have "holes" with inactive sequences, so every sequence needs to be checked before using it.

10.69.6.20 m_was_active_main

```
bool seq64::perform::m_was_active_main[c_max_sequence]  [private]
```

This value seems to be used only in maintaining dirtiness-status; did some process modify the sequence? Was it's mute/unmute status changed?

10.69.6.21 m_was_active_edit

```
bool seq64::perform::m_was_active_edit[c_max_sequence]  [private]
```

This value seems to be used only in maintaining dirtiness-status for editing the mute/unmute status during pattern editing.

10.69.6.22 m_was_active_perf

```
bool seq64::perform::m_was_active_perf[c_max_sequence]  [private]
```

This value seems to be used only in maintaining dirtiness-status for editing the mute/unmute status during performance/song editing.

10.69.6.23 m_was_active_names

```
bool seq64::perform::m_was_active_names[c_max_sequence]  [private]
```

This value seems to be used only in maintaining dirtiness-status for editing the mute/unmute status during performance names editing. Not sure that it serves a real purpose; perhaps created with an eye to editing the pattern name in the song editor?

10.69.6.24 m_sequence_state

```
bool seq64::perform::m_sequence_state[c_max_sequence]  [private]
```

10.69.6.25 m_screenset_state

```
std::vector<bool> seq64::perform::m_screenset_state  [private]
```

This is used in the new queue-replace (queue-solo) feature.

```
bool m_screenset_state[c_seqs_in_set];
```

10.69.6.26 m_queued_replace_slot

```
int seq64::perform::m_queued_replace_slot  [private]
```

This value is set to -1 when queue mode is exited. See the SEQ64_NO_QUEUED_SOLO value.

10.69.6.27 m_transpose

```
int seq64::perform::m_transpose  [private]
```

10.69.6.28 m_out_thread

```
pthread_t seq64::perform::m_out_thread  [private]
```

Provides a "handle" to the output thread.

10.69.6.29 m_in_thread

```
pthread_t seq64::perform::m_in_thread  [private]
```

10.69.6.30 m_out_thread_launched

```
bool seq64::perform::m_out_thread_launched  [private]
```

10.69.6.31 m_in_thread_launched

```
bool seq64::perform::m_in_thread_launched  [private]
```

10.69.6.32 m_is_running

```
bool seq64::perform::m_is_running  [private]
```

However, this flag is conflated with some JACK support, and we have to supplement it with another flag, m_is_↩ pattern_playing.

10.69.6.33 m_is_pattern_playing

```
bool seq64::perform::m_is_pattern_playing  [private]
```

It replaces rc_settings :: is_pattern_playing(), which is gone, since the perform object is now visible to all classes that care about it.

10.69.6.34 m_inputing

```
bool seq64::perform::m_inputing  [private]
```

10.69.6.35 m_outputing

```
bool seq64::perform::m_outputing  [private]
```

10.69.6.36 m_looping

```
bool seq64::perform::m_looping  [private]
```

If true, the performance will loop between the L and R markers in the performance editor.

10.69.6.37 m_song_recording

```
bool seq64::perform::m_song_recording  [private]
```

10.69.6.38 m_song_record_snap

```
bool seq64::perform::m_song_record_snap  [private]
```

10.69.6.39 m_resume_note_ons

```
bool seq64::perform::m_resume_note_ons  [private]
```

10.69.6.40 m_current_tick

```
double seq64::perform::m_current_tick  [private]
```

10.69.6.41 m_playback_mode

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

There are two, "live" and "song", indicated by the following values:

```
        m_playback_mode == false:       live mode
        m_playback_mode == true:        playback/song mode
```

10.69.6.42 m_ppqn

```
int seq64::perform::m_ppqn  [private]
```

10.69.6.43 m_bpm

```
midibpm seq64::perform::m_bpm  [private]
```

10.69.6.44 m_beats_per_bar

```
int seq64::perform::m_beats_per_bar  [private]
```

The default value is SEQ64_DEFAULT_BEATS_PER_MEASURE (4).

10.69.6.45 m_beat_width

```
int seq64::perform::m_beat_width [private]
```

The default value is SEQ64_DEFAULT_BEAT_WIDTH (4).

10.69.6.46 m_tempo_track_number

```
int seq64::perform::m_tempo_track_number [private]
```

Normally 0, it can be changed to any value from 1 to 1023 via the tempo-track-number setting in the "rc" file, and that can be overriden by the c_tempo_track SeqSpec possibly present in the song's MIDI file.

10.69.6.47 m_clocks_per_metronome

```
int seq64::perform::m_clocks_per_metronome [private]
```

This value provides the number of MIDI clocks between metronome clicks. The default value of this item is 24. It can also be read from some SMF 1 files, such as our hymne.mid example.

10.69.6.48 m_32nds_per_quarter

```
int seq64::perform::m_32nds_per_quarter [private]
```

Useful in export. A duplicate of the same member in the sequence class.

10.69.6.49 m_us_per_quarter_note

```
long seq64::perform::m_us_per_quarter_note [private]
```

Useful in export. A duplicate of the same member in the sequence class.

10.69.6.50 m_master_bus

```
mastermidibus* seq64::perform::m_master_bus [private]
```

We changed this item to a pointer so that we can delay the creation of this object until after all settings have been read.

10.69.6.51 m_filter_by_channel

```
bool seq64::perform::m_filter_by_channel [private]
```

10.69.6.52 m_master_clocks

```
std::vector<clock_e> seq64::perform::m_master_clocks [private]
```

10.69.6.53 m_master_inputs

```
std::vector<bool> seq64::perform::m_master_inputs [private]
```

10.69.6.54 m_one_measure

```
midipulse seq64::perform::m_one_measure [private]
```

We can save some multiplications, and, more importantly, later define a more flexible definition of "one measure's worth" than simply four quarter notes.

10.69.6.55 m_left_tick

```
midipulse seq64::perform::m_left_tick [private]
```

Note that "tick" is actually "pulses".

10.69.6.56 m_right_tick

```
midipulse seq64::perform::m_right_tick [private]
```

Note that "tick" is actually "pulses".

10.69.6.57 m_starting_tick

```
midipulse seq64::perform::m_starting_tick [private]
```

By default, this value is always reset to the value of the "left tick". We want to eventually be able to leave it at the last playing tick, to support a "pause" functionality. Note that "tick" is actually "pulses".

10.69.6.58 m_tick

```
midipulse seq64::perform::m_tick [mutable], [private]
```

The m_tick member holds the tick to be used in displaying the progress bars and the maintime pill. It is mutable because sometimes we want to adjust it in a const function for pause functionality.

10.69.6.59 m_jack_tick

```
midipulse seq64::perform::m_jack_tick  [private]
```

10.69.6.60 m_usemidiclock

```
bool seq64::perform::m_usemidiclock  [private]
```

10.69.6.61 m_midiclockrunning

```
bool seq64::perform::m_midiclockrunning  [private]
```

10.69.6.62 m_midiclocktick

```
int seq64::perform::m_midiclocktick  [private]
```

10.69.6.63 m_midiclockpos

```
int seq64::perform::m_midiclockpos  [private]
```

10.69.6.64 m_dont_reset_ticks

```
bool seq64::perform::m_dont_reset_ticks  [private]
```

All this member is used for is keeping the last tick from being reset.

10.69.6.65 m_screenset_notepad

```
std::string seq64::perform::m_screenset_notepad[c_max_sets]  [private]
```

10.69.6.66 m_midi_cc_toggle

```
midi_control seq64::perform::m_midi_cc_toggle[c_midi_controls_extended]  [private]
```

10.69.6.67 m_midi_cc_on

```
midi_control seq64::perform::m_midi_cc_on[c_midi_controls_extended]  [private]
```

10.69.6.68 m_midi_cc_off

```
midi_control seq64::perform::m_midi_cc_off[c_midi_controls_extended]  [private]
```

10.69.6.69 m_control_status

```
int seq64::perform::m_control_status  [private]
```

Need to learn more about this one. It is used in the replace, snapshot, and queue functionality.

10.69.6.70 m_screenset

```
int seq64::perform::m_screenset  [private]
```

This is merely the screen-set that is in view. The fix of tdeagan substitutes the "in-view" screen-set for the "playing" screen-set.

10.69.6.71 m_screenset_offset

```
int seq64::perform::m_screenset_offset  [private]
```

Saves some multiplications. It is used in the MIDI control of the playback status of the sequences in the current screen-set. It is also used to offset the sequence numbers so that the control (mute/unmute) keys can be shown on any screen-set.

10.69.6.72 m_playscreen

```
int seq64::perform::m_playscreen  [private]
```

In seq24, this value is altered by set_playing_screenset(), which is called by handle_midi_control(c_midi_control↩
_play_ss, state).

10.69.6.73 m_playscreen_offset

```
int seq64::perform::m_playscreen_offset  [private]
```

Saves some multiplications, should make the code easier to grok, and centralizes the use of c_seqs_in_set/m_↩
seqs_in_set, which we want to be able to change at run-time, as a future enhancement.

10.69.6.74 m_max_sets

```
int seq64::perform::m_max_sets  [private]
```

Again, currently set to the old value, which is used in hard-wired array sizes. To make it variable will require a move from arrays to vectors.

10.69.6.75 m_sequence_count

```
int seq64::perform::m_sequence_count  [private]
```

Used by the install_sequence() function. Note that this value is not a suitable replacement for c_max_sequence/m↩
_sequence_max, because there can be inactive sequences amidst the active sequences. See the m_sequence↩
_limit member.

10.69.6.76 m_sequence_max

```
int seq64::perform::m_sequence_max  [private]
```

However, this value is already 32 $*$ 32 = 1024, and is probably enough for any usage. Famous last words?

10.69.6.77 m_sequence_high

```
int seq64::perform::m_sequence_high  [private]
```

This value starts as 0, to indicate no sequences loaded, and then contains the highest sequence number hitherto loaded, plus 1 so that it can be used as a for-loop limit similar to m_sequence_max. It's maximum value should be m_sequence_max (c_max_sequence).

Currently meant only for limited context to try to squeeze a little extra speed out of playback. There's no easy way to lower this value when the highest sequence is deleted, though.

10.69.6.78 m_edit_sequence

```
int seq64::perform::m_edit_sequence  [private]
```

Moving this status from seqmenu into perform for better centralized management.

10.69.6.79 m_is_modified

```
bool seq64::perform::m_is_modified  [private]
```

All the GUIs seem to use a perform object.

10.69.6.80 m_condition_var

```
condition_var seq64::perform::m_condition_var  [private]
```

It is signalled if playback has been started. The output thread function waits on this variable until m_is_running and m_outputing are false. This variable is also signalled in the perform destructor.

10.69.6.81 m_jack_asst

```
jack_assistant seq64::perform::m_jack_asst  [private]
```

It implements most of the JACK stuff.

10.69.6.82 m_have_undo

```
bool seq64::perform::m_have_undo  [private]
```

10.69.6.83 m_undo_vect

```
std::vector<int> seq64::perform::m_undo_vect  [private]
```

See the push_trigger_undo() function.

10.69.6.84 m_have_redo

```
bool seq64::perform::m_have_redo  [private]
```

10.69.6.85 m_redo_vect

```
std::vector<int> seq64::perform::m_redo_vect  [private]
```

See the pop_trigger_undo() function.

10.69.6.86 m_notify

```
std::vector<performcallback *> seq64::perform::m_notify  [private]
```

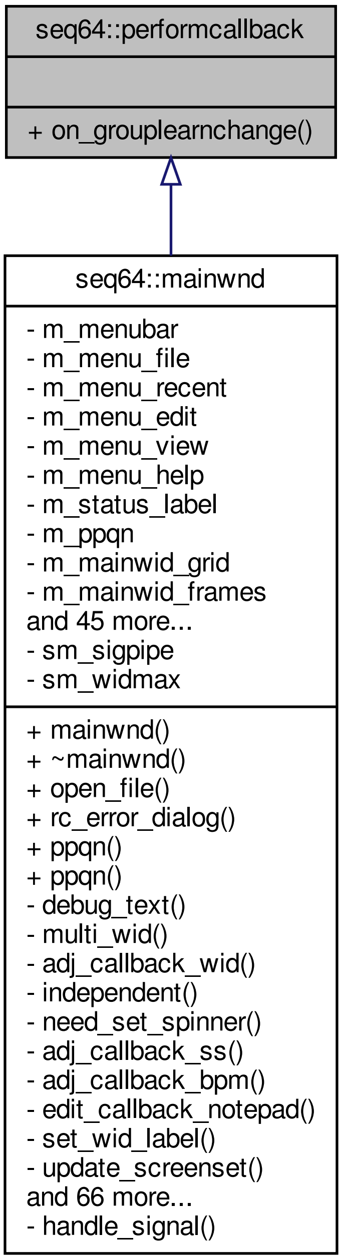
10.69.6.87 m_gui_support

```
gui_assistant& seq64::perform::m_gui_support  [private]
```

10.70 seq64::performcallback Struct Reference

Provides for notification of events.

Inheritance diagram for seq64::performcallback:



Public Member Functions

- virtual void on_grouplearnchange (bool)

  A do-nothing callback.

10.70.1 Detailed Description

Provide a response to a group-learn change event.

10.70.2 Member Function Documentation

10.70.2.1 on_grouplearnchange()

```
virtual void seq64::performcallback::on_grouplearnchange (
            bool  )  [inline], [virtual]
```

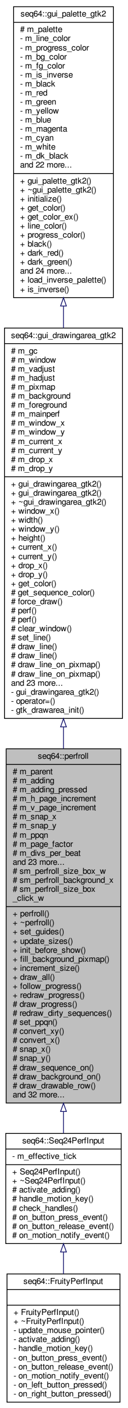
"state" is an Unused parameter.

Reimplemented in seq64::mainwnd.

10.71 seq64::perfroll Class Reference

This class implements the performance roll user interface.

Inheritance diagram for seq64::perfroll:



Public Member Functions

- perfroll (perform &perf, perfedit &parent, Gtk::Adjustment &hadjust, Gtk::Adjustment &vadjust, int ppqn=S↩ EQ64_USE_DEFAULT_PPQN)

    Principal constructor.
- virtual ∼perfroll ()

    This destructor deletes the interaction object.

- void set_guides (int snap, int measure, int beat)

  This function sets the m_snap_x, m_measure_length, and m_beat_length members directly from the function parameters, which are in units of pulses (sometimes misleadingly called "ticks".)
- 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 piano roll.
- void increment_size ()

  Increments the value of m_roll_length_ticks by the PPQN ∗ 512, then calls update_sizes().
- void draw_all ()

  Provides a very common sequence of calls used in perfroll_input.
- void follow_progress ()

  Checks the position of the tick, and, if it is in a different piano-roll "page" than the last page, moves the page to the next page.
- void redraw_progress ()

  Helper function to simplify the client call.

Protected Member Functions

- 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 set_ppqn (int ppqn)

  Handles changes to the PPQN value in one place.
- void convert_xy (int x, int y, midipulse &tick, int &seq)

  Converts (x, y) coordinates on the piano roll to tick (pulse) and sequence numbers.
- void convert_x (int x, midipulse &tick)

  Converts an x-coordinate to a tick-offset on the x axis.
- void snap_x (int &x)

  This function performs a 'snap' action on x.
- void snap_y (int &y)

  This function performs a 'snap' action on y.
- void draw_sequence_on (int seqnum)

  Draws the given pattern/sequence on the given drawable area.
- void draw_background_on (int seqnum)

  Draws the given pattern/sequence background on the given drawable area.
- void draw_drawable_row (int y)

  Not quite sure what this draws yet.
- void draw_sequence (int seqnum)

  To be used in iterating through a set.
- void offset_sequence (int seqnum, midipulse offset)
- void change_horz ()

  Changes the 4-bar horizontal offset member and queues up a draw operation.
- void change_vert ()

  Changes the vertical offset member and queues up a draw operation.
- void split_trigger (int sequence, midipulse tick)

  Splits a trigger, whatever that means.

- void enqueue_draw ()

  Wraps queue_draw() and forwards the call to the parent perfedit, so that it can forward it to any other perfedit that exists.
- void set_zoom (int z)

  Implements the horizontal zoom feature.
- void convert_drop_xy ()

  A convenience function.
- void horizontal_adjust (double step)

  This function provides optimization for the on_scroll_event() function.
- void vertical_adjust (double step)

  This function provides optimization for the on_scroll_event() function.
- void horizontal_set (double value)

  Sets the exact position of a horizontal scroll-bar.
- void vertical_set (double value)

  Sets the exact position of a vertical scroll-bar.
- virtual void activate_adding (bool adding)=0
- virtual bool handle_motion_key (bool is_left)=0
- bool is_adding () const

  'Getter' function for member m_adding
- void set_adding (bool flag)

  'Setter' function for member m_adding
- bool is_adding_pressed () const

  'Getter' function for member m_adding_pressed
- void set_adding_pressed (bool flag)

  'Setter' function for member m_adding_pressed
- bool growing () const

  'Getter' function for member m_growing
- bool moving () const

  'Getter' function for member m_moving
- bool drop_action () const

  Indicates if we're moving.
- virtual void on_realize ()

  Provides the on-realization callback.
- virtual bool on_expose_event (GdkEventExpose ∗ev)

  Handles the on-expose event.
- virtual bool on_button_press_event (GdkEventButton ∗ev)

  This callback function handles the follow-on work of a button press, and is called by overridden versions such as Seq24PerfInput :: on_button_press_event()
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  This callback function handles a button release by forwarding it to the interaction object's button-release function.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Handles motion notification by forwarding it to the interaction object's motion-notification callback function.
- virtual bool on_scroll_event (GdkEventScroll ∗ev)

  Handles horizontal and vertical scrolling.
- virtual bool on_focus_in_event (GdkEventFocus ∗ev)

  This callback handles an in-focus event by setting the flag to HAS_FOCUS.
- virtual bool on_focus_out_event (GdkEventFocus ∗ev)

  This callback handles an out-of-focus event by resetting the flag HAS_FOCUS.
- virtual void on_size_allocate (Gtk::Allocation &al)

  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().

- virtual bool on_key_press_event (GdkEventKey ∗ev)

  This callback function handles a key-press event.
- virtual void on_size_request (GtkRequisition ∗)

  This do-nothing callback effectively throws away a size request.

Protected Attributes

- perfedit & m_parent

  Provides a link to the perfedit that created this object.
- bool m_adding

  Indicates we are in the middle of adding a sequence segment to the performance.
- bool m_adding_pressed

  Indicates if the left mouse button is pressed while in adding mode.
- int m_h_page_increment

  Provides the horizontal page increment for the horizontal scrollbar.
- int m_v_page_increment

  Provides the vertical page increment for the vertical scrollbar.
- int m_snap_x

  Amount of horizontal snap, pulses.
- int m_snap_y

  The amount of vertical snap.
- int m_ppqn

  Parts-per-quarter-note value.
- int m_page_factor

  4096, horizonal page sizing.
- int m_divs_per_beat

  Holds current tick scaling value.
- midipulse m_ticks_per_bar

  Holds current bar scaling value.
- int m_perf_scale_x

  Scaling based on zoom and PPQN.
- int m_w_scale_x

  Scaling based on zoom and PPQN.
- int m_zoom

  New value to attempt a rudimentary time-zoom feature.
- int m_names_y

  The maximum height of the perfroll names box, in pixels.
- int m_background_x

  The width of the perfroll background.
- int m_size_box_w

  This is a basically constant value set to s_perfroll_size_box_w = 3.
- int m_measure_length

  The legnth of a measure, in beat units.
- int m_beat_length

  The length of a beat, in parts-per-quarter note.
- midipulse m_old_progress_ticks

  Saves the position of the progress bar, for erasing it in preparation for drawing it at the next tick value.
- int m_scroll_page

  Provides the current scroll page in which the progress bar resides.
- bool m_have_button_press

Used in the fruity and seq24 perfroll input classes to help with trigger push/pop management.
- midipulse m_4bar_offset

  Holds the horizontal offset related to the horizontal scroll-bar position.
- int m_sequence_offset

  This value is the vertical version of m_4bar_offset.
- int m_roll_length_ticks

  Provides the width of the piano roll in ticks.
- midipulse m_drop_tick

  The horizontal location for section movement.
- midipulse m_drop_tick_offset

  The horizontal trigger location for section movement.
- int m_drop_sequence

  Holds the currently-selected sequence being moved.
- int m_sequence_max

  Currently, just a class-specific version of c_max_sequence, meant for the future.
- bool m_sequence_active [c_max_sequence]

  Used when drawing an active sequence.
- bool m_moving

  Used in the Seq24 or Fruity processing when moving a section of triggers.
- bool m_growing

  Used in the Seq24 or Fruity processing when growing a section of triggers.
- bool m_grow_direction

  Used in the Seq24 or Fruity processing when growing a section of triggers.

Static Protected Attributes

- static int sm_perfroll_size_box_w

  Static sizing members for initial zoom of the perfroll.
- static int sm_perfroll_background_x

  sm_perfroll_background_x is copied into m_background_x; it gets adjusted in perfroll::set_ppqn().
- static int sm_perfroll_size_box_click_w

  Provides sizing information for the perfroll-derived classes, using in the Seq24PerfInput and FruityPerfInput classes.

Friends

- class perfedit

  These friend implement interaction-specific behavior, although only the Seq24 interactions support full keyboard processing, except for some common functionality provided by perform::perfroll_key_event().

Additional Inherited Members

10.71.1 Constructor & Destructor Documentation

10.71.1.1 perfroll()

```
seq64::perfroll::perfroll (
            perform & p,
            perfedit & parent,
            Gtk::Adjustment & hadjust,
            Gtk::Adjustment & vadjust,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

Parameters

p	The perform object that this class will affect via user interaction.
parent	The perfedit object that holds this user-interface class.
hadjust	A horizontal adjustment object, used here to control scrolling.
vadjust	A vertical adjustment object, used here to control scrolling.
ppqn	The "resolution" of the MIDI file, used in zooming and scaling.

10.71.1.2 ∼perfroll()

```
seq64::perfroll::∼perfroll ( )  [virtual]
```

Well, now there are two objects, so no explicit deletion necessary.

10.71.2 Member Function Documentation

10.71.2.1 set_guides()

```
void seq64::perfroll::set_guides (
             int snap,
             int measure,
             int beat )
```

This function then fills in the background, and queues up a draw operation.

Parameters

snap	Provides the number of snap-pulses (pulses per snap interval) as calculated in perfedit::set_guides(). This is actually equal to the measure-pulses divided by the snap value in perfedit; the snap value defaults to 8.
measure	Provides the number of measure-pulses (pulses per measure) as calculated in perfedit::set_guides().
beat	Provides the number of beat-pulses (pulses per beat) as calculated in perfedit::set_guides().

10.71.2.2 update_sizes()

```
void seq64::perfroll::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:

```
            pixels * ticks / pixel
bars = ----------------------------
         ticks / beat * beats / 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 perfroll user-interface.  So for now we'll call it
the latter, and make a variable called "m_divs_per_beat", see its
definition in the class initializer list.
```

10.71.2.3 init_before_show()

```
void seq64::perfroll::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.

10.71.2.4 fill_background_pixmap()

```
void seq64::perfroll::fill_background_pixmap ( )
```

The first thing done is to clear the background by painting it with a filled white rectangle.

This function is called whenever something occurs (e.g. zoom) that can affect how the piano roll is drawn.

10.71.2.5 increment_size()

```
void seq64::perfroll::increment_size ( )
```

10.71.2.6 draw_all()

```
void seq64::perfroll::draw_all ( )
```

m_drop_y is adjusted by perfroll::change_vert() for any scroll after it was originally selected. The call below to draw_drawable_row() will have the wrong y location and un-select will not occur if the user scrolls the track up or down to a new y location, if not adjusted.

For the box set/selections, we create a perform::SeqOperation functor by binding &perfroll::draw_sequence() to this object and passing it to perform::selection_operation(). The whole set of operations replaces the single operation of the "drop" sequence.

Note:

We could bind additional parameters as needed, either as place-holders or constant parameter values.

10.71.2.7 follow_progress()

```
void seq64::perfroll::follow_progress ( )
```

10.71.2.8 redraw_progress()

```
void seq64::perfroll::redraw_progress ( )  [inline]
```

10.71.2.9 draw_progress()

```
void seq64::perfroll::draw_progress ( )  [protected]
```

We would like to be able to leave the line there when the progress is paused while running off of JACK transport. How? The perf().get_tick() call always returns 0 when stop is in force.

If we comment out the erasure of the old line, we see that the progress bar is also erased when a pattern boundary is hit (triggers), and when the sequence is stopped by the user.

In order to support true pause in the song editor, we tried to replace perform::get_tick() with perform::get_start_tick() and perform::get_last_tick() [a new experimental function]. But those replacements here always return 0, even as perform::get_tick() increases. (Note that the draw_progress function is called at every timeout, that is, constantly.)

10.71.2.10 redraw_dirty_sequences()

```
void seq64::perfroll::redraw_dirty_sequences ( )  [protected]
```

Change Note ca 2016-05-30 Lets try not drawing sequences greater than the maximum, at all.

10.71.2.11 set_ppqn()

```
void seq64::perfroll::set_ppqn (
             int ppqn )  [protected]
```

The m_ticks_per_bar member replaces the global ppqn times 16. This construct is parts-per-quarter-note times 4 quarter notes times 4 sixteenth notes in a bar. (We think...)

The m_perf_scale_x member starts out at c_perf_scale_x, which is 32 ticks per pixel at the default tick rate of 192 PPQN. We adjust this now. But note that this calculation still involves the c_perf_scale_x constant.

Todo Resolve the issue of c_perf_scale_x versus m_perf_scale_x in perfroll.

10.71.2.12 convert_xy()

```
void seq64::perfroll::convert_xy (
             int x,
             int y,
             midipulse & d_tick,
             int & d_seq )  [protected]
```

The results are returned via the d_tick and d_seq parameters. The sequence number is clipped to a legal value (0 to m_sequence_max).

Parameters

	x	The x coordinate of the mouse pointer.
	y	The y coordinate of the mouse pointer.
out	*d_tick*	Holds the calculated tick value.
out	*d_seq*	Holds the calculated sequence-number value.

10.71.2.13 convert_x()

```
void seq64::perfroll::convert_x (
             int x,
             midipulse & tick )  [protected]
```

The result is returned via the tick parameter. Note that m_4bar_offset already includes the m_ticks_per_bar = ppqn ∗ 16 factor, for speed.

Parameters

	x	The input x (pixel) value.
out	*tick*	Holds the result of the calculation.

10.71.2.14 snap_x()

```
void seq64::perfroll::snap_x (
             int & x )  [protected]
```

- m_snap_x = number pulses to snap to
- m_perf_scale_x = number of pulses per pixel

Therefore mod = m_snap_x/m_perf_scale_x equals the number pixels to snap to.

Parameters

out	*x*	The destination for the x-snap calculation.

10.71.2.15 snap_y()

```
void seq64::perfroll::snap_y (
             int & y )  [protected]
```

We don't do vertical zoom, so this function is simpler than snap_x().

Parameters

out	*y*	The destination for the y-snap calculation.

10.71.2.16 draw_sequence_on()

```
void seq64::perfroll::draw_sequence_on (
             int seqnum )  [protected]
```

Statement nesting from hell! Items drawn on the Song editor piano roll:

1. Main trigger box (also called a "segment") background.
2. Trigger outline (the rectangle around a "segment").
3. The left hand side little sequence grab handle, or segment handle.
4. The right-side segment handle.

printf ("seq %d trigger: %s\n", seqnum, selected ? "selected" : "unselected");

10.71.2.17 draw_background_on()

```
void seq64::perfroll::draw_background_on (
             int seqnum )  [protected]
```

10.71.2.18 draw_drawable_row()

```
void seq64::perfroll::draw_drawable_row (
             int y )  [protected]
```

It is involved in the drawing of a greyed (selected) row.

What's weird is that we divide y by m_names_y, then multiply it by m_names_y, before passing the result to draw↩_drawable(). However, if we just use y casted to an int, then the drawing of the row is only partial, vertically.

10.71.2.19 draw_sequence()

```
void seq64::perfroll::draw_sequence (
             int seqnum )  [inline], [protected]
```

10.71.2.20 offset_sequence()

```
void seq64::perfroll::offset_sequence (
             int seqnum,
             midipulse offset )  [protected]
```

10.71.2.21 change_horz()

```
void seq64::perfroll::change_horz ( )  [protected]
```

Since the m_4bar_offset value is always multiplied by m_ticks_per_bar before usage, let's just do it here and not have to multiply it later.

10.71.2.22 change_vert()

```
void seq64::perfroll::change_vert ( )  [protected]
```

Stazed:

```
 Must adjust m_drop_y or perfroll_input's unselect_triggers() will not
 work if scrolled up or down to a new location.  See the note in
 on_button_press_event() in the perfroll_input module.  Also see the
 note in the draw_all() function.
```

10.71.2.23 split_trigger()

```
void seq64::perfroll::split_trigger (
             int sequence,
             midipulse tick )  [protected]
```

10.71.2.24 enqueue_draw()

```
void seq64::perfroll::enqueue_draw ( )  [protected]
```

The parent perfedit will call perfroll::queue_draw() on behalf of this object, and it will pass a perfroll::enqueue_draw() to the peer perfedit's perfroll, if the peer exists.

10.71.2.25 set_zoom()

```
void seq64::perfroll::set_zoom (
             int z )  [protected]
```

Change Note ca 2016-04-05 The initial zoom value is c_perf_scale_x (32). We allow it to range from 1 to 128, for now. Smaller values zoom in.

10.71.2.26 convert_drop_xy()

```
void seq64::perfroll::convert_drop_xy ( )  [inline], [protected]
```

10.71.2.27 horizontal_adjust()

```
void seq64::perfroll::horizontal_adjust (
             double step )  [inline], [protected]
```

A duplicate of the one in seqroll.

Parameters

step	Provides the step value to use for adjusting the horizontal scrollbar. See gui_drawingarea_gtk2::scroll_hadjust() for more information.

10.71.2.28 vertical_adjust()

```
void seq64::perfroll::vertical_adjust (
             double step )  [inline], [protected]
```

A near-duplicate of the one in seqroll.

Parameters

step	Provides the step value to use for adjusting the vertical scrollbar. See gui_drawingarea_gtk2::scroll_vadjust() for more information.

10.71.2.29 horizontal_set()

```
void seq64::perfroll::horizontal_set (
             double value )  [inline], [protected]
```

Parameters

value	The desired position. Mostly this is either 0.0 or 9999999.0 (an "infinite" value to select the start or end position.

10.71.2.30 vertical_set()

```
void seq64::perfroll::vertical_set (
             double value )  [inline], [protected]
```

Parameters

value	The desired position. Mostly this is either 0.0 or 9999999.0 (an "infinite" value to select the start or end position.

10.71.2.31 activate_adding()

```
virtual void seq64::perfroll::activate_adding (
             bool adding )  [protected], [pure virtual]
```

Implemented in seq64::Seq24PerfInput, and seq64::FruityPerfInput.

10.71.2.32 handle_motion_key()

```
virtual bool seq64::perfroll::handle_motion_key (
             bool is_left )  [protected], [pure virtual]
```

Implemented in seq64::Seq24PerfInput, and seq64::FruityPerfInput.

10.71.2.33 is_adding()

```
bool seq64::perfroll::is_adding ( ) const  [inline], [protected]
```

10.71.2.34 set_adding()

```
void seq64::perfroll::set_adding (
             bool flag )  [inline], [protected]
```

10.71.2.35 is_adding_pressed()

```
bool seq64::perfroll::is_adding_pressed ( ) const  [inline], [protected]
```

10.71.2.36 set_adding_pressed()

```
void seq64::perfroll::set_adding_pressed (
            bool flag )  [inline], [protected]
```

10.71.2.37 growing()

```
bool seq64::perfroll::growing ( ) const  [inline], [protected]
```

10.71.2.38 moving()

```
bool seq64::perfroll::moving ( ) const  [inline], [protected]
```

10.71.2.39 drop_action()

```
bool seq64::perfroll::drop_action ( ) const  [inline], [protected]
```

Returns

Returns true if one of those two flags are set.

10.71.2.40 on_realize()

```
void seq64::perfroll::on_realize ( )  [protected], [virtual]
```

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.

Stazed:

```
This creation of m_background needs to be set to the max width for
proper drawing of zoomed measures or they will get truncated with high
beats per measure and low beat width. Since this is a constant size,
it cannot be adjusted later for zoom. The constant
c_perfroll_background_x is set to the max amount by default for use
here. The drawing functions fill_background_pixmap() and
draw_background_on() which use c_perfroll_background_x also, could be
adjusted by zoom with a substituted variable. Not sure if there is any
benefit to doing the adjustment...  Perhaps a small benefit in speed?
Maybe FIXME if really, really bored...
```

10.71.2.41 on_expose_event()

```
bool seq64::perfroll::on_expose_event (
            GdkEventExpose * ev )  [protected], [virtual]
```

Draws a vertical page of the performance editor. The part drawn starts at m_sequence_offset and continues until the last sequence that can be at least partially seen given the height of the window.

If we're at the bottom of the sequences (1024, a non-existent sequence) would be the last sequence shown, we don't bother drawing it. This prevents debug messages about an illegal sequence, and can show a black bottom row that is a clear sign we're at the end of the legal sequences.

Parameters

ev	Provides the expose event.

Returns

Always returns true.

10.71.2.42 on_button_press_event()

```
bool seq64::perfroll::on_button_press_event (
            GdkEventButton * ev )  [protected], [virtual]
```

One minor issue: Fruity behavior doesn't yet provide the keystroke behavior we now handle for the Seq24 mode of operation.

Reimplemented in seq64::Seq24PerfInput, and seq64::FruityPerfInput.

10.71.2.43 on_button_release_event()

```
bool seq64::perfroll::on_button_release_event (
            GdkEventButton * ev )  [protected], [virtual]
```

This gives us Seq24 versus Fruity behavior.

Reimplemented in seq64::Seq24PerfInput, and seq64::FruityPerfInput.

10.71.2.44 on_motion_notify_event()

```
bool seq64::perfroll::on_motion_notify_event (
            GdkEventMotion * ev )  [protected], [virtual]
```

Actually, this is backwards; this function is called within the derived object's override.

Reimplemented in seq64::Seq24PerfInput, and seq64::FruityPerfInput.

10.71.2.45 on_scroll_event()

```
bool seq64::perfroll::on_scroll_event (
            GdkEventScroll * ev )  [protected], [virtual]
```

If the Shift key is held while scrolling, then the scrolling is horizontal, otherwise it is vertical. This matches the convention of the seqedit class.

Note that, unlike the seqedit class, Ctrl-Scroll is not used to modify the zoom value. Rather than mess up legacy behavior, we will rely on keystrokes (z, 0, Z, and Ctrl-Page-Up and Ctrl-Page-Down) to implement this zoom.

Parameters

ev	Provides the scroll event.

Returns

Currently always returns true.

10.71.2.46 on_focus_in_event()

```
bool seq64::perfroll::on_focus_in_event (
            GdkEventFocus * ev )  [protected], [virtual]
```

10.71.2.47 on_focus_out_event()

```
bool seq64::perfroll::on_focus_out_event (
            GdkEventFocus * ev )  [protected], [virtual]
```

10.71.2.48 on_size_allocate()

```
void seq64::perfroll::on_size_allocate (
            Gtk::Allocation & al )  [protected], [virtual]
```

10.71.2.49 on_key_press_event()

```
bool seq64::perfroll::on_key_press_event (
            GdkEventKey * ev )  [protected], [virtual]
```

If we don't check the event type first, then the ev->keyval value is something weird like 65507. Note that we pass the functionality on to the perform::perfroll_key_event() function for the handling of delete, cut, copy, paste, and undo operations. If the keystroke is not handled by that function, then we handle it here.

Note that only the Seq24 input interaction object handles additional keystrokes not handled by the perfroll_key_↩ event() function.

The perfroll_key_event() call handles Del, Ctrl-X, Ctrl-C, Ctrl-V, and Ctrl-Z (which does nothing at present).

We've also added support for moving up and down in the piano roll (Up and Down arrows), paging up and down (Page-Up and Page-Down keys), paging left and right (Shift Page-Up and Page-Down), paging to top and bottom (Home and End), and paging to start and end (Shift Home and End).

The Keypad-End key is an issue on our ASUS "gaming" laptop. Whether it is seen as a "1" or an "End" key depends on an interaction between the Shift and the Num Lock key. Annoying, takes some time to get used to.

Stazed: there are many changes from seq32 that need to be studied before including them here. Note that, even though we filter out the Ctrl key here, it still works for Ctrl-X (cut) and Ctrl-V (paste). For undo, the Undo button can be used, Ctrl-Z never worked in this view anyway.

Warning

We see that 'x' and 'z' are already handled in perfroll_key_event() if the Ctrl key was pressed. Be careful.

10.71.2.50 on_size_request()

```
virtual void seq64::perfroll::on_size_request (
             GtkRequisition * )  [inline], [protected], [virtual]
```

10.71.3 Friends And Related Function Documentation

10.71.3.1 perfedit

```
friend class perfedit  [friend]
```

The perfedit class needs access to the private enqueue_draw() function.

10.71.4 Field Documentation

10.71.4.1 sm_perfroll_size_box_w

```
int seq64::perfroll::sm_perfroll_size_box_w  [static], [protected]
```

Static (private) convenience values.

We need to be able to adjust sm_perfroll_background_x per the selected PPQN value. This adjustment is made in the constructor, and assigned to the perfroll::m_background_x member.

sm_perfroll_size_box_w is copied into the m_size_box_w member, and is the width of the small square handle in the corner of each trigger segment. It gets adjusted in perfroll::set_ppqn().

10.71.4.2 sm_perfroll_background_x

```
int seq64::perfroll::sm_perfroll_background_x  [static], [protected]
```

10.71.4.3 sm_perfroll_size_box_click_w

```
int seq64::perfroll::sm_perfroll_size_box_click_w  [static], [protected]
```

10.71.4.4 m_parent

```
perfedit& seq64::perfroll::m_parent  [protected]
```

We want to support two perfedit windows, but the children of perfedit will have to communicate changes requiring a redraw through the parent.

10.71.4.5 m_adding

```
bool seq64::perfroll::m_adding  [protected]
```

Moved from AbstractPerfInput.

10.71.4.6 m_adding_pressed

```
bool seq64::perfroll::m_adding_pressed  [protected]
```

Moved from AbstractPerfInput.

10.71.4.7 m_h_page_increment

```
int seq64::perfroll::m_h_page_increment  [protected]
```

It was set to 1, the same as the step increment. That is too little. This value will be set to 4, for now. Might be a useful "user" configuration option.

10.71.4.8 m_v_page_increment

```
int seq64::perfroll::m_v_page_increment  [protected]
```

It was set to 1, the same as the step increment. That is too little. This value will be set to 8, for now. Might be a useful "user" configuration option.

10.71.4.9 m_snap_x

```
int seq64::perfroll::m_snap_x  [protected]
```

10.71.4.10 m_snap_y

```
int seq64::perfroll::m_snap_y  [protected]
```

10.71.4.11 m_ppqn

```
int seq64::perfroll::m_ppqn  [protected]
```

10.71.4.12 m_page_factor

```
int seq64::perfroll::m_page_factor  [protected]
```

10.71.4.13 m_divs_per_beat

```
int seq64::perfroll::m_divs_per_beat  [protected]
```

10.71.4.14 m_ticks_per_bar

```
midipulse seq64::perfroll::m_ticks_per_bar  [protected]
```

10.71.4.15 m_perf_scale_x

```
int seq64::perfroll::m_perf_scale_x  [protected]
```

10.71.4.16 m_w_scale_x

```
int seq64::perfroll::m_w_scale_x  [protected]
```

10.71.4.17 m_zoom

```
int seq64::perfroll::m_zoom  [protected]
```

It seems to work pretty well now.

10.71.4.18 m_names_y

```
int seq64::perfroll::m_names_y  [protected]
```

This is currently semantically a constant set to c_names_y = 24.

10.71.4.19 m_background_x

```
int seq64::perfroll::m_background_x  [protected]
```

This is based on the m_ppqn value and the value of c_perf_scale_x (or is m_perf_scale_x preferable?)

10.71.4.20 m_size_box_w

```
int seq64::perfroll::m_size_box_w  [protected]
```

It is used in drawing the short lines of the small box that sits at the top-left and bottom-right corners of each segment in the pattern editor. These can be used to lengthen and shorten a section in the song editor. We will increase this size, perhaps double it, to make it easier to grab.

10.71.4.21 m_measure_length

```
int seq64::perfroll::m_measure_length  [protected]
```

10.71.4.22 m_beat_length

```
int seq64::perfroll::m_beat_length  [protected]
```

10.71.4.23 m_old_progress_ticks

```
midipulse seq64::perfroll::m_old_progress_ticks  [protected]
```

See the draw_progress() function. This could almost be static inside that function.

10.71.4.24 m_scroll_page

```
int seq64::perfroll::m_scroll_page  [protected]
```

10.71.4.25 m_have_button_press

```
bool seq64::perfroll::m_have_button_press  [protected]
```

10.71.4.26 m_4bar_offset

```
midipulse seq64::perfroll::m_4bar_offset [protected]
```

Used in drawing the progress bar and the sequence events. Also used in convert_x() and convert_xy(). This used to be the offset in units of bar ticks, but now we use it as a full-fledged ticks value. See the change_horz() function.

10.71.4.27 m_sequence_offset

```
int seq64::perfroll::m_sequence_offset [protected]
```

It is obtained or changed when the vertical scroll-bar moves. It is used for drawing the correct vertical window in the piano roll.

10.71.4.28 m_roll_length_ticks

```
int seq64::perfroll::m_roll_length_ticks [protected]
```

Calculated in init_before_show() based on the maximum trigger found in the perform object, the ticks/bar, the P↵
PQN, and the page factor. Also can be increased in size in the increment_size() function [tied to the Grow button]. Used in update_sizes().

10.71.4.29 m_drop_tick

```
midipulse seq64::perfroll::m_drop_tick [protected]
```

Used only by the friend modules perfroll_input and fruityperfroll_input.

10.71.4.30 m_drop_tick_offset

```
midipulse seq64::perfroll::m_drop_tick_offset [protected]
```

Used only by the modules perfroll_input and fruityperfroll_input.

10.71.4.31 m_drop_sequence

```
int seq64::perfroll::m_drop_sequence [protected]
```

Used for redrawing the sequence.

Extension?

We would like to extend this to a list of sequencens so that we could move more than one sequence at once.

10.71.4.32 m_sequence_max

```
int seq64::perfroll::m_sequence_max [protected]
```

10.71.4.33 m_sequence_active

```
bool seq64::perfroll::m_sequence_active[c_max_sequence]  [protected]
```

Not sure yet why we can't just use the sequence's member function to access this status boolean.

10.71.4.34 m_moving

```
bool seq64::perfroll::m_moving  [protected]
```

10.71.4.35 m_growing

```
bool seq64::perfroll::m_growing  [protected]
```

10.71.4.36 m_grow_direction

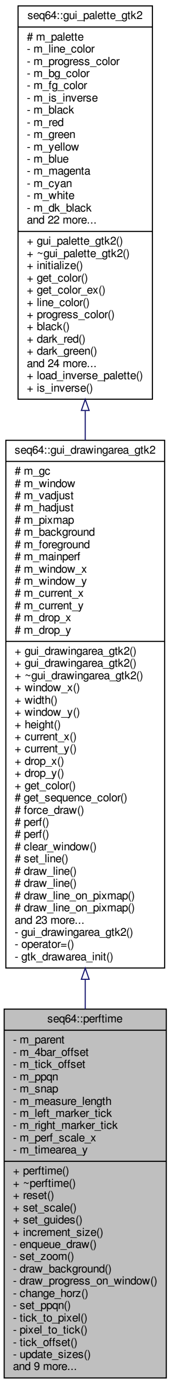
```
bool seq64::perfroll::m_grow_direction  [protected]
```

Determines whether the section is growing to the left or to the right.

10.72 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, perfedit &parent, Gtk::Adjustment &hadjust, int ppqn=SEQ64_USE_DEFAULT_P↩ PQN)

  Principal constructor.
- virtual ∼perftime ()

  Let's provide a do-nothing virtual destructor.

- void reset ()
- void set_scale (int scale)
- void set_guides (int snap, int measure)

  Sets the m_snap value and the m_measure_length members directly from the function parameters, which are in units of pulses (sometimes misleadingly called "ticks".)
- void increment_size ()

  This function does nothing.

Private Member Functions

- void enqueue_draw ()

  Wraps queue_draw() and forwards the call to the parent perfedit, so that it can forward it to any other perfedit that exists.
- void set_zoom (int z)

  Implements the horizontal zoom feature.
- void draw_background ()

  Separated out the drawing done in on_expose_event(), so that it can be redone when the zoom changes.
- void draw_progress_on_window ()
- void change_horz ()

  Changes the m_4bar_offset and queues a draw operation.
- void set_ppqn (int ppqn)

  Handles changes to the PPQN value in one place.
- long tick_to_pixel (midipulse tick)

  Common calculation to convert a pulse/tick value to a perftime x value.
- midipulse pixel_to_tick (long pixel)

  The inverse of tick_to_pixel().
- int tick_offset ()

  Centralizes calculation of the tick offset of the time bar.
- 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 to set the L and R ticks.
- void on_size_allocate (Gtk::Allocation &r)

  Implements a size-allocation event.
- bool on_button_release_event (GdkEventButton ∗)

  This button-release handler does nothing.
- bool key_press_event (GdkEventKey ∗ev)

  This callback function handles a key-press event.

Private Attributes

- perfedit & m_parent

  Provides a link to the perfedit that created this object.
- int m_4bar_offset

  Not yet sure exactly what this member represents.
- int m_tick_offset

  This member is m_4bar_offset times 16 times the current PPQN, to save some calculations and centralize this value.
- int m_ppqn

  The current value of PPQN, which we are trying to get to work everywhere, when PPQN is changed from the global ppqn = 192.
- int m_snap

  Snap value, starts out very small, equal to m_ppqn.
- int m_measure_length

  Provides the length of a measure in pulses or ticks.
- int m_left_marker_tick

  Holds the current location of the left (L) marker when arrow movement is in force.
- int m_right_marker_tick

  Holds the current location of the right (R) marker when arrow movement is in force.
- int m_perf_scale_x

  A class version of the global c_perf_scale_x factor.
- int m_timearea_y

  A class version of the global c_timerarea_y factor.

Friends

- class perfedit

Additional Inherited Members

10.72.1 Constructor & Destructor Documentation

10.72.1.1 perftime()

```
seq64::perftime::perftime (
            perform & p,
            perfedit & parent,
            Gtk::Adjustment & hadjust,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

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.

Parameters

p	Provides a reference to the main performance object of the application.
parent	Provides a reference to the object that contains this object, so that this object can tell the parent to queue up a drawing operation.
hadjust	Provides the horizontal scrollbar object needed so that perftime can respond to scrollbar cursor/thumb movement.
ppqn	An optional override of the default PPQN value for the application.

10.72.1.2 ∼perftime()

```
virtual seq64::perftime::∼perftime ( )  [inline], [virtual]
```

10.72.2 Member Function Documentation

10.72.2.1 reset()

```
void seq64::perftime::reset ( )
```

10.72.2.2 set_scale()

```
void seq64::perftime::set_scale (
             int scale )
```

10.72.2.3 set_guides()

```
void seq64::perftime::set_guides (
             int snap,
             int measure )
```

This function then fills in the background, and queues up a draw operation.

Parameters

snap	Provides the number of snap-pulses (pulses per snap interval) as calculated in perfedit::set_guides(). This is actually equal to the measure-pulses divided by the snap value in perfedit; the snap value defaults to 8.
measure	Provides the number of measure-pulses (pulses per measure) as calculated in perfedit::set_guides().

10.72.2.4 increment_size()

```
void seq64::perftime::increment_size ( )  [inline]
```

Compare it to perfroll::increment_size().

10.72.2.5 enqueue_draw()

```
void seq64::perftime::enqueue_draw ( )  [private]
```

The parent perfedit will call perftime::queue_draw() on behalf of this object, and it will pass a perftime::enqueue_↩ draw() to the peer perfedit's perftime, if the peer exists.

10.72.2.6 set_zoom()

```
void seq64::perftime::set_zoom (
             int z )  [private]
```

Redraws the background if the new zoom checked out.

Parameters

z	Provides the zoom value, which is checked, and then copied into m_perf_scale_x.

10.72.2.7 draw_background()

```
void seq64::perftime::draw_background ( )  [private]
```

Note that m_measure_length == 0 will cause integer overflow.

10.72.2.8 draw_progress_on_window()

```
void seq64::perftime::draw_progress_on_window ( )  [private]
```

10.72.2.9 change_horz()

```
void seq64::perftime::change_horz ( )  [private]
```

Again, uses the constant, 16 [now offloaded to the new tick_offset() function.].

10.72.2.10 set_ppqn()

```
void seq64::perftime::set_ppqn (
            int ppqn )  [private]
```

It also modifies m_snap, m_measure_length (but always for four measures!), and m_tick_offset.

Todo We need make the 4 constant variable per the number of beats (quarter-notes) per bar, and also at least make 16 (4x4) a meaningful manifest constant.

Parameters

ppqn	The override value for the PPQN.

10.72.2.11 tick_to_pixel()

```
long seq64::perftime::tick_to_pixel (
            midipulse tick )  [inline], [private]
```

Parameters

tick	The horizontal tick value to convert to an x pixel value, based on tick-offset and the x-scale.

Returns

Returns the x-pixel representing the time location parameter.

10.72.2.12 pixel_to_tick()

```
midipulse seq64::perftime::pixel_to_tick (
            long pixel )  [inline], [private]
```

Parameters

pixel	The pixel value.

Returns

Returns the time value represented b the pixel.

10.72.2.13 tick_offset()

```
int seq64::perftime::tick_offset ( )  [inline], [private]
```

Returns

Returns m_4bar_offset ∗ 16 ∗ m_ppqn.

10.72.2.14 update_sizes()

```
void seq64::perftime::update_sizes ( )  [inline], [private]
```

10.72.2.15 idle_progress()

```
int seq64::perftime::idle_progress ( )  [inline], [private]
```

10.72.2.16 update_pixmap()

```
void seq64::perftime::update_pixmap ( )  [inline], [private]
```

10.72.2.17 draw_pixmap_on_window()

```
void seq64::perftime::draw_pixmap_on_window ( )  [inline], [private]
```

10.72.2.18 on_realize()

```
void seq64::perftime::on_realize ( )  [private]
```

It is important to call the base-class version of this function.

The former work of this function is now done in base-class's on_realize() and in its constructor now.

```
m_window = get_window();
m_gc = Gdk::GC::create(m_window);
m_window->clear();
set_size_request(10, m_timearea_y);
```

10.72.2.19 on_expose_event()

```
bool seq64::perftime::on_expose_event (
             GdkEventExpose * ev )  [private]
```

Redraws the background.

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.

Parameters

ev	The expose event, not used.

Returns

Always returns true.

10.72.2.20 on_button_press_event()

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

Added functionality to try to set the start-tick if ctrl-left-click is pressed.

Parameters

p0	The button event.

Returns

Always returns true.

Why is setting the start-tick disabled? We re-enable it and see if it works. To our surprise, it works, but it sticks between stop/pause and the next playback in the performance editor. We added a feature where stop sets the start-tick to the left tick (or the beginning tick).

10.72.2.21 on_size_allocate()

```
void seq64::perftime::on_size_allocate (
            Gtk::Allocation & r )  [private]
```

10.72.2.22 on_button_release_event()

```
bool seq64::perftime::on_button_release_event (
            GdkEventButton * )  [inline], [private]
```

"ev", The button event parameter, is not used.

Returns

Always returns false

10.72.2.23 key_press_event()

```
bool seq64::perftime::key_press_event (
            GdkEventKey * ev )  [private]
```

Can't get the keystroke events to be seen by perfroll or perftime here using the normal callback function for keystrokes, and not sure why. The perfedit object can call this function, and that call works, so the perfedit class, which does get keystrokes, calls this function to do the work.

This function uses the "l" key to activate the movement of the "L" marker with the arrow keys, by the interval of on snap value for each press. It also uses the "r" key to activate the movement of the "R" marker, and the "x" to deactivate either movement move.

Be aware that there is no visual feedback, as yet, that one is in the movement mode.

Also be aware the changing the name of this function from "key_press_event()" to "on_key_press_event()" will disrupt the process, causing keystrokes to not get here. Too tricky.

10.72.3 Friends And Related Function Documentation

10.72.3.1 perfedit

```
friend class perfedit  [friend]
```

10.72.4 Field Documentation

10.72.4.1 m_parent

```
perfedit& seq64::perftime::m_parent  [private]
```

We want to support two perfedit windows, but the children of perfedit will have to communicate changes requiring a redraw through the parent.

10.72.4.2 m_4bar_offset

```
int seq64::perftime::m_4bar_offset  [private]
```

Also, why always 4/16 in the calculations of this value? Might be able to get rid of this member, though it's a bit tricky.

10.72.4.3 m_tick_offset

```
int seq64::perftime::m_tick_offset  [private]
```

Why 16?

10.72.4.4 m_ppqn

```
int seq64::perftime::m_ppqn  [private]
```

10.72.4.5 m_snap

```
int seq64::perftime::m_snap  [private]
```

10.72.4.6 m_measure_length

```
int seq64::perftime::m_measure_length  [private]
```

This value is m_ppqn $*$ 4, though eventually we want to employ a more flexible representation of measure length. Supports perftime's keystroke processing.

10.72.4.7 m_left_marker_tick

```
int seq64::perftime::m_left_marker_tick  [private]
```

Otherwise it is -1. Supports perftime's keystroke processing.

10.72.4.8 m_right_marker_tick

```
int seq64::perftime::m_right_marker_tick  [private]
```

Otherwise it is -1. Supports perftime's keystroke processing.

10.72.4.9 m_perf_scale_x

```
int seq64::perftime::m_perf_scale_x  [private]
```

10.72.4.10 m_timearea_y

```
int seq64::perftime::m_timearea_y  [private]
```

10.73 seq64::midi_port_info::port_info_t Struct Reference

Hold the information for a single port.

Data Fields

- int m_client_number

  The major buss number of the port.
- std::string m_client_name

  The system's name for the client.
- int m_port_number

  The minor port number of the port.
- std::string m_port_name

  The system's name for the port.
- int m_queue_number

  A number used in some APIs.
- bool m_is_input

  Indicates an input port.
- bool m_is_virtual

  Indicates an manual/virtual port.
- bool m_is_system

  Built-in port, almost always false.

10.73.1 Detailed Description

Except for the virtual-vs-normal status, this information is obtained by scanning the system at the startup time of the application.

10.73.2 Field Documentation

10.73.2.1 m_client_number

```
int seq64::midi_port_info::port_info_t::m_client_number
```

10.73.2.2 m_client_name

```
std::string seq64::midi_port_info::port_info_t::m_client_name
```

10.73.2.3 m_port_number

```
int seq64::midi_port_info::port_info_t::m_port_number
```

10.73.2.4 m_port_name

```
std::string seq64::midi_port_info::port_info_t::m_port_name
```

10.73.2.5 m_queue_number

```
int seq64::midi_port_info::port_info_t::m_queue_number
```

10.73.2.6 m_is_input

```
bool seq64::midi_port_info::port_info_t::m_is_input
```

10.73.2.7 m_is_virtual

```
bool seq64::midi_port_info::port_info_t::m_is_virtual
```

10.73.2.8 m_is_system

```
bool seq64::midi_port_info::port_info_t::m_is_system
```

10.74 seq64::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 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.
- const std::string & comments_block () const

  'Getter' function for member m_comments_block
- void clear_comments ()

  'Setter' function for member m_comments_block
- void append_comment_line (const std::string &line)

  'Setter' function for member m_comments_block
- bool verbose_option () const

  'Getter' function for member m_verbose_option
- bool auto_option_save () const

  'Getter' function for member m_auto_option_save
- bool legacy_format () const

  'Getter' function for member m_legacy_format
- bool lash_support () const

  'Getter' function for member m_lash_support
- bool allow_mod4_mode () const

  'Getter' function for member m_allow_mod4_mode
- bool allow_snap_split () const

  'Getter' function for member m_allow_snap_split
- bool allow_click_edit () const

  'Getter' function for member m_allow_click_edit
- bool show_midi () const

  'Getter' function for member m_show_midi
- bool priority () const

  'Getter' function for member m_priority
- bool stats () const

  'Getter' function for member m_stats
- bool pass_sysex () const

  'Getter' function for member m_pass_sysex
- bool with_jack_transport () const

  'Getter' function for member m_with_jack_transport
- bool with_jack_master () const

  'Getter' function for member m_with_jack_master
- bool with_jack_master_cond () const

  'Getter' function for member m_with_jack_master_cond
- bool with_jack_midi () const

'Getter' function for member m_with_jack_midi
- void with_jack_transport (bool flag)

  'Setter' function for member m_with_jack_transport
- void with_jack_master (bool flag)

  'Setter' function for member m_with_jack_master
- void with_jack_master_cond (bool flag)

  'Setter' function for member m_with_jack_master_cond
- bool with_jack () const

  'Getter' function for member m_with_jack_transport m_with_jack_master, and m_with_jack_master_cond, to save client code some trouble.
- bool filter_by_channel () const

  'Getter' function for member m_filter_by_channel
- bool manual_alsa_ports () const

  'Getter' function for member m_manual_alsa_ports
- bool reveal_alsa_ports () const

  'Getter' function for member m_reveal_alsa_ports
- bool print_keys () const

  'Getter' function for member m_print_keys
- bool device_ignore () const

  'Getter' function for member 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
- mute_group_handling_t mute_group_saving () const

  'Getter' function for member m_mute_group_saving
- const std::string & filename () const

  'Getter' function for member m_filename
- void filename (const std::string &value)

  'Setter' 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
- void last_used_dir (const std::string &value)

  'Setter' function for member m_last_used_dir
- bool add_recent_file (const std::string &filename)

  'Setter' function for member m_recent_files
- bool append_recent_file (const std::string &filename)
- bool remove_recent_file (const std::string &filename)
- const std::string & config_directory () const

  'Getter' function for member m_config_directory
- std::string home_config_directory () const

  Provides the directory for the configuration file, and also creates the directory if necessary.
- void set_config_files (const std::string &value)

  'Setter' function for member m_config_filename and m_user_filename
- 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
- const std::string application_name () const

  'Getter' function for member m_application_name
- const std::string & app_client_name () const

  'Getter' function for member m_app_client_name
- int tempo_track_number () const

  'Getter' function for member m_tempo_track_number
- std::string recent_file (int index, bool shorten=true) const

  'Getter' function for member m_recent_files
- int recent_file_count () const

  'Getter' function for member m_recent_files.size()

Protected Member Functions

- void verbose_option (bool flag)

  'Setter' function for member m_verbose_option
- void auto_option_save (bool flag)

  'Setter' function for member m_auto_option_save
- void legacy_format (bool flag)

  'Setter' function for member m_legacy_format
- void lash_support (bool flag)

  'Setter' function for member m_lash_support
- void allow_mod4_mode (bool flag)

  'Setter' function for member m_allow_mod4_mode
- void allow_snap_split (bool flag)

  'Setter' function for member m_allow_snap_split
- void allow_click_edit (bool flag)

  'Setter' function for member m_allow_click_edit
- void show_midi (bool flag)

  'Setter' function for member m_show_midi
- void priority (bool flag)

  'Setter' function for member m_priority
- void stats (bool flag)

  'Setter' function for member m_stats
- void pass_sysex (bool flag)

  'Setter' function for member m_pass_sysex
- void with_jack_midi (bool flag)

  'Setter' function for member m_with_jack_midi
- void filter_by_channel (bool flag)

  'Setter' function for member m_filter_by_channel
- void manual_alsa_ports (bool flag)

  'Setter' function for member m_manual_alsa_ports
- void reveal_alsa_ports (bool flag)

  'Setter' function for member m_reveal_alsa_ports
- void print_keys (bool flag)

  'Setter' function for member m_print_keys
- void device_ignore (bool flag)

  'Setter' function for member m_device_ignore

- void tempo_track_number (int track)

  'Setter' function for member m_tempo_track_number
- 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.
- bool interaction_method (interaction_method_t value)

  'Setter' function for member m_interaction_method
- bool mute_group_saving (mute_group_handling_t mgh)

  'Setter' function for member m_mute_group_saving
- void jack_session_uuid (const std::string &value)

  'Setter' function for member m_jack_session_uuid
- 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 ("rc")
- void user_filename (const std::string &value)

  'Setter' function for member m_user_filename ("usr")
- 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 Attributes

- std::string m_comments_block

  [comments]
- bool m_verbose_option

  [auto-option-save] setting.
- bool m_auto_option_save

  [auto-option-save] setting.
- bool m_legacy_format

  Write files in legacy format.
- bool m_lash_support

  Enable LASH, if compiled in.
- bool m_allow_mod4_mode

  Allow Mod4 to hold drawing mode.
- bool m_allow_snap_split

  Allow snap-split of a trigger.
- bool m_allow_click_edit

  Allow double-click edit pattern.
- bool m_show_midi

  Show MIDI events to console.
- bool m_priority

  Run at high priority (Linux only).
- bool m_stats

  Show some output statistics.
- bool m_pass_sysex

  Pass SysEx to outputs, not ready.
- bool m_with_jack_transport

Enable synchrony with JACK.

- bool m_with_jack_master

  Serve as a JACK transport Master.
- bool m_with_jack_master_cond

  Serve as JACK Master if possible.
- bool m_with_jack_midi

  Use JACK MIDI.
- bool m_filter_by_channel

  Record only sequence channel data.
- bool m_manual_alsa_ports

  [manual-alsa-ports] setting.
- bool m_reveal_alsa_ports

  [reveal-alsa-ports] setting.
- bool m_print_keys

  Show hot-key in main window slot.
- bool m_device_ignore

  From seq24 module, unused!
- int m_device_ignore_num

  From seq24 module, unused!
- interaction_method_t m_interaction_method

  [interaction-method]
- mute_group_handling_t m_mute_group_saving

  Handling of mutes.
- std::string m_filename

  Provides the name of current MIDI file.
- std::string m_jack_session_uuid

  Holds the JACK UUID value that makes this JACK connection unique.
- std::string m_last_used_dir

  Holds the directory from which the last MIDI file was opened (or saved).
- std::string m_config_directory

  Holds the current "rc" and "user" configuration directory.
- std::string m_config_filename

  Holds the current "rc" configuration filename.
- std::string m_user_filename

  Holds the current "user" configuration filename.
- std::string m_config_filename_alt

  Holds the legacy "rc" filename, ".seq24rc".
- std::string m_user_filename_alt

  Holds the legacy "user" filename, ".seq24usr".
- const std::string m_application_name

  Holds the application name, e.g.
- std::string m_app_client_name

  Holds the client name for the application.
- int m_tempo_track_number

  New value to allow the user to violate the MIDI specification and use a track other than the first track (#0) as the MIDI tempo track.
- recent m_recent_files

  Holds a few MIDI file-names most recently used.

Friends

- class optionsfile
- class options
- class mainwnd
- class rtmidi_info
- int parse_command_line_options (perform &, int, char ∗[ ])

  Parses the command-line options on behalf of the application.
- bool help_check (int, char ∗[ ])

  Checks to see if the first option is a help or version argument, just so we can skip the "Reading configuration ..." messages.

10.74.1 Detailed Description

It gives us a whole lot more encapsulation and control over how the options of the "rc" file (optionsfile) are set and used. Note that this class does not support the hot-keys options; those are handled in the keys_perform class.

10.74.2 Constructor & Destructor Documentation

10.74.2.1 rc_settings() [1/2]

```
seq64::rc_settings::rc_settings ( )
```

10.74.2.2 rc_settings() [2/2]

```
seq64::rc_settings::rc_settings (
             const rc_settings & rhs )
```

Parameters

rhs	The source of the data for the copy.

10.74.3 Member Function Documentation

10.74.3.1 operator=()

```
rc_settings & seq64::rc_settings::operator= (
             const rc_settings & rhs )
```

Parameters

rhs	The source of the data for the assignment.

Returns

Returns a reference to the destination for use in serial assignments.

10.74.3.2 config_filespec()

```
std::string seq64::rc_settings::config_filespec ( ) const
```

Returns

If home_config_directory() returns a non-empty string, then the legacy or normal "rc" configuration file-name is appended to that result, and returned. Otherwise, an empty string is returned.

10.74.3.3 user_filespec()

```
std::string seq64::rc_settings::user_filespec ( ) const
```

Returns

If home_config_directory() returns a non-empty string, then the legacy or normal "user" configuration file-name is appended to that result, and returned. Otherwise, an empty string is returned.

10.74.3.4 set_defaults()

```
void seq64::rc_settings::set_defaults ( )
```

10.74.3.5 comments_block()

```
const std::string& seq64::rc_settings::comments_block ( ) const  [inline]
```

10.74.3.6 clear_comments()

```
void seq64::rc_settings::clear_comments ( )  [inline]
```

10.74.3.7 append_comment_line()

```
void seq64::rc_settings::append_comment_line (
             const std::string & line )  [inline]
```

10.74.3.8 verbose_option() [1/2]

```
bool seq64::rc_settings::verbose_option ( ) const  [inline]
```

10.74.3.9 auto_option_save() [1/2]

```
bool seq64::rc_settings::auto_option_save ( ) const  [inline]
```

10.74.3.10 legacy_format() [1/2]

```
bool seq64::rc_settings::legacy_format ( ) const  [inline]
```

10.74.3.11 lash_support() [1/2]

```
bool seq64::rc_settings::lash_support ( ) const  [inline]
```

10.74.3.12 allow_mod4_mode() [1/2]

```
bool seq64::rc_settings::allow_mod4_mode ( ) const  [inline]
```

10.74.3.13 allow_snap_split() [1/2]

```
bool seq64::rc_settings::allow_snap_split ( ) const  [inline]
```

10.74.3.14 allow_click_edit() [1/2]

```
bool seq64::rc_settings::allow_click_edit ( ) const  [inline]
```

10.74.3.15 show_midi() [1/2]

```
bool seq64::rc_settings::show_midi ( ) const  [inline]
```

10.74.3.16 priority() [1/2]

```
bool seq64::rc_settings::priority ( ) const  [inline]
```

10.74.3.17 stats() [1/2]

```
bool seq64::rc_settings::stats ( ) const  [inline]
```

10.74.3.18 pass_sysex() [1/2]

```
bool seq64::rc_settings::pass_sysex ( ) const  [inline]
```

10.74.3.19 with_jack_transport() [1/2]

```
bool seq64::rc_settings::with_jack_transport ( ) const  [inline]
```

10.74.3.20 with_jack_master() [1/2]

```
bool seq64::rc_settings::with_jack_master ( ) const  [inline]
```

10.74.3.21 with_jack_master_cond() [1/2]

```
bool seq64::rc_settings::with_jack_master_cond ( ) const  [inline]
```

10.74.3.22 with_jack_midi() [1/2]

```
bool seq64::rc_settings::with_jack_midi ( ) const  [inline]
```

10.74.3.23 with_jack_transport() [2/2]

```
void seq64::rc_settings::with_jack_transport (
             bool flag )
```

10.74.3.24 with_jack_master() [2/2]

```
void seq64::rc_settings::with_jack_master (
             bool flag )
```

10.74.3.25 with_jack_master_cond() [2/2]

```
void seq64::rc_settings::with_jack_master_cond (
             bool flag )
```

10.74.3.26 with_jack()

```
bool seq64::rc_settings::with_jack ( ) const  [inline]
```

Do not confuse these original options with the new "no JACK MIDI" option.

10.74.3.27 filter_by_channel() [1/2]

```
bool seq64::rc_settings::filter_by_channel ( ) const  [inline]
```

10.74.3.28 manual_alsa_ports() [1/2]

```
bool seq64::rc_settings::manual_alsa_ports ( ) const  [inline]
```

10.74.3.29 reveal_alsa_ports() [1/2]

```
bool seq64::rc_settings::reveal_alsa_ports ( ) const  [inline]
```

10.74.3.30 print_keys() [1/2]

```
bool seq64::rc_settings::print_keys ( ) const  [inline]
```

10.74.3.31 device_ignore() [1/2]

```
bool seq64::rc_settings::device_ignore ( ) const  [inline]
```

10.74.3.32 device_ignore_num() [1/2]

```
int seq64::rc_settings::device_ignore_num ( ) const  [inline]
```

10.74.3.33 interaction_method() [1/2]

```
interaction_method_t seq64::rc_settings::interaction_method ( ) const  [inline]
```

10.74.3.34 mute_group_saving() [1/2]

```
mute_group_handling_t seq64::rc_settings::mute_group_saving ( ) const  [inline]
```

10.74.3.35 filename() [1/2]

```
const std::string& seq64::rc_settings::filename ( ) const  [inline]
```

10.74.3.36 filename() [2/2]

```
void seq64::rc_settings::filename (
             const std::string & value )
```

Parameters

value	The value to use to make the setting.

10.74.3.37 jack_session_uuid() [1/2]

```
const std::string& seq64::rc_settings::jack_session_uuid ( ) const  [inline]
```

10.74.3.38 last_used_dir() [1/2]

```
const std::string& seq64::rc_settings::last_used_dir ( ) const  [inline]
```

10.74.3.39 last_used_dir() [2/2]

```
void seq64::rc_settings::last_used_dir (
             const std::string & value )
```

Parameters

value	The value to use to make the setting. It needs to be a directory, not a file. Also, we now expand a relative directory to the full path to that directory, to avoid ambiguity should the application be run from a different directory.

10.74.3.40 add_recent_file()

```
bool seq64::rc_settings::add_recent_file (
             const std::string & filename )  [inline]
```

First makes sure the filename is not already present, and removes the back entry from the list, if it is full (SEQ64←_RECENT_FILES_MAX) before adding it.

Now the full pathname is added.

Parameters

fname	Provides the full path to the MIDI file that is to be added to the recent-files list.

Returns

Returns true if the file-name was able to be added.

10.74.3.41 append_recent_file()

```
bool seq64::rc_settings::append_recent_file (
            const std::string & filename )  [inline]
```

10.74.3.42 remove_recent_file()

```
bool seq64::rc_settings::remove_recent_file (
            const std::string & filename )  [inline]
```

10.74.3.43 config_directory() [1/2]

```
const std::string& seq64::rc_settings::config_directory ( ) const  [inline]
```

10.74.3.44 home_config_directory()

```
std::string seq64::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".

This function should also adapt to Windows conventions automatically. We shall see. No, it does not. But all we have to do is replace Window's HOMEPATH with its LOCALAPPDATA value.

getenv(HOME):

```
 -   Linux returns "/home/ahlstrom".  Append "/.config/sequencer64".
 -   Windows returns "\Users\ahlstrom".  A better value than HOMEPATH
     is LOCALAPPDATA, which gives us most of what we want:
     "C:\Users\ahlstrom\AppData\local", and then we append simply
     "sequencer64".
```

Returns

Returns the selected home configuration directory. If it does not exist, or could not be created, then an empty string is returned.

10.74.3.45 set_config_files()

```
void seq64::rc_settings::set_config_files (
            const std::string & value )
```

Implements the –config option to change both configuration files ("rc" and "usr") with one option.

Parameters

value	The value to use to make the setting, if the string is not empty. If the value has an extension, it is stripped first.

10.74.3.46 config_filename() [1/2]

```
const std::string& seq64::rc_settings::config_filename ( ) const  [inline]
```

10.74.3.47 user_filename() [1/2]

```
const std::string& seq64::rc_settings::user_filename ( ) const  [inline]
```

10.74.3.48 config_filename_alt() [1/2]

```
const std::string& seq64::rc_settings::config_filename_alt ( ) const  [inline]
```

10.74.3.49 user_filename_alt() [1/2]

```
const std::string& seq64::rc_settings::user_filename_alt ( ) const  [inline]
```

10.74.3.50 application_name()

```
const std::string seq64::rc_settings::application_name ( ) const  [inline]
```

10.74.3.51 app_client_name()

```
const std::string& seq64::rc_settings::app_client_name ( ) const  [inline]
```

10.74.3.52 tempo_track_number() [1/2]

```
int seq64::rc_settings::tempo_track_number ( ) const  [inline]
```

10.74.3.53 recent_file()

```
std::string seq64::rc_settings::recent_file (
            int index,
            bool shorten = true ) const
```

Gets the desired recent MIDI file-name, if present.

Parameters

index	Provides the desired index into the recent-files vector.
shorten	If true, remove the path-name from the file-name. True by default. It needs to be short for the menu entry, but the full path-name for the "rc" file.

Returns

Returns m_recent_files[index], perhaps shortened. An empty string is returned if there is no such animal.

10.74.3.54 recent_file_count()

```
int seq64::rc_settings::recent_file_count ( ) const  [inline]
```

10.74.3.55 verbose_option() [2/2]

```
void seq64::rc_settings::verbose_option (
            bool flag )  [inline], [protected]
```

10.74.3.56 auto_option_save() [2/2]

```
void seq64::rc_settings::auto_option_save (
            bool flag )  [inline], [protected]
```

10.74.3.57 legacy_format() [2/2]

```
void seq64::rc_settings::legacy_format (
            bool flag )  [inline], [protected]
```

10.74.3.58 lash_support() [2/2]

```
void seq64::rc_settings::lash_support (
            bool flag )  [inline], [protected]
```

10.74.3.59 allow_mod4_mode() [2/2]

```
void seq64::rc_settings::allow_mod4_mode (
             bool flag )  [inline], [protected]
```

10.74.3.60 allow_snap_split() [2/2]

```
void seq64::rc_settings::allow_snap_split (
             bool flag )  [inline], [protected]
```

10.74.3.61 allow_click_edit() [2/2]

```
void seq64::rc_settings::allow_click_edit (
             bool flag )  [inline], [protected]
```

10.74.3.62 show_midi() [2/2]

```
void seq64::rc_settings::show_midi (
             bool flag )  [inline], [protected]
```

10.74.3.63 priority() [2/2]

```
void seq64::rc_settings::priority (
             bool flag )  [inline], [protected]
```

10.74.3.64 stats() [2/2]

```
void seq64::rc_settings::stats (
             bool flag )  [inline], [protected]
```

10.74.3.65 pass_sysex() [2/2]

```
void seq64::rc_settings::pass_sysex (
             bool flag )  [inline], [protected]
```

10.74.3.66 with_jack_midi() [2/2]

```
void seq64::rc_settings::with_jack_midi (
            bool flag )  [inline], [protected]
```

10.74.3.67 filter_by_channel() [2/2]

```
void seq64::rc_settings::filter_by_channel (
            bool flag )  [inline], [protected]
```

10.74.3.68 manual_alsa_ports() [2/2]

```
void seq64::rc_settings::manual_alsa_ports (
            bool flag )  [inline], [protected]
```

10.74.3.69 reveal_alsa_ports() [2/2]

```
void seq64::rc_settings::reveal_alsa_ports (
            bool flag )  [inline], [protected]
```

10.74.3.70 print_keys() [2/2]

```
void seq64::rc_settings::print_keys (
            bool flag )  [inline], [protected]
```

10.74.3.71 device_ignore() [2/2]

```
void seq64::rc_settings::device_ignore (
            bool flag )  [inline], [protected]
```

10.74.3.72 tempo_track_number() [2/2]

```
void seq64::rc_settings::tempo_track_number (
            int track )  [protected]
```

10.74.3.73 device_ignore_num() [2/2]

```
void seq64::rc_settings::device_ignore_num (
            int value )  [protected]
```

Parameters

value	The value to use to make the setting.

10.74.3.74 interaction_method() [2/2]

```
bool seq64::rc_settings::interaction_method (
            interaction_method_t value )  [protected]
```

Parameters

value	The value to use to make the setting.

Returns

Returns true if the value was legal.

10.74.3.75 mute_group_saving() [2/2]

```
bool seq64::rc_settings::mute_group_saving (
            mute_group_handling_t mgh )  [protected]
```

10.74.3.76 jack_session_uuid() [2/2]

```
void seq64::rc_settings::jack_session_uuid (
            const std::string & value )  [protected]
```

Parameters

value	The value to use to make the setting.

10.74.3.77 config_directory() [2/2]

```
void seq64::rc_settings::config_directory (
            const std::string & value )  [protected]
```

Parameters

value	The value to use to make the setting. Currently, we do not handle relative paths. To do so seems... iffy.

10.74.3.78 config_filename() [2/2]

```
void seq64::rc_settings::config_filename (
            const std::string & value )  [protected]
```

Parameters

value	The value to use to make the setting, if the string is not empty. If there is no period in the string, then ".rc" is appended to the end of the filename.

10.74.3.79 user_filename() [2/2]

```
void seq64::rc_settings::user_filename (
            const std::string & value )  [protected]
```

Parameters

value	The value to use to make the setting, if the string is not empty. If there is no period in the string, then ".usr" is appended to the end of the filename.

10.74.3.80 config_filename_alt() [2/2]

```
void seq64::rc_settings::config_filename_alt (
            const std::string & value )  [protected]
```

Parameters

value	The value to use to make the setting, if the string is not empty.

10.74.3.81 user_filename_alt() [2/2]

```
void seq64::rc_settings::user_filename_alt (
            const std::string & value )  [protected]
```

Parameters

value	The value to use to make the setting.

10.74.4 Friends And Related Function Documentation

10.74.4.1 optionsfile

```
friend class optionsfile  [friend]
```

10.74.4.2 options

```
friend class options  [friend]
```

10.74.4.3 mainwnd

```
friend class mainwnd  [friend]
```

10.74.4.4 rtmidi_info

```
friend class rtmidi_info  [friend]
```

10.74.4.5 parse_command_line_options

```
int parse_command_line_options (
            perform & p,
            int argc,
            char * argv[] )  [friend]
```

Note that, since we call this function twice (once before the configuration files are parsed, and once after), we have to make sure that the global value optind is reset to 0 before calling this function. Note that the traditional reset value for optind is 1, but 0 is used in GNU code to trigger the internal initialization routine of get_opt().

Parameters

p	The performance object that implements some of the command-line options.
argc	The number of command-line arguments.
argv	The array of command-line argument pointers.

Returns

Returns the value of optind if no help-related options were provided.

10.74.4.6 help_check

```
bool help_check (
            int argc,
            char * argv[ ] )  [friend]
```

Also check for the –legacy option. Finally, it also checks for the "?" option that people sometimes use as a guess to get help.

Parameters

argc	The number of command-line arguments.
argv	The array of command-line argument pointers.

Returns

Returns true only if -v, -V, –version, -#, -h, –help, or "?" were encountered. If the legacy options occurred, then rc().legacy_format(true) is called, as a side effect, because it will be needed before we parse the options.

10.74.5 Field Documentation

10.74.5.1 m_comments_block

```
std::string seq64::rc_settings::m_comments_block  [private]
```

Provides a way to embed comments in the "rc" file and not lose them when the "rc" file is auto-saved.

10.74.5.2 m_verbose_option

```
bool seq64::rc_settings::m_verbose_option  [private]
```

10.74.5.3 m_auto_option_save

```
bool seq64::rc_settings::m_auto_option_save  [private]
```

10.74.5.4 m_legacy_format

```
bool seq64::rc_settings::m_legacy_format  [private]
```

10.74.5.5 m_lash_support

```
bool seq64::rc_settings::m_lash_support  [private]
```

10.74.5.6 m_allow_mod4_mode

```
bool seq64::rc_settings::m_allow_mod4_mode  [private]
```

10.74.5.7 m_allow_snap_split

```
bool seq64::rc_settings::m_allow_snap_split  [private]
```

10.74.5.8 m_allow_click_edit

```
bool seq64::rc_settings::m_allow_click_edit  [private]
```

10.74.5.9 m_show_midi

```
bool seq64::rc_settings::m_show_midi  [private]
```

10.74.5.10 m_priority

```
bool seq64::rc_settings::m_priority  [private]
```

10.74.5.11 m_stats

```
bool seq64::rc_settings::m_stats  [private]
```

10.74.5.12 m_pass_sysex

```
bool seq64::rc_settings::m_pass_sysex  [private]
```

10.74.5.13 m_with_jack_transport

```
bool seq64::rc_settings::m_with_jack_transport  [private]
```

10.74.5.14 m_with_jack_master

```
bool seq64::rc_settings::m_with_jack_master  [private]
```

10.74.5.15 m_with_jack_master_cond

```
bool seq64::rc_settings::m_with_jack_master_cond  [private]
```

10.74.5.16 m_with_jack_midi

```
bool seq64::rc_settings::m_with_jack_midi  [private]
```

10.74.5.17 m_filter_by_channel

```
bool seq64::rc_settings::m_filter_by_channel  [private]
```

10.74.5.18 m_manual_alsa_ports

```
bool seq64::rc_settings::m_manual_alsa_ports  [private]
```

10.74.5.19 m_reveal_alsa_ports

```
bool seq64::rc_settings::m_reveal_alsa_ports  [private]
```

10.74.5.20 m_print_keys

```
bool seq64::rc_settings::m_print_keys  [private]
```

10.74.5.21 m_device_ignore

```
bool seq64::rc_settings::m_device_ignore  [private]
```

10.74.5.22 m_device_ignore_num

```
int seq64::rc_settings::m_device_ignore_num  [private]
```

10.74.5.23 m_interaction_method

```
interaction_method_t seq64::rc_settings::m_interaction_method  [private]
```

10.74.5.24 m_mute_group_saving

```
mute_group_handling_t seq64::rc_settings::m_mute_group_saving  [private]
```

10.74.5.25 m_filename

```
std::string seq64::rc_settings::m_filename  [private]
```

10.74.5.26 m_jack_session_uuid

```
std::string seq64::rc_settings::m_jack_session_uuid  [private]
```

10.74.5.27 m_last_used_dir

```
std::string seq64::rc_settings::m_last_used_dir  [private]
```

10.74.5.28 m_config_directory

```
std::string seq64::rc_settings::m_config_directory  [private]
```

This value is "∼/.config/sequencer64" by default.

10.74.5.29 m_config_filename

```
std::string seq64::rc_settings::m_config_filename  [private]
```

This value is "sequencer64.rc" by default.

10.74.5.30 m_user_filename

```
std::string seq64::rc_settings::m_user_filename  [private]
```

This value is "sequencer64.rc" by default.

10.74.5.31 m_config_filename_alt

```
std::string seq64::rc_settings::m_config_filename_alt  [private]
```

10.74.5.32 m_user_filename_alt

```
std::string seq64::rc_settings::m_user_filename_alt  [private]
```

10.74.5.33 m_application_name

```
const std::string seq64::rc_settings::m_application_name  [private]
```

"sequencer64", "seq64portmidi", or "seq64". This is a constant, set to SEQ64_APP_NAME. Also see the seq_↩
app_name() function.

10.74.5.34 m_app_client_name

```
std::string seq64::rc_settings::m_app_client_name  [private]
```

This is much like the application name, but in the future will be a configuration option. For now it is just the value of the SEQ64_CLIENT_NAME macro. Also see the seq_client_name() function.

10.74.5.35 m_tempo_track_number

```
int seq64::rc_settings::m_tempo_track_number  [private]
```

10.74.5.36 m_recent_files

```
recent seq64::rc_settings::m_recent_files  [private]
```

Although this is a vector, we do not let it grow past SEQ64_RECENT_FILES_MAX.

New feature from Oli Kester's kepler34 project.

std::vector<std::string> m_recent_files;

10.75 seq64::rect Class Reference

Supports a simple rectangle and some common manipulations needed by the user-interface.

Public Member Functions

- rect ()
  Default constructor
- rect (int x, int y, int width, int height)
  Principal constructor.
- void get (int &x, int &y, int &width, int &height) const
  Gets the rectangle values for primitive callers that don't store them as a rectangle.
- void set (int x, int y, int width, int height)
  Sets all of the members of the rectangle directly.
- void clear ()
- void xy_to_rect (int x1, int y1, int x2, int y2)
- int x () const
  'Getter' function for member m_x
- void x (int v)
  'Setter' function for member m_x The width is assumed to be unchanged by this function.
- void x_incr (int v)
  'Setter' function for member m_x Provides a setter that uses the parameter to increment the member.
- int y () const
  'Getter' function for member m_y
- void y (int v)

'Setter' function for member m_y The height is assumed to be unchanged by this function.
- void y_incr (int v)

  'Setter' function for member m_y Provides a setter that uses the parameter to increment the member.
- int width () const

  'Getter' function for member m_width
- void width (int w)

  'Setter' function for member m_width
- void width_incr (int w)

  'Setter' function for member m_width
- int height () const

  'Getter' function for member m_height
- void height (int h)

  'Setter' function for member m_height
- void height_incr (int h)

  'Setter' function for member m_height
- void xy_incr (int xv, int yv)

Static Public Member Functions

- static void xy_to_rect (int x1, int y1, int x2, int y2, rect &r)

  Converts rectangle corner coordinates to a rect object, which includes width and height.
- static void xy_to_rect_get (int x1, int y1, int x2, int y2, int &x, int &y, int &w, int &h)

  Converts rectangle corner coordinates to a starting coordinate, plus a width and height.

Static Private Member Functions

- static int calculated_width (int x1, int x2)

  The calculated width is always positive.
- static int calculated_height (int y1, int y2)

  The calculated height is always positive.

Private Attributes

- int m_x

  The x coordinate of the first corner.
- int m_y

  The y coordinate of the first corner.
- int m_width

  The width of the rectangle.
- int m_height

  The height of the rectangle.

10.75.1 Detailed Description

Will eventually replace the gui_drawingarea_gtk2::rect structure.

One minor issue that may crop up in the transition from Gtkmm to Qt 5 is the exact meaning of the coordinates. To be clarified later. For now, it uses the current Gtkmm conventions.

10.75.2 Constructor & Destructor Documentation

10.75.2.1 rect() [1/2]

```
seq64::rect::rect ( )
```

10.75.2.2 rect() [2/2]

```
seq64::rect::rect (
             int x,
             int y,
             int width,
             int height )
```

Parameters

x	The x coordinate.
y	The y coordinate.
width	The width value.
height	The width value.

10.75.3 Member Function Documentation

10.75.3.1 get()

```
void seq64::rect::get (
             int & x,
             int & y,
             int & width,
             int & height ) const
```

Parameters

out	*x*	The destination x coordinate.
out	*y*	The destination y coordinate.
out	*width*	The destination width value.
out	*height*	The destination width value.

10.75.3.2 set()

```
void seq64::rect::set (
            int x,
            int y,
            int width,
            int height )
```

Parameters

x	The x coordinate.
y	The y coordinate.
width	The width value.
height	The width value.

10.75.3.3 clear()

```
void seq64::rect::clear ( )  [inline]
```

10.75.3.4 xy_to_rect() [1/2]

```
void seq64::rect::xy_to_rect (
            int x1,
            int y1,
            int x2,
            int y2,
            rect & r )  [static]
```

Parameters

	x1	The x value of the first corner.
	y1	The y value of the first corner.
	x2	The x value of the second corner.
	y2	The y value of the second corner.
out	*r*	The destination for the coordinate, width, and height.

10.75.3.5 xy_to_rect_get()

```
void seq64::rect::xy_to_rect_get (
            int x1,
            int y1,
            int x2,
            int y2,
            int & x,
            int & y,
            int & w,
            int & h )  [static]
```

This function checks the mins / maxes, and then fills in the x, y, width, and height values. It picks the lowest x and y coordinate to use as the corner coordinate, so that the width and height are always positive.

Parameters

	x1	The x value of the first corner.
	y1	The y value of the first corner.
	x2	The x value of the second corner.
	y2	The y value of the second corner.
out	*x*	The destination for the x value in pixels.
out	*y*	The destination for the y value in pixels.
out	*w*	The destination for the rectangle width in pixels.
out	*h*	The destination for the rectangle height value in pixels.

10.75.3.6 xy_to_rect() [2/2]

```
void seq64::rect::xy_to_rect (
            int x1,
            int y1,
            int x2,
            int y2 )  [inline]
```

10.75.3.7 x() [1/2]

```
int seq64::rect::x ( ) const  [inline]
```

10.75.3.8 x() [2/2]

```
void seq64::rect::x (
            int v )  [inline]
```

10.75.3.9 x_incr()

```
void seq64::rect::x_incr (
            int v )  [inline]
```

The width is assumed to be unchanged by this function.

10.75.3.10 y() [1/2]

```
int seq64::rect::y ( ) const  [inline]
```

10.75.3.11 y() [2/2]

```
void seq64::rect::y (
            int v )  [inline]
```

10.75.3.12 y_incr()

```
void seq64::rect::y_incr (
            int v )  [inline]
```

The height is assumed to be unchanged by this function.

10.75.3.13 width() [1/2]

```
int seq64::rect::width ( ) const  [inline]
```

10.75.3.14 width() [2/2]

```
void seq64::rect::width (
            int w )  [inline]
```

10.75.3.15 width_incr()

```
void seq64::rect::width_incr (
            int w )  [inline]
```

10.75.3.16 height() [1/2]

```
int seq64::rect::height ( ) const  [inline]
```

10.75.3.17 height() [2/2]

```
void seq64::rect::height (
             int h )  [inline]
```

10.75.3.18 height_incr()

```
void seq64::rect::height_incr (
             int h )  [inline]
```

10.75.3.19 xy_incr()

```
void seq64::rect::xy_incr (
             int xv,
             int yv )  [inline]
```

10.75.3.20 calculated_width()

```
static int seq64::rect::calculated_width (
             int x1,
             int x2 )  [inline], [static], [private]
```

Follows the conventions of the xy_to_rect_get() function.

10.75.3.21 calculated_height()

```
static int seq64::rect::calculated_height (
             int y1,
             int y2 )  [inline], [static], [private]
```

Follows the conventions of the xy_to_rect_get() function.

10.75.4 Field Documentation

10.75.4.1 m_x

```
int seq64::rect::m_x  [private]
```

10.75.4.2 m_y

```
int seq64::rect::m_y  [private]
```

10.75.4.3 m_width

```
int seq64::rect::m_width  [private]
```

10.75.4.4 m_height

```
int seq64::rect::m_height  [private]
```

10.76 seq64::rterror Class Reference

Exception handling class for rtexmidi.

Inherits exception.

Public Types

- enum Type {
  WARNING,
  DEBUG_WARNING,
  UNSPECIFIED,
  NO_DEVICES_FOUND,
  INVALID_DEVICE,
  MEMORY_ERROR,
  INVALID_PARAMETER,
  INVALID_USE,
  DRIVER_ERROR,
  SYSTEM_ERROR,
  THREAD_ERROR }

Public Member Functions

- rterror (const std::string &message, Type type=rterror::UNSPECIFIED)
- virtual ∼rterror ()
- virtual void print_message () const

  Prints thrown error message to stderr.
- virtual const Type & getType () const

  Returns the thrown error message type.
- virtual const std::string & get_message () const

  Returns the thrown error message string.
- virtual const char ∗ what () const noexcept

  Returns the thrown error message as a c-style string.

Private Attributes

- std::string m_message

  Holds the latest message information for the exception.
- Type m_type

  Holds the type or severity of the exception.

10.76.1 Detailed Description

The rterror class is quite simple but it does allow errors to be "caught" by rterror::Type. See the rtexmidi documentation to know which methods can throw an rterror.

Please note that, in this refactoring of rtmidi, we've done away with all the exception specifications, on the advice of Herb Sutter. They may be more relevent to C++11 and beyond, but this library is too small to worry about them, for now.

10.76.2 Member Enumeration Documentation

10.76.2.1 Type

```
enum seq64::rterror::Type
```

Enumerator

WARNING	A non-critical error.
DEBUG_WARNING	Non-critical error useful for debugging.
UNSPECIFIED	The default, unspecified error type.
NO_DEVICES_FOUND	No devices found on system.
INVALID_DEVICE	An invalid device ID was specified.
MEMORY_ERROR	An error occured during memory allocation.
INVALID_PARAMETER	Invalid parameter specified to a function.
INVALID_USE	The function was called incorrectly.
DRIVER_ERROR	A system driver error occured.
SYSTEM_ERROR	A system error occured.
THREAD_ERROR	A thread error occured.

10.76.3 Constructor & Destructor Documentation

10.76.3.1 rterror()

```
seq64::rterror::rterror (
            const std::string & message,
            Type type = rterror::UNSPECIFIED )  [inline]
```

10.76.3.2 ∼rterror()

```
virtual seq64::rterror::∼rterror ( )  [inline], [virtual]
```

10.76.4 Member Function Documentation

10.76.4.1 print_message()

```
virtual void seq64::rterror::print_message ( ) const  [inline], [virtual]
```

10.76.4.2 getType()

```
virtual const Type& seq64::rterror::getType ( ) const  [inline], [virtual]
```

10.76.4.3 get_message()

```
virtual const std::string& seq64::rterror::get_message ( ) const  [inline], [virtual]
```

10.76.4.4 what()

```
virtual const char* seq64::rterror::what ( ) const  [inline], [virtual], [noexcept]
```

10.76.5 Field Documentation

10.76.5.1 m_message

```
std::string seq64::rterror::m_message  [private]
```

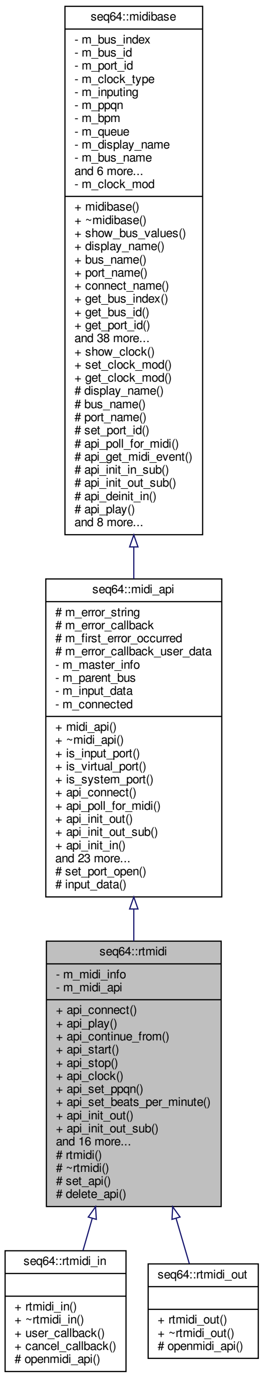
10.76.5.2 m_type

```
Type seq64::rterror::m_type  [private]
```

10.77 seq64::rtmidi Class Reference

The main class of the rtmidi API.

Inheritance diagram for seq64::rtmidi:



Public Member Functions

- virtual bool api_connect ()
- virtual void api_play (event ∗e24, midibyte channel)
- virtual void api_continue_from (midipulse tick, midipulse beats)
- virtual void api_start ()
- virtual void api_stop ()
- virtual void api_clock (midipulse tick)
- virtual void api_set_ppqn (int ppqn)
- virtual void api_set_beats_per_minute (midibpm bpm)
- virtual bool api_init_out ()
- virtual bool api_init_out_sub ()
- virtual bool api_init_in ()
- virtual bool api_init_in_sub ()
- virtual bool api_deinit_in ()
- virtual bool api_get_midi_event (event ∗inev)
- virtual int api_poll_for_midi ()
- virtual void api_sysex (event ∗e24)
- virtual void api_flush ()
- virtual bool is_port_open () const

    Returns true if a port is open and false if not.
- virtual int get_bus_id ()

    Gets the buss/client ID for a MIDI interfaces.
- virtual std::string get_bus_name ()
- virtual int get_port_id ()
- virtual std::string get_port_name ()
- int get_port_count ()
- int full_port_count ()
- const midi_api ∗ get_api () const

    'Getter' function for member m_midi_api const version
- midi_api ∗ get_api ()

    'Getter' function for member m_midi_api non-const version

Protected Member Functions

- rtmidi (midibus &parentbus, rtmidi_info &info)
- virtual ∼rtmidi ()
- void set_api (midi_api ∗ma)

    'Setter' function for member m_midi_api
- void delete_api ()

    'Setter' function for member m_midi_api

Private Attributes

- rtmidi_info & m_midi_info

    Holds a reference to the "global" midi_info wrapper object.
- midi_api ∗ m_midi_api

    Points to the API I/O object (e.g.

Friends

- class midibus

Additional Inherited Members

10.77.1 Detailed Description

We moved the enum Api definition into the new rtmidi_types.hpp module to make refactoring the code easier.

10.77.2 Constructor & Destructor Documentation

10.77.2.1 rtmidi()

```
seq64::rtmidi::rtmidi (
            midibus & parentbus,
            rtmidi_info & info )  [protected]
```

10.77.2.2 ∼rtmidi()

```
virtual seq64::rtmidi::∼rtmidi ( )  [protected], [virtual]
```

10.77.3 Member Function Documentation

10.77.3.1 api_connect()

```
virtual bool seq64::rtmidi::api_connect ( )  [inline], [virtual]
```

Reimplemented from seq64::midi_api.

10.77.3.2 api_play()

```
virtual void seq64::rtmidi::api_play (
            event * e24,
            midibyte channel )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.3 api_continue_from()

```
virtual void seq64::rtmidi::api_continue_from (
            midipulse tick,
            midipulse beats )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.4 api_start()

```
virtual void seq64::rtmidi::api_start ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.5 api_stop()

```
virtual void seq64::rtmidi::api_stop ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.6 api_clock()

```
virtual void seq64::rtmidi::api_clock (
            midipulse tick )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.7 api_set_ppqn()

```
virtual void seq64::rtmidi::api_set_ppqn (
            int ppqn )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.8 api_set_beats_per_minute()

```
virtual void seq64::rtmidi::api_set_beats_per_minute (
            midibpm bpm )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.9 api_init_out()

```
virtual bool seq64::rtmidi::api_init_out ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.10 api_init_out_sub()

```
virtual bool seq64::rtmidi::api_init_out_sub ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.11 api_init_in()

```
virtual bool seq64::rtmidi::api_init_in ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.12 api_init_in_sub()

```
virtual bool seq64::rtmidi::api_init_in_sub ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.13 api_deinit_in()

```
virtual bool seq64::rtmidi::api_deinit_in ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.14 api_get_midi_event()

```
virtual bool seq64::rtmidi::api_get_midi_event (
             event * inev )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.15 api_poll_for_midi()

```
virtual int seq64::rtmidi::api_poll_for_midi ( )  [inline], [virtual]
```

Reimplemented from seq64::midi_api.

10.77.3.16 api_sysex()

```
virtual void seq64::rtmidi::api_sysex (
             event * e24 )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.17 api_flush()

```
virtual void seq64::rtmidi::api_flush ( )  [inline], [virtual]
```

Implements seq64::midi_api.

10.77.3.18 is_port_open()

```
virtual bool seq64::rtmidi::is_port_open ( ) const  [inline], [virtual]
```

10.77.3.19 get_bus_id()

```
virtual int seq64::rtmidi::get_bus_id ( )  [inline], [virtual]
```

This is the left-hand side of a X:Y pair (such as 128:0).

This function is a new part of the RtMidi interface.

Returns

Returns the buss/client value as provided by the selected API.

10.77.3.20 get_bus_name()

```
virtual std::string seq64::rtmidi::get_bus_name ( )  [inline], [virtual]
```

Returns

Returns the buss name from the selected API subsystem.

10.77.3.21 get_port_id()

```
virtual int seq64::rtmidi::get_port_id ( )  [inline], [virtual]
```

Returns

Returns the port ID number from the selected API subsystem.

10.77.3.22 get_port_name()

```
virtual std::string seq64::rtmidi::get_port_name ( )  [inline], [virtual]
```

Returns

Returns the port name from the selected API subsystem.

10.77.3.23 get_port_count()

```
int seq64::rtmidi::get_port_count ( )  [inline]
```

Returns

This value depends on the MIDI mode setting (input versus output).

10.77.3.24 full_port_count()

```
int seq64::rtmidi::full_port_count ( )  [inline]
```

Returns

This value is the sum of the number of input and output ports.

10.77.3.25 get_api() [1/2]

```
const midi_api* seq64::rtmidi::get_api ( ) const  [inline]
```

10.77.3.26 get_api() [2/2]

```
midi_api* seq64::rtmidi::get_api ( )  [inline]
```

10.77.3.27 set_api()

```
void seq64::rtmidi::set_api (
             midi_api * ma )  [inline], [protected]
```

10.77.3.28 delete_api()

```
void seq64::rtmidi::delete_api ( )  [inline], [protected]
```

10.77.4 Friends And Related Function Documentation

10.77.4.1 midibus

```
friend class midibus  [friend]
```

10.77.5 Field Documentation

10.77.5.1 m_midi_info

```
rtmidi_info& seq64::rtmidi::m_midi_info  [private]
```

Unlike the original RtMidi library, this library separates the port-enumeration code ("info") from the port-usage code ("api").

We might make it a static object at some point.

10.77.5.2 m_midi_api

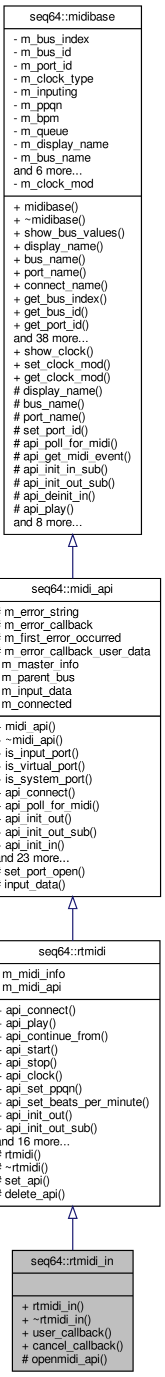
```
midi_api* seq64::rtmidi::m_midi_api  [private]
```

midi_alsa or midi_jack) for which this class is a wrapper.

10.78 seq64::rtmidi_in Class Reference

A realtime MIDI input class.

Inheritance diagram for seq64::rtmidi_in:



Public Member Functions

- rtmidi_in (midibus &parentbus, rtmidi_info &info)
- virtual ∼rtmidi_in ()
- void user_callback (rtmidi_callback_t callback, void ∗userdata=nullptr)

    Set a callback function to be invoked for incoming MIDI messages.
- void cancel_callback ()

    Cancel use of the current callback function (if one exists).

Protected Member Functions

- void openmidi_api (rtmidi_api api, rtmidi_info &info)

Additional Inherited Members

10.78.1 Detailed Description

This class provides a common, platform-independent API for realtime MIDI input. It allows access to a single MIDI input port. Incoming MIDI messages are either saved to a queue for retrieval using the get_message() function or immediately passed to a user-specified callback function. Create multiple instances of this class to connect to more than one MIDI device at the same time. With the OS-X, Linux ALSA, and JACK MIDI APIs, it is also possible to open a virtual input port to which other MIDI software clients can connect.

10.78.2 Constructor & Destructor Documentation

10.78.2.1 rtmidi_in()

```
seq64::rtmidi_in::rtmidi_in (
            midibus & parentbus,
            rtmidi_info & info )
```

10.78.2.2 ∼rtmidi_in()

```
virtual seq64::rtmidi_in::∼rtmidi_in ( )  [virtual]
```

10.78.3 Member Function Documentation

10.78.3.1 user_callback()

```
void seq64::rtmidi_in::user_callback (
            rtmidi_callback_t callback,
            void * userdata = nullptr )  [inline]
```

The callback function will be called whenever an incoming MIDI message is received. While not absolutely necessary, it is best to set the callback function before opening a MIDI port to avoid leaving some messages in the queue.

Parameters

callback	A callback function must be given.
userdata	Optionally, a pointer to additional data can be passed to the callback function whenever it is called.

10.78.3.2 cancel_callback()

```
void seq64::rtmidi_in::cancel_callback ( )  [inline]
```

Subsequent incoming MIDI messages will be written to the queue and can be retrieved with the *get_message* function.

10.78.3.3 openmidi_api()

```
void seq64::rtmidi_in::openmidi_api (
            rtmidi_api api,
            rtmidi_info & info )  [protected]
```

10.79 seq64::rtmidi_in_data Class Reference

The rtmidi_in_data structure is used to pass private class data to the MIDI input handling function or thread.

Public Member Functions

- rtmidi_in_data ()
- const midi_queue & queue () const

  'Getter' function for member m_queue const
- midi_queue & queue ()

  'Getter' function for member m_queue non-const
- const midi_message & message () const
- midi_message & message ()
- midibyte ignore_flags () const
- bool test_ignore_flags (midibyte testbits)
- void ignore_flags (midibyte setbits)
- bool do_input () const
- void do_input (bool flag)
- bool first_message () const
- void first_message (bool flag)
- bool continue_sysex () const
- void continue_sysex (bool flag)
- bool using_callback () const
- void using_callback (bool flag)
- const void ∗ api_data () const

  'Getter' function for member m_api_data const
- void ∗ api_data ()

'Getter' function for member m_api_data non-const
- void api_data (void ∗dataptr)
- const void ∗ user_data () const

  'Getter' function for member m_user_data const
- void ∗ user_data ()

  'Getter' function for member m_user_data const
- void user_data (void ∗dataptr)

  'Setter' function for member m_user_data
- rtmidi_callback_t user_callback () const

  'Getter' function for member m_user_callback
- void user_callback (rtmidi_callback_t cbptr)

  'Setter' function for member m_user_callback This should be done immediately after opening the port to avoid having incoming messages written to the queue instead of sent to the callback function.

Private Attributes

- midi_queue m_queue
- midi_message m_message
- midibyte m_ignore_flags
- bool m_do_input
- bool m_first_message
- void ∗ m_api_data
- bool m_using_callback
- rtmidi_callback_t m_user_callback
- void ∗ m_user_data
- bool m_continue_sysex

10.79.1 Detailed Description

Used to be nested in the rtmidi_in class.

10.79.2 Constructor & Destructor Documentation

10.79.2.1 rtmidi_in_data()

```
seq64::rtmidi_in_data::rtmidi_in_data ( )
```

10.79.3 Member Function Documentation

10.79.3.1 queue() [1/2]

```
const midi_queue& seq64::rtmidi_in_data::queue ( ) const  [inline]
```

10.79.3.2 queue() [2/2]

```
midi_queue& seq64::rtmidi_in_data::queue ( )  [inline]
```

10.79.3.3 message() [1/2]

```
const midi_message& seq64::rtmidi_in_data::message ( ) const  [inline]
```

10.79.3.4 message() [2/2]

```
midi_message& seq64::rtmidi_in_data::message ( )  [inline]
```

10.79.3.5 ignore_flags() [1/2]

```
midibyte seq64::rtmidi_in_data::ignore_flags ( ) const  [inline]
```

10.79.3.6 test_ignore_flags()

```
bool seq64::rtmidi_in_data::test_ignore_flags (
             midibyte testbits )  [inline]
```

10.79.3.7 ignore_flags() [2/2]

```
void seq64::rtmidi_in_data::ignore_flags (
             midibyte setbits )  [inline]
```

10.79.3.8 do_input() [1/2]

```
bool seq64::rtmidi_in_data::do_input ( ) const  [inline]
```

10.79.3.9 do_input() [2/2]

```
void seq64::rtmidi_in_data::do_input (
             bool flag )  [inline]
```

10.79.3.10 first_message() [1/2]

```
bool seq64::rtmidi_in_data::first_message ( ) const  [inline]
```

10.79.3.11 first_message() [2/2]

```
void seq64::rtmidi_in_data::first_message (
             bool flag )  [inline]
```

10.79.3.12 continue_sysex() [1/2]

```
bool seq64::rtmidi_in_data::continue_sysex ( ) const  [inline]
```

10.79.3.13 continue_sysex() [2/2]

```
void seq64::rtmidi_in_data::continue_sysex (
             bool flag )  [inline]
```

10.79.3.14 using_callback() [1/2]

```
bool seq64::rtmidi_in_data::using_callback ( ) const  [inline]
```

10.79.3.15 using_callback() [2/2]

```
void seq64::rtmidi_in_data::using_callback (
            bool flag ) [inline]
```

10.79.3.16 api_data() [1/3]

```
const void* seq64::rtmidi_in_data::api_data ( ) const [inline]
```

10.79.3.17 api_data() [2/3]

```
void* seq64::rtmidi_in_data::api_data ( ) [inline]
```

10.79.3.18 api_data() [3/3]

```
void seq64::rtmidi_in_data::api_data (
            void * dataptr ) [inline]
```

10.79.3.19 user_data() [1/3]

```
const void* seq64::rtmidi_in_data::user_data ( ) const [inline]
```

10.79.3.20 user_data() [2/3]

```
void* seq64::rtmidi_in_data::user_data ( ) [inline]
```

10.79.3.21 user_data() [3/3]

```
void seq64::rtmidi_in_data::user_data (
            void * dataptr ) [inline]
```

10.79.3.22 user_callback() [1/2]

```
rtmidi_callback_t seq64::rtmidi_in_data::user_callback ( ) const  [inline]
```

10.79.3.23 user_callback() [2/2]

```
void seq64::rtmidi_in_data::user_callback (
             rtmidi_callback_t cbptr )  [inline]
```

10.79.4 Field Documentation

10.79.4.1 m_queue

```
midi_queue seq64::rtmidi_in_data::m_queue  [private]
```

10.79.4.2 m_message

```
midi_message seq64::rtmidi_in_data::m_message  [private]
```

10.79.4.3 m_ignore_flags

```
midibyte seq64::rtmidi_in_data::m_ignore_flags  [private]
```

10.79.4.4 m_do_input

```
bool seq64::rtmidi_in_data::m_do_input  [private]
```

10.79.4.5 m_first_message

```
bool seq64::rtmidi_in_data::m_first_message  [private]
```

10.79.4.6 m_api_data

```
void* seq64::rtmidi_in_data::m_api_data  [private]
```

10.79.4.7 m_using_callback

```
bool seq64::rtmidi_in_data::m_using_callback  [private]
```

10.79.4.8 m_user_callback

```
rtmidi_callback_t seq64::rtmidi_in_data::m_user_callback  [private]
```

10.79.4.9 m_user_data

```
void* seq64::rtmidi_in_data::m_user_data  [private]
```

10.79.4.10 m_continue_sysex

```
bool seq64::rtmidi_in_data::m_continue_sysex  [private]
```

10.80 seq64::rtmidi_info Class Reference

A class for enumerating MIDI clients and ports.

Public Member Functions

- rtmidi_info (rtmidi_api api=RTMIDI_API_UNSPECIFIED, const std::string &appname="rtmidiapp", int ppqn=SEQ64_DEFAULT_PPQN, midibpm bpm=SEQ64_DEFAULT_BPM)
- virtual ∼rtmidi_info ()
- bool midi_mode () const

  Sets the input or output mode for getting data.
- void midi_mode (bool flag)

  Sets the input or output mode for getting data.
- void clear ()

  Clear the MIDI port container.
- void add_input (const midibus ∗m)

  Add midibus information to the input ports.
- void add_output (const midibus ∗m)

  Add midibus information to the output ports.
- void add_bus (const midibus ∗m)

  Adds the bus to a list of busses to be connected by the API at the right time (currently applies only to JACK).
- int get_bus_id (int index) const

  Gets the buss/client ID for a MIDI interfaces.
- std::string get_bus_name (int index) const
- int get_port_count () const
- int full_port_count () const
- int get_port_id (int index) const
- std::string get_port_name (int index) const
- bool get_input (int index) const
- bool get_virtual (int index) const
- bool get_system (int index) const
- int get_all_port_info ()
- int queue_number (int index) const
- const std::string & app_name () const
- int global_queue () const
- int ppqn () const
- void api_set_ppqn (int p)
- midibpm bpm () const
- void api_set_beats_per_minute (midibpm b)
- void api_port_start (mastermidibus &masterbus, int bus, int port)
- bool api_get_midi_event (event ∗inev)
- void api_flush ()
- int api_poll_for_midi ()
- std::string port_list () const

  Returns a list of all the ports as an ASCII string.
- const midi_info ∗ get_api_info () const

  'Getter' function for member m_info_api const version
- midi_info ∗ get_api_info ()

  'Getter' function for member m_info_api non-const version

Static Public Member Functions

- static std::string get_version ()
- static void get_compiled_api (std::vector< rtmidi_api > &apis)
- static rtmidi_api & selected_api ()

  'Getter' function for member sm_selected_api

Protected Member Functions

- bool api_connect ()
- bool set_api_info (midi_info ∗ma)

  'Setter' function for member m_info_api This function also checks the pointer and returns false if it is not valid.
- void delete_api ()

  'Setter' function for member m_info_api
- bool openmidi_api (rtmidi_api api, const std::string &appname, int ppqn, midibpm bpm)

Static Protected Member Functions

- static void selected_api (const rtmidi_api &api)

  'Setter' function for member sm_selected_api

Private Attributes

- midi_info ∗ m_info_api

  Provides access to the selected API (currently only JACK or ALSA).

Static Private Attributes

- static rtmidi_api sm_selected_api

  To save repeated queries, we save this value.

Friends

- class mastermidibus
- class midibus
- class rtmidi_in
- class rtmidi_out

10.80.1 Detailed Description

New, but ripe for refactoring nonetheless.

10.80.2 Constructor & Destructor Documentation

10.80.2.1 rtmidi_info()

```
seq64::rtmidi_info::rtmidi_info (
            rtmidi_api api = RTMIDI_API_UNSPECIFIED,
            const std::string & appname = "rtmidiapp",
            int ppqn = SEQ64_DEFAULT_PPQN,
            midibpm bpm = SEQ64_DEFAULT_BPM )
```

10.80.2.2 ∼rtmidi_info()

```
virtual seq64::rtmidi_info::∼rtmidi_info ( ) [virtual]
```

10.80.3 Member Function Documentation

10.80.3.1 get_version()

```
static std::string seq64::rtmidi_info::get_version ( ) [static]
```

10.80.3.2 get_compiled_api()

```
static void seq64::rtmidi_info::get_compiled_api (
            std::vector< rtmidi_api > & apis ) [static]
```

10.80.3.3 midi_mode() [1/2]

```
bool seq64::rtmidi_info::midi_mode ( ) const [inline]
```

10.80.3.4 midi_mode() [2/2]

```
void seq64::rtmidi_info::midi_mode (
            bool flag ) [inline]
```

10.80.3.5 clear()

```
void seq64::rtmidi_info::clear ( ) [inline]
```

10.80.3.6 add_input()

```
void seq64::rtmidi_info::add_input (
            const midibus * m ) [inline]
```

Also adds the midibus to a lit of busses to connect in mastermidibus. This function is meant for virtual ports.

10.80.3.7 add_output()

```
void seq64::rtmidi_info::add_output (
            const midibus * m )  [inline]
```

Also adds the midibus to a lit of busses to connect in mastermidibus. This function is meant for virtual ports.

10.80.3.8 add_bus()

```
void seq64::rtmidi_info::add_bus (
            const midibus * m )  [inline]
```

See the calls to this function in mastermidibus.

10.80.3.9 get_bus_id()

```
int seq64::rtmidi_info::get_bus_id (
            int index ) const  [inline]
```

This is the left-hand side of a X:Y pair (such as 128:0).

This function is a new part of the RtMidi interface.

Parameters

index	The ordinal index of the desired interface to look up.

Returns

Returns the buss/client value as provided by the selected API.

10.80.3.10 get_bus_name()

```
std::string seq64::rtmidi_info::get_bus_name (
            int index ) const  [inline]
```

10.80.3.11 get_port_count()

```
int seq64::rtmidi_info::get_port_count ( ) const  [inline]
```

10.80.3.12 full_port_count()

```
int seq64::rtmidi_info::full_port_count ( ) const  [inline]
```

10.80.3.13 get_port_id()

```
int seq64::rtmidi_info::get_port_id (
             int index ) const  [inline]
```

10.80.3.14 get_port_name()

```
std::string seq64::rtmidi_info::get_port_name (
             int index ) const  [inline]
```

10.80.3.15 get_input()

```
bool seq64::rtmidi_info::get_input (
             int index ) const  [inline]
```

10.80.3.16 get_virtual()

```
bool seq64::rtmidi_info::get_virtual (
             int index ) const  [inline]
```

10.80.3.17 get_system()

```
bool seq64::rtmidi_info::get_system (
             int index ) const  [inline]
```

10.80.3.18 get_all_port_info()

```
int seq64::rtmidi_info::get_all_port_info ( )  [inline]
```

10.80.3.19 queue_number()

```
int seq64::rtmidi_info::queue_number (
             int index ) const  [inline]
```

10.80.3.20 app_name()

```
const std::string& seq64::rtmidi_info::app_name ( ) const  [inline]
```

10.80.3.21 global_queue()

```
int seq64::rtmidi_info::global_queue ( ) const  [inline]
```

10.80.3.22 ppqn()

```
int seq64::rtmidi_info::ppqn ( ) const  [inline]
```

10.80.3.23 api_set_ppqn()

```
void seq64::rtmidi_info::api_set_ppqn (
             int p )  [inline]
```

10.80.3.24 bpm()

```
midibpm seq64::rtmidi_info::bpm ( ) const  [inline]
```

10.80.3.25 api_set_beats_per_minute()

```
void seq64::rtmidi_info::api_set_beats_per_minute (
             midibpm b )  [inline]
```

10.80.3.26 api_port_start()

```
void seq64::rtmidi_info::api_port_start (
            mastermidibus & masterbus,
            int bus,
            int port )  [inline]
```

10.80.3.27 api_get_midi_event()

```
bool seq64::rtmidi_info::api_get_midi_event (
            event * inev )  [inline]
```

10.80.3.28 api_flush()

```
void seq64::rtmidi_info::api_flush ( )  [inline]
```

10.80.3.29 api_poll_for_midi()

```
int seq64::rtmidi_info::api_poll_for_midi ( )  [inline]
```

10.80.3.30 port_list()

```
std::string seq64::rtmidi_info::port_list ( ) const  [inline]
```

10.80.3.31 selected_api() [1/2]

```
static rtmidi_api& seq64::rtmidi_info::selected_api ( )  [inline], [static]
```

10.80.3.32 get_api_info() [1/2]

```
const midi_info* seq64::rtmidi_info::get_api_info ( ) const  [inline]
```

10.80.3.33 get_api_info() [2/2]

```
midi_info* seq64::rtmidi_info::get_api_info ( )  [inline]
```

10.80.3.34 api_connect()

```
bool seq64::rtmidi_info::api_connect ( )  [inline], [protected]
```

10.80.3.35 selected_api() [2/2]

```
static void seq64::rtmidi_info::selected_api (
             const rtmidi_api & api )  [inline], [static], [protected]
```

10.80.3.36 set_api_info()

```
bool seq64::rtmidi_info::set_api_info (
             midi_info * ma )  [inline], [protected]
```

This feature is important to allow a missing API (e.g. the JACK server is not running) to be detected.

10.80.3.37 delete_api()

```
void seq64::rtmidi_info::delete_api ( )  [inline], [protected]
```

10.80.3.38 openmidi_api()

```
bool seq64::rtmidi_info::openmidi_api (
             rtmidi_api api,
             const std::string & appname,
             int ppqn,
             midibpm bpm )  [protected]
```

10.80.4 Friends And Related Function Documentation

10.80.4.1 mastermidibus

```
friend class mastermidibus  [friend]
```

10.80.4.2 midibus

```
friend class midibus  [friend]
```

10.80.4.3 rtmidi_in

```
friend class rtmidi_in  [friend]
```

10.80.4.4 rtmidi_out

```
friend class rtmidi_out  [friend]
```

10.80.5 Field Documentation

10.80.5.1 m_info_api

```
midi_info* seq64::rtmidi_info::m_info_api  [private]
```

10.80.5.2 sm_selected_api

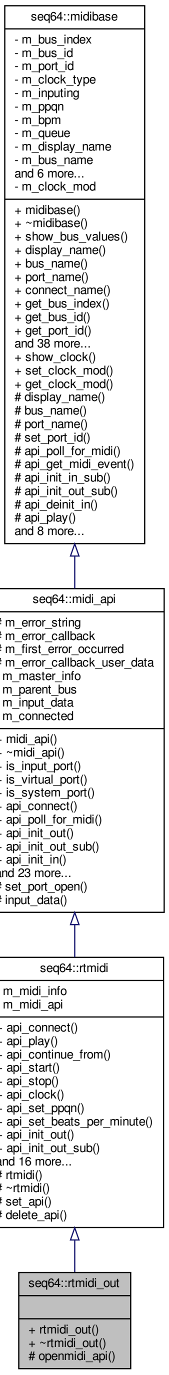
```
rtmidi_api seq64::rtmidi_info::sm_selected_api  [static], [private]
```

Its default value is RTMIDI_API_UNSPECIFIED.

10.81 seq64::rtmidi_out Class Reference

A realtime MIDI output class.

Inheritance diagram for seq64::rtmidi_out:



Public Member Functions

- rtmidi_out (midibus &parentbus, rtmidi_info &info)

- virtual ∼rtmidi_out ()

    The destructor closes any open MIDI connections.

Protected Member Functions

- void openmidi_api (rtmidi_api api, rtmidi_info &info)

Additional Inherited Members

10.81.1 Detailed Description

This class provides a common, platform-independent API for MIDI output. It allows one to probe available MIDI output ports, to connect to one such port, and to send MIDI bytes immediately over the connection. Create multiple instances of this class to connect to more than one MIDI device at the same time. With the OS-X, Linux ALSA and JACK MIDI APIs, it is also possible to open a virtual port to which other MIDI software clients can connect.

10.81.2 Constructor & Destructor Documentation

10.81.2.1 rtmidi_out()

```
seq64::rtmidi_out::rtmidi_out (
            midibus & parentbus,
            rtmidi_info & info )
```

10.81.2.2 ∼rtmidi_out()

```
virtual seq64::rtmidi_out::∼rtmidi_out ( )  [virtual]
```

10.81.3 Member Function Documentation

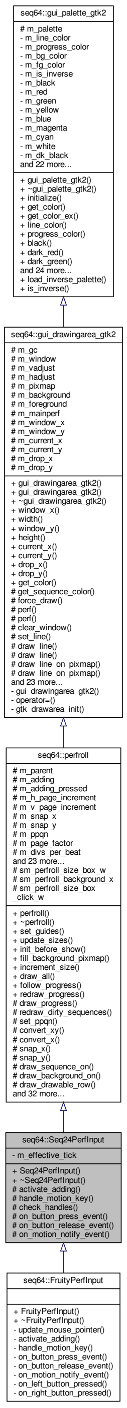
10.81.3.1 openmidi_api()

```
void seq64::rtmidi_out::openmidi_api (
            rtmidi_api api,
            rtmidi_info & info )  [protected]
```

10.82 seq64::Seq24PerfInput Class Reference

Implements the default (Seq24) performance input characteristics of this application.

Inheritance diagram for seq64::Seq24PerfInput:



Public Member Functions

- Seq24PerfInput (perform &perf, perfedit &parent, Gtk::Adjustment &hadjust, Gtk::Adjustment &vadjust, int ppqn=SEQ64_USE_DEFAULT_PPQN)

Principal constructor.
- ∼Seq24PerfInput ()

  virtual destructor

Protected Member Functions

- virtual void activate_adding (bool a_adding)

  Turns on/off the mode of adding triggers to the song performance.
- virtual bool handle_motion_key (bool is_left)

  Handles the keystroke motion-notify event for moving a pattern back and forth in the performance.
- bool check_handles ()

  Pulled this function out to simplify the on-button-press callback.
- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Initial unselection:
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Handles various button-release events.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Handles the normal motion-notify event.

Private Attributes

- midipulse m_effective_tick

  The current tick for the current segment?

Additional Inherited Members

10.82.1 Constructor & Destructor Documentation

10.82.1.1 Seq24PerfInput()

```
seq64::Seq24PerfInput::Seq24PerfInput (
             perform & p,
             perfedit & parent,
             Gtk::Adjustment & hadjust,
             Gtk::Adjustment & vadjust,
             int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

Parameters

p	The perform object that this class will affect via user interaction.
parent	The perfedit object that holds this user-interface class.
hadjust	A horizontal adjustment object, passed along to the perfroll class.
vadjust	A vertical adjustment object, passed along to the perfroll class.
ppqn	The "resolution" of the MIDI file, used in zooming and scaling.

10.82.1.2 ∼Seq24PerfInput()

```
seq64::Seq24PerfInput::∼Seq24PerfInput ( )  [inline]
```

10.82.2 Member Function Documentation

10.82.2.1 activate_adding()

```
void seq64::Seq24PerfInput::activate_adding (
             bool adding )  [protected], [virtual]
```

Changes both the flag and the mouse cursor icon.

Parameters

adding	Indicates the adding-triggers state to be set.

Implements seq64::perfroll.

Reimplemented in seq64::FruityPerfInput.

10.82.2.2 handle_motion_key()

```
bool seq64::Seq24PerfInput::handle_motion_key (
             bool is_left )  [protected], [virtual]
```

What happens when the mouse is used to drag the pattern is that, first, m_drop_tick is set by left-clicking into the pattern to select it. As the pattern is dragged, the drop-tick value does not change, but the tick (converted from the moving x value) does.

Then the button-handler sets m_moving = true, and calculates m_drop_tick_offset = m_drop_tick - (drop sequence)->selected_trigger_start(). The motion handler sees that m_moving is true, gets the new tick value from the new x value, offsets it, and calls (drop sequence)->move_triggers(tick, true). When the user releases the left button, then m_growing is turned off and the roll draw_all()'s.

Parameters

is_left	False denotes the right arrow key, and true denotes the left arrow key.

Returns

Returns true if there was some action able to happen that would necessitate a window update. We've updated triggers::move_triggers() [called indirectly near the end of this routine] to return false if no more movement could be made. This prevents this routine from moving way ahead after movement of the selected (in the user-interface) trigger stops.

Implements seq64::perfroll.

Reimplemented in seq64::FruityPerfInput.

10.82.2.3 check_handles()

```
bool seq64::Seq24PerfInput::check_handles ( )  [protected]
```

Set this flag to tell on_motion_notify_event() to call perf().push_trigger_undo(). This section handles motions of the held mouse that grow or shrink the selected trigger, or else the moving of the selected trigger.

wscalex is 4 $*$ 32 ticks/pixel. What about zoom? See perfroll; it sets m_perf_scale_x and m_zoom to c_perf_↩ scale_x. Let's use m_perf_scale_x instead and make it a memmber, m_w_scale_x. This section is almost common code with the fruityperfrol_input.cpp module.

Check for a corner drag (on the small box at the left of the trigger segment) to "grow" the sequence start. Otherwise, check for a corner drag (on the small box at the right of the sequence) to "grow" the sequence end. Otherwise, we are moving the sequence.

Returns

Returns true if the mouse pointer is inside a trigger handle.

10.82.2.4 on_button_press_event()

```
bool seq64::Seq24PerfInput::on_button_press_event (
             GdkEventButton * ev )  [protected], [virtual]
```

This code causes the un-greying of the previously selected trigger segment. If commented out, then we can seemingly select more than one trigger segment, but only the last one "selected" can be moved. We'd like to be able to select and move a bunch at once by holding a modifier key.

convert_drop_xy():

```
convert_drop_xy() uses m_drop_x and m_drop_y, and sets m_drop_tick and
m_drop_sequence.  It gets the sequence number of the pattern clicked.
It doesn't matter which button was clicked.
```

is_adding():

```
The is_adding() status is set on a right-click with no trigger under the
mouse, and unset when the right-click is released.
```

Ctrl key:

```
Note the is_ctrl_key() test.  We make better use of the Ctrl key here.
Let Ctrl-left be handled exactly like the middle click (split the
segment/trigger), then bug out.  Middle click in seq24 mouse mode is
either for splitting the triggers or for setting the paste location of
copy/paste.  The "a_or_b_trigger()" functions check the trigger status
of the sequence to decide what to do, so that the caller doesn't have to
do those checks.
```

Shift key:

```
TODO.
```

No modifier key:

```
Add a new sequence if nothing is selected.  The adding flag is set on a
right-click where there is no trigger under the mouse, and is unset when
the right-click is released [if not in allow_mod4_mode()].
```

Mouse buttons:

```
The middle click in seq24 interaction mode is either for splitting the
triggers or for setting the paste location of copy/paste.
```

Stazed:

```
 m_drop_y will be adjusted by perfroll::change_vert() for any scroll
 after it was originally selected. The call here to draw_drawable_row()
 [now folded into draw_all()] will have the wrong y location and
 un-select will not occur (or the wrong sequence will be unselected) if
 the user scrolls the track up or down to a new y location, if not
 adjusted.
```

Box set selection:

```
 This new setup is meant to support selecting multiple sequences in the
 perfroll, and later to support Kepler34's box-selection of multiple
 sequences for movement.  Here are the rules we want to implement:

 -   Nothing selected.
     -   Outside a trigger segment (determined by the "intersect"
         function.)
     -   Inside a trigger segment.
 -   Click or Shift-Click with nothing already selected will select the
     current drop sequence and add it to the set.
 -   Click with at least one *other* sequence selected will unselect
     the others and select the current sequence.
 -   Click or Shift-Click outside a sequence will unselect them all.
 -   Shift-Click will leave the other selected sequences alone and add
     the current drop sequence.
```

Returns

Returns true if a modification occurred, necessitating a redraw.

Reimplemented from seq64::perfroll.

Reimplemented in seq64::FruityPerfInput.

10.82.2.5 on_button_release_event()

```
bool seq64::Seq24PerfInput::on_button_release_event (
             GdkEventButton * ev )  [protected], [virtual]
```

Any use for the middle-button or ctrl-left-click we can add?

Parameters

ev	The button event to be handles as a button-release.

Returns

Returns true if any modification occurred.

Reimplemented from seq64::perfroll.

Reimplemented in seq64::FruityPerfInput.

10.82.2.6 on_motion_notify_event()

```
bool seq64::Seq24PerfInput::on_motion_notify_event (
             GdkEventMotion * ev )  [protected], [virtual]
```

We now check to see if it is a drag-motion (left/middle/right-click-drag) to avoid flickering when just moving the mouse across the surface.

Parameters

ev	Provides a pointer to the motion event.

Returns

Returns true if a modification occurs. This function used to always return true.

Reimplemented from seq64::perfroll.

Reimplemented in seq64::FruityPerfInput.

10.82.3 Field Documentation

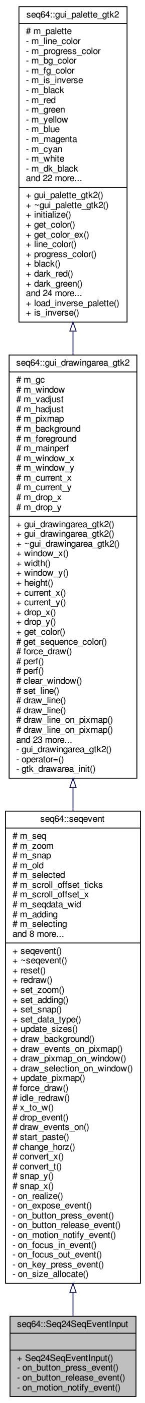
10.82.3.1 m_effective_tick

```
midipulse seq64::Seq24PerfInput::m_effective_tick  [private]
```

10.83 seq64::Seq24SeqEventInput Class Reference

This structure implement the normal interaction methods for Seq24.

Inheritance diagram for seq64::Seq24SeqEventInput:


seq64::gui_palette_gtk2
seq64::gui_drawingarea_gtk2
seq64::seqevent
seq64::Seq24SeqEventInput
+ Seq24SeqEventInput()
- on_button_press_event()
- on_button_release_event()
- on_motion_notify_event()

Public Member Functions

- Seq24SeqEventInput (perform &p, sequence &seq, int zoom, int snap, seqdata &seqdata_wid, Gtk::↩ Adjustment &hadjust,)

Private Member Functions

- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Implements the on-button-press event callback.
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Implements the on-button-release callback.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Implements the on-motion-notify event.

Additional Inherited Members

10.83.1 Constructor & Destructor Documentation

10.83.1.1 Seq24SeqEventInput()

```
seq64::Seq24SeqEventInput::Seq24SeqEventInput (
            perform & p,
            sequence & seq,
            int zoom,
            int snap,
            seqdata & seqdata_wid,
            Gtk::Adjustment & hadjust )
```

10.83.2 Member Function Documentation

10.83.2.1 on_button_press_event()

```
bool seq64::Seq24SeqEventInput::on_button_press_event (
            GdkEventButton * ev ) [private], [virtual]
```

Set values for dragging, then reset the box that holds dirty redraw spot. Then do the rest.

Parameters

ev	The button event for the press of a mouse button.

Returns

Returns true if a likely modification was made. This function used to return true all the time.

Reimplemented from seq64::seqevent.

10.83.2.2 on_button_release_event()

```
bool seq64::Seq24SeqEventInput::on_button_release_event (
            GdkEventButton * ev )  [private], [virtual]
```

Parameters

ev	The button event for the release of a mouse button.

Returns

Returns true if a likely modification was made. This function used to return true all the time.

Reimplemented from seq64::seqevent.

10.83.2.3 on_motion_notify_event()

```
bool seq64::Seq24SeqEventInput::on_motion_notify_event (
            GdkEventMotion * ev )  [private], [virtual]
```

Parameters

ev	The button event for the motion of the mouse cursor.

Returns

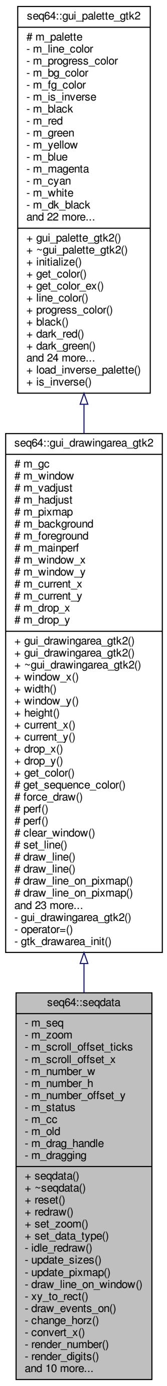
Returns true if a likely modification was made. This function used to return true all the time.

Reimplemented from seq64::seqevent.

10.84 seq64::seqdata Class Reference

This class supports drawing piano-roll eventis on a window.

Inheritance diagram for seq64::seqdata:



Public Member Functions

- seqdata (sequence &seq, perform &p, int zoom, Gtk::Adjustment &hadjust)

  Principal constructor.
- virtual ∼seqdata ()

  Let's provide a do-nothing virtual destructor.
- void reset ()

This function calls update_size().
- void redraw ()

  Calls change_horz() to update the pixmap and queue 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 (midibyte status, midibyte control)

  Sets the status to the given value, and the control to the optional given value, which defaults to 0, then calls redraw().

Private Member Functions

- int idle_redraw ()

  Draws events on this object's built-in window and pixmap.
- 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 the data window.
- void xy_to_rect (int x1, int y1, int x2, int y2, int &rx, int &ry, int &rw, int &rh)

  This function takes two points, and returns an XWin rectangle, returned via the last four parameters.
- void draw_events_on (Glib::RefPtr< Gdk::Drawable > drawable)

  Draws events on the given drawable object.
- void change_horz ()

  Change the scrolling offset on the x-axis, and redraw.
- void convert_x (int x, midipulse &tick)

  This function takes screen coordinates, and gives the horizontaol tick value based on the current zoom, returned via the second parameter.
- void render_number (Glib::RefPtr< Gdk::Pixmap > &pixmap, int x, int y, const char ∗const num)

  Convenience function for rendering numbers.
- void render_digits (Glib::RefPtr< Gdk::Drawable > drawable, int digits, int x)

  Renders an up to 3-digit string vertically to represent a data value.
- 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 ∗ev)

  Implements the on-expose event by calling draw_drawable() on the event.
- bool on_button_press_event (GdkEventButton ∗ev)

  Implements a mouse button-press event.
- bool on_button_release_event (GdkEventButton ∗ev)

  Implement a button-release event.
- bool on_motion_notify_event (GdkEventMotion ∗ev)

  Handles a motion-notify event.
- bool on_leave_notify_event (GdkEventCrossing ∗ev)

  Handles an on-leave notification event.
- bool on_scroll_event (GdkEventScroll ∗ev)

  Implements the on-scroll event.
- void on_size_allocate (Gtk::Allocation &)

  Handles a size-allocation event by updating m_window_x and m_window_y, and then updating all of the sizes of the data pane in update_sizes().

Private Attributes

- sequence & m_seq

  Points to the sequence whose data is being affected by this class.
- int m_zoom

  Sets the zoom value for this part of the sequence editor, one pixel == m_zoom ticks, i.e.
- int m_scroll_offset_ticks

  The value of the leftmost tick in the data pane.
- int m_scroll_offset_x

  The value of the leftmost pixel in the data pane.
- int m_number_w

  The adjusted width of a digit in a data number.
- int m_number_h

  The adjusted height of all digits in a data number.
- int m_number_offset_y

  A new value to make it easier to adapt the vertical number drawing of a data item's numeric value to a different font.
- midibyte m_status

  Holds the status byte of the next event in the sequence, and indicates What the data window is currently editing or drawing.
- midibyte m_cc

  Holds the MIDI CC byte of the next event in the sequence, and indicates What the data window is currently editing or drawing.
- GdkRectangle m_old

  This rectangle is used in blanking out a data line in draw_line_on_window().
- bool m_drag_handle
- bool m_dragging

  This value is true if the mouse is being dragged in the data pane, which is done in order to change the height and value of each data line.

Friends

- class lfownd
- class seqevent
- class seqroll

Additional Inherited Members

10.84.1 Constructor & Destructor Documentation

10.84.1.1 seqdata()

```
seq64::seqdata::seqdata (
            sequence & seq,
            perform & p,
            int zoom,
            Gtk::Adjustment & hadjust )
```

In the constructor one can only allocate colors, get_window() returns 0 because this pane has not yet been realized.

Parameters

seq	The sequence that is being displayed and edited by this data pane.
p	The performance object that oversees all of the sequences. This object is needed here only to access the perform::modify() function.
zoom	The starting zoom of this pane.
hadjust	The horizontal adjustment object provided by the parent class, seqedit, that created this pane.

10.84.1.2 ∼seqdata()

```
virtual seq64::seqdata::∼seqdata ( )  [inline], [virtual]
```

10.84.2 Member Function Documentation

10.84.2.1 reset()

```
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.

10.84.2.2 redraw()

```
void seq64::seqdata::redraw ( )  [inline]
```

10.84.2.3 set_zoom()

```
void seq64::seqdata::set_zoom (
             int z )
```

Called by seqedit::set_zoom(), which validates the zoom value.

Parameters

z	The desired zoom value, assumed to be validated already. See the seqedit::set_zoom() function.

10.84.2.4 set_data_type()

```
void seq64::seqdata::set_data_type (
            midibyte status,
            midibyte control )
```

Perhaps we should check that at least one of the parameters causes a change.

Parameters

status	The MIDI event byte (status byte) to set.
control	The MIDI CC value to set.

10.84.2.5 idle_redraw()

```
int seq64::seqdata::idle_redraw ( )  [private]
```

This drawing is done only if there is no dragging in progress, to guarantee no flicker.

10.84.2.6 update_sizes()

```
void seq64::seqdata::update_sizes ( )  [private]
```

It creates a pixmap with window dimensions given by m_window_x and m_window_y.

We thought there was a potential memory leak, since m_pixmap is created every time the window is resized, but valgrind says otherwise... maybe. An awful lot of Gtk leaks!

10.84.2.7 update_pixmap()

```
void seq64::seqdata::update_pixmap ( )  [private]
```

10.84.2.8 draw_line_on_window()

```
void seq64::seqdata::draw_line_on_window ( )  [private]
```

10.84.2.9 xy_to_rect()

```
void seq64::seqdata::xy_to_rect (
            int x1,
            int y1,
            int x2,
            int y2,
            int & rx,
            int & ry,
            int & rw,
            int & rh )  [private]
```

It checks the mins/maxes, then fills in x, y, and width, height.

Parameters

	x1	The input x value for the first data point.
	y1	The input y value for the first data point.
	x2	The input x value for the second data point.
	y2	The input y value for the second data point.
out	*rx*	The output for the x value of the XWin rectangle.
out	*ry*	The output for the y value of the XWin rectangle.
out	*rw*	The output for the width value of the XWin rectangle.
out	*rh*	The output for the height of the XWin rectangle.

10.84.2.10 draw_events_on()

```
void seq64::seqdata::draw_events_on (
             Glib::RefPtr< Gdk::Drawable > drawable )  [private]
```

Very similar to seqevent :: draw_events_on(). And yet it doesn't handle zooming as well, must fix!

Stazed:

```
For Note On there can be multiple events on the same vertical in which
the selected item can be covered.  For Note On the selected item
needs to be drawn last so it can be seen.  So, for other events the
variable num_selected_events will be -1 for ALL_EVENTS. For Note On
only, the variable will be the number of selected events. If 0 then
only one pass is needed. If > 0 then two passes are needed, one for
unselected (first), and one for selected (last).  For the first pass,
if any events are selected, the selection type is EVENTS_UNSELECTED.
For the second pass, it will be set to num_selected_events.
```

We now draw the data line for selected event in dark orange, instead of black. We're not likely to adopt the Stazed convention of drawing in blue. Also, there seem to be some bugs in how the data selection works. Needs more evaluation.

Also, if we decide to draw handle on each vertical data line, it would look nicer if a circle.

Parameters

drawable	The given drawable object.

10.84.2.11 change_horz()

```
void seq64::seqdata::change_horz ( )  [private]
```

Basically identical to seqevent::change_horz().

10.84.2.12 convert_x()

```
void seq64::seqdata::convert_x (
             int x,
             midipulse & tick )  [inline], [private]
```

10.84.2.13 render_number()

```
void seq64::seqdata::render_number (
             Glib::RefPtr< Gdk::Pixmap > & pixmap,
             int x,
             int y,
             const char *const num )  [inline], [private]
```

Parameters

pixmap	The reference pointer to the GDK pixmap onto which this number will be drawing.
x	The x-coordinate of the position of the text.
y	The y-coordinate of the position of the text.
num	The number to be rendered. This should be a string reference, but oh well.

10.84.2.14 render_digits()

```
void seq64::seqdata::render_digits (
             Glib::RefPtr< Gdk::Drawable > drawable,
             int digits,
             int x )  [private]
```

Parameters

drawable	Where to draw the digits.
digits	xxxxxx
x	xxxxxx

10.84.2.15 draw_events_on_pixmap()

```
void seq64::seqdata::draw_events_on_pixmap ( )  [inline], [private]
```

10.84.2.16 draw_pixmap_on_window()

```
void seq64::seqdata::draw_pixmap_on_window ( )  [inline], [private]
```

10.84.2.17 on_realize()

```
void seq64::seqdata::on_realize ( )  [private]
```

It also connects up the change_horz() function.

Note that this function creates a small pixmap for every possible y-value, where y ranges from 0 to MIDI_COUNT←_MAX-1 = 127. It then fills each pixmap with a numeric representation of that y value, up to three digits (left-padded with spaces).

10.84.2.18 on_expose_event()

```
bool seq64::seqdata::on_expose_event (
            GdkEventExpose * ev )  [private]
```

Parameters

ev	Provides the expose-event.

Returns

Always returns true.

10.84.2.19 on_button_press_event()

```
bool seq64::seqdata::on_button_press_event (
            GdkEventButton * ev )  [private]
```

This function pushes the undo information for the sequence, sets the drop-point, resets the box that holds dirty redraw spot, and sets m_dragging to true.

Parameters

ev	Provides the button-press event.

Returns

Always returns true.

10.84.2.20 on_button_release_event()

```
bool seq64::seqdata::on_button_release_event (
             GdkEventButton * ev )  [private]
```

Sets the current point. If m_dragging is true, then the sequence data is changed, the performance modification flag is set, and m_dragging is reset.

Parameters

ev	Provides the button-release event.

Returns

Returns true if a modification occurred, and in that case also sets the perform modification flag.

10.84.2.21 on_motion_notify_event()

```
bool seq64::seqdata::on_motion_notify_event (
             GdkEventMotion * ev )  [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.

Parameters

ev	The motion event.

Returns

Returns true if a change in event data occurred. If true, then the perform modification flag is set.

10.84.2.22 on_leave_notify_event()

```
bool seq64::seqdata::on_leave_notify_event (
             GdkEventCrossing * ev )  [private]
```

Parameter "p0", the crossing point for the event, is unused.

10.84.2.23 on_scroll_event()

```
bool seq64::seqdata::on_scroll_event (
             GdkEventScroll * ev )  [private]
```

This scroll event only handles basic scrolling, without any modifier keys such as the Ctrl of Shift masks. If there is a note (seqroll pane) or event (seqevent pane) selected, and mouse hovers over the data area (seqdata pane), then this scrolling action will increase or decrease the value of the data item, which lengthens of shortens the line drawn.

Todo DOCUMENT the seqdata scrolling behavior in the documentation projects.

Parameters

ev	Provides the scroll-event.

Returns

Always returns true.

10.84.2.24 on_size_allocate()

```
void seq64::seqdata::on_size_allocate (
             Gtk::Allocation & r )  [private]
```

Parameters

r	Provides the allocation event.

10.84.3 Friends And Related Function Documentation

10.84.3.1 lfownd

```
friend class lfownd  [friend]
```

10.84.3.2 seqevent

```
friend class seqevent  [friend]
```

10.84.3.3 seqroll

```
friend class seqroll  [friend]
```

10.84.4 Field Documentation

10.84.4.1 m_seq

```
sequence& seq64::seqdata::m_seq [private]
```

10.84.4.2 m_zoom

```
int seq64::seqdata::m_zoom [private]
```

the unit is ticks/pixel.

10.84.4.3 m_scroll_offset_ticks

```
int seq64::seqdata::m_scroll_offset_ticks [private]
```

Adjusted in the change_horz() function.

10.84.4.4 m_scroll_offset_x

```
int seq64::seqdata::m_scroll_offset_x [private]
```

Adjusted in the change_horz() function. It is the offset ticks divided by the zoom value, i.e. the unit is pixels..

10.84.4.5 m_number_w

```
int seq64::seqdata::m_number_w [private]
```

By "adjusted", well this is just a minor tweak for appearances.

10.84.4.6 m_number_h

```
int seq64::seqdata::m_number_h [private]
```

Basically, the character height times 3. By "adjusted", well this is just a minor tweak for appearances.

10.84.4.7 m_number_offset_y

```
int seq64::seqdata::m_number_offset_y [private]
```

This value was hardwired as 8, for a character height of 10.

10.84.4.8 m_status

```
midibyte seq64::seqdata::m_status [private]
```

10.84.4.9 m_cc

```
midibyte seq64::seqdata::m_cc  [private]
```

10.84.4.10 m_old

```
GdkRectangle seq64::seqdata::m_old  [private]
```

10.84.4.11 m_drag_handle

```
bool seq64::seqdata::m_drag_handle  [private]
```

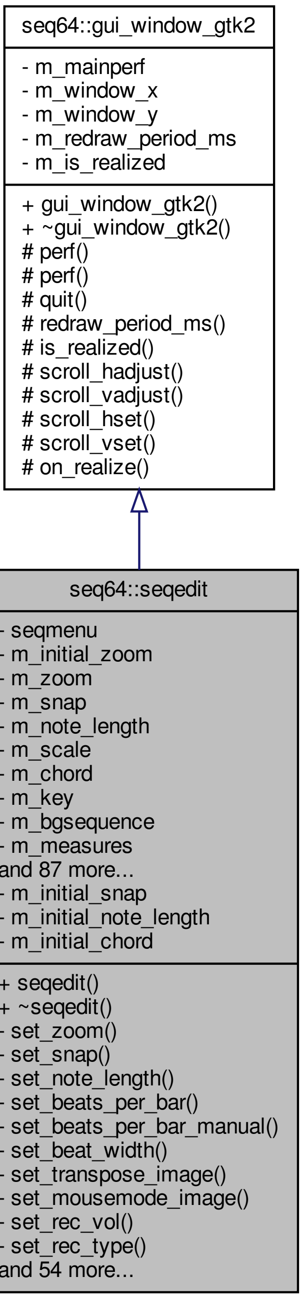
10.84.4.12 m_dragging

```
bool seq64::seqdata::m_dragging  [private]
```

10.85 seq64::seqedit Class Reference

Implements the Pattern Editor, which has references to:

Inheritance diagram for seq64::seqedit:



Public Member Functions

- seqedit (perform &perf, sequence &seq, int pos, int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.
- virtual ~seqedit ()

  A rote destructor.

Private Member Functions

- void set_zoom (int zoom)

    Selects the given zoom value.
- void set_snap (int snap)

    Selects the given snap value, which is the number of ticks in a snap-sized interval.
- void set_note_length (int note_length)

    Selects the given note-length value.
- void set_beats_per_bar (int bpm)

    Set the bpm (beats per measure) value, using the given parameter, and some internal values passed to apply_↵ length().
- void set_beats_per_bar_manual ()

    Set the bpm (beats per measure) value manually.
- void set_beat_width (int bw)

    Set the bw (beat width) value, using the given parameter, and some internal values passed to apply_length().
- void set_transpose_image (bool istransposable)

    Changes the image used for the transpose button.
- void set_mousemode_image (bool isfruity)

    Changes the image used for the mouse-mode indicator.
- void set_rec_vol (int recvol)

    Passes the given parameter to sequence::set_rec_vol().
- void set_rec_type (loop_record_t rectype)
- void horizontal_adjust (double step)

    This function provides optimization for the on_scroll_event() function.
- void vertical_adjust (double step)

    This function provides optimization for the on_scroll_event() function.
- void horizontal_set (double value)

    Sets the exact position of a horizontal scroll-bar.
- void vertical_set (double value)

    Sets the exact position of a vertical scroll-bar.
- int 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_measures (int lim)

    Set the measures value, using the given parameter, and some internal values passed to apply_length().
- void set_measures_manual ()

    Set the measures value manually.
- void apply_length (int bpb, int bw, int measures)

    Sets the sequence length based on the three given parameters.
- void set_midi_channel (int midichannel, bool user_change=false)

    Selects the given MIDI channel parameter in the main sequence object, so that it will use that channel.
- void set_midi_bus (int midibus, bool user_change=false)

    Selects the given MIDI buss parameter in the main sequence object, so that it will use that buss.
- void set_scale (int scale)

    Selects the given scale value.
- void set_chord (int chord)
- void set_key (int note)

    Selects the given key (signature) value.
- void set_background_sequence (int seq)

    Draws the given background sequence on the Pattern editor so that the musician has something to see that can be played against.
- void transpose_change_callback ()

Passes the transpose status to the sequence object.

- void name_change_callback ()

  Set the name for the main sequence to this object's entry name.
- void follow_change_callback ()

  Passes the Follow status to the seqroll object.
- 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 tells the segroll, seqtime, seqdata, and seqevent objects to redraw.
- void redo_callback ()

  Pops a redo operation from the sequence object, and then tell the segroll, seqtime, seqdata, and seqevent objects to redraw.
- void update_all_windows ()
- 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 set_data_type (midibyte status, midibyte control=0)

  Sets the data type based on the given parameters.
- void set_event_entry (Gtk::Menu ∗menu, const std::string &text, bool present, midibyte status, midibyte control=0)

  Function to create event menu entries.
- void popup_menu (Gtk::Menu ∗menu)

  Pops up the given pop-up menu.
- void popup_event_menu ()

  Populates the event-selection menu, in necessary, and then pops it up.
- void repopulate_event_menu (int buss, int channel)

  Populates the event-selection menu that drops from the "Event" button in the bottom row of the Pattern editor.
- void popup_mini_event_menu ()

  Populates the event-selection menu, in necessary, and then pops it up.
- void repopulate_mini_event_menu (int buss, int channel)

  Populates the mini event-selection menu that drops from the mini-"Event" button in the bottom row of the Pattern editor.
- void popup_record_menu ()
- 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, if necessary, and then reveals the menu to the user.
- void repopulate_midich_menu (int buss)

Populates the MIDI Channel pop-up menu.
- Gtk::Image ∗ create_menu_image (bool state=false)

  Sets the menu 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 action, int var)

  Implements the actions brought forth from the Tools (hammer) button.
- void mouse_action (mouse_action_e action)
- void start_playing ()
- void stop_playing ()
- void change_focus (bool set_it=true)

  Changes what perform and mainwid see as the "current sequence".
- void handle_close ()

  Handles closing the sequence editor.
- void on_realize ()

  On realization, calls the base-class version, and connects the redraw timeout signal, timed at redraw_period_ms().
- void on_set_focus (Widget ∗focus)

  On receiving focus, attempt to tell mainwid that this sequence is now the current sequence.
- 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_delete_event (GdkEventAny ∗event)

  Handles an on-delete event.
- bool on_scroll_event (GdkEventScroll ∗ev)

  Handles an on-scroll event.
- bool on_key_press_event (GdkEventKey ∗ev)

  Handles a key-press event.

Private Attributes

- friend seqmenu
- const int m_initial_zoom

  Provides the initial zoom, used for restoring the original zoom using the 0 key.
- int m_zoom

  Provides the zoom values: 1 2 3 4, and 1, 2, 4, 8, 16.
- int m_snap

  Used in setting the snap-to value in pulses, off = 1.
- int m_note_length

  The default length of a note to be inserted by a right-left-click operation.
- int m_scale

  Setting for the music scale, can now be saved with the sequence.
- int m_chord

  Setting for the current chord generation; not now saved with the sequence.
- int m_key

  Setting for the music key, can now be saved with the sequence.
- int m_bgsequence

  Setting for the background sequence, can now be saved with the sequence.
- long m_measures

Provides the length of the sequence in measures.
- int m_ppqn

  Holds a copy of the current PPQN for the sequence (and the entire MIDI file).
- int m_pp_whole
- int m_pp_eighth
- int m_pp_sixteenth
- sequence & m_seq

  Holds a reference to the sequence that this window represents.
- Gtk::MenuBar ∗ m_menubar

  A number of user-interface objects for common.
- Gtk::Menu ∗ m_menu_tools

  The "hammer" tool button menu.
- Gtk::Menu ∗ m_menu_zoom

  Magnifying glass zoom menu.
- Gtk::Menu ∗ m_menu_snap

  Two-arrows grid-snap menu.
- Gtk::Menu ∗ m_menu_note_length

  Notes menu for note length.
- Gtk::Menu ∗ m_menu_length

  Pattern-length "bars" menu.
- Gtk::ToggleButton ∗ m_toggle_transpose

  Transpose toggle button.
- Gtk::Image ∗ m_image_transpose

  Image for transpose button.
- Gtk::Menu ∗ m_menu_midich

  MIDI channel DIN menu button.
- Gtk::Menu ∗ m_menu_midibus

  MIDI output buss menu button.
- Gtk::Menu ∗ m_menu_data

  "Event" button to select data.
- Gtk::Menu ∗ m_menu_minidata

  Mini button for actual events.
- Gtk::Menu ∗ m_menu_key

  "Music key" menu button.
- Gtk::Menu ∗ m_menu_scale

  "Music scale" menu button.
- Gtk::Menu ∗ m_menu_chords

  "Chords" menu button.
- Gtk::Menu ∗ m_menu_sequences

  "Background sequence" button.
- Gtk::Menu ∗ m_menu_bpm

  Beats/measure numerator menu.
- Gtk::Menu ∗ m_menu_bw

  Beat-width denominator menu.
- Gtk::Menu ∗ m_menu_rec_vol

  Recording level "Vol" button.
- Gtk::Menu ∗ m_menu_rec_type

  Recording type menu.
- Gtk::Adjustment ∗ m_vadjust

  Scrollbar and adjustment objects for horizontal and vertical panning.
- Gtk::Adjustment ∗ m_hadjust

Horizontal motion scratchpad.

- Gtk::VScrollbar ∗ m_vscroll_new

  Main vertical scroll-bar.
- Gtk::HScrollbar ∗ m_hscroll_new

  Main horizontal scroll-bar.
- seqkeys ∗ m_seqkeys_wid

  Handles the piano-keys part of the pattern-editor user-interface.
- seqtime ∗ m_seqtime_wid

  Handles the time-line (bar or measures) part of the pattern-editor user-interface.
- seqdata ∗ m_seqdata_wid

  Handles the event-data part of the pattern-editor user-interface.
- seqevent ∗ m_seqevent_wid

  Handles the small event part of the pattern-editor user-interface, where events can be moved and added.
- seqroll ∗ m_seqroll_wid

  Handles the piano-roll part of the pattern-editor user-interface.
- Gtk::Button ∗ m_button_lfo

  The LFO button in the pattern editor.
- lfownd ∗ m_lfo_wnd

  The LFO window object used by the pattern editor.
- Gtk::Table ∗ m_table

  More user-interface elements.
- Gtk::VBox ∗ m_vbox

  Layout box for 3 h-boxes.
- Gtk::HBox ∗ m_hbox

  Topmost menu/text dialog row.
- Gtk::HBox ∗ m_hbox2

  Second row of buttons.
- Gtk::Button ∗ m_button_undo

  Undo-edit button.
- Gtk::Button ∗ m_button_redo

  Redo-edit button.
- Gtk::Button ∗ m_button_quantize

  Quantize-pattern button.
- Gtk::Button ∗ m_button_tools

  Button for the Tools menu.
- Gtk::Button ∗ m_button_sequence

  Button for Background pattern.
- Gtk::Entry ∗ m_entry_sequence

  Text for background pattern.
- Gtk::Button ∗ m_button_bus

  Button for MIDI Buss menu.
- Gtk::Entry ∗ m_entry_bus

  Text showing MIDI Buss name.
- Gtk::Button ∗ m_button_channel

  Button for the MIDI Channel.
- Gtk::Entry ∗ m_entry_channel

  Text for the MIDI Channel.
- Gtk::Button ∗ m_button_snap

  Button for the Grid-snap menu.
- Gtk::Entry ∗ m_entry_snap

  Text for selected Grid-snap.

- Gtk::Button ∗ m_button_note_length

  Button for Note-length menu.
- Gtk::Entry ∗ m_entry_note_length

  Text showing the Note-length.
- Gtk::Button ∗ m_button_zoom

  Button for the Zoom menu.
- Gtk::Entry ∗ m_entry_zoom

  Text for the selected Zoom.
- Gtk::Button ∗ m_button_length

  Button for pattern-length.
- Gtk::Entry ∗ m_entry_length

  Text for the pattern-length.
- Gtk::Button ∗ m_button_key

  Button for the Music Key.
- Gtk::Entry ∗ m_entry_key

  Text for selected Music Key.
- Gtk::Button ∗ m_button_scale

  Button for the Music Scale.
- Gtk::Entry ∗ m_entry_scale

  Text for the Music Scale.
- Gtk::Button ∗ m_button_chord

  Button for the current Chord.
- Gtk::Entry ∗ m_entry_chord

  Text for the current Chord.
- Gtk::Tooltips ∗ m_tooltips

  Tooltip collector for dialog.
- Gtk::Button ∗ m_button_data

  Button for Event (data) menu.
- Gtk::Button ∗ m_button_minidata

  Mini button for data menu.
- Gtk::Entry ∗ m_entry_data

  Text for the selected Event.
- Gtk::Button ∗ m_button_bpm

  Button for Beats/Measure menu.
- Gtk::Entry ∗ m_entry_bpm

  Text for chosen Beats/Measure.
- Gtk::Button ∗ m_button_bw

  Button for Beat-Width menu.
- Gtk::Entry ∗ m_entry_bw

  Text for chosen Beat-Width.
- Gtk::Button ∗ m_button_rec_vol

  Button for recording volume.
- Gtk::Button ∗ m_button_rec_type

  Button for recording type.
- Gtk::ToggleButton ∗ m_toggle_follow

  Follow progress bar button.
- Gtk::ToggleButton ∗ m_toggle_play

  Pattern-to-MIDI record button.
- Gtk::ToggleButton ∗ m_toggle_record

  MIDI-port-to-pattern button.
- Gtk::ToggleButton ∗ m_toggle_q_rec

Quantized-record MIDI button.
- Gtk::ToggleButton ∗ m_toggle_thru

  MIDI-to-pattern-MIDI button.
- Gtk::Entry ∗ m_entry_seqnumber

  Number of the sequence.
- Gtk::Entry ∗ m_entry_name

  Name of the sequence.
- Gtk::Image ∗ m_image_mousemode

  Image for mouse mode button.
- midibyte m_editing_status

  Indicates what MIDI event/status the data window currently editing.
- midibyte m_editing_cc

  Indicates what MIDI CC value the data window currently editing.
- midibyte m_first_event

  Indicates the first event found in the sequence while setting up the data menu via set_event_entry().
- std::string m_first_event_name

  Provides the string describing the first event, or "(no events)".
- bool m_have_focus

  Indicates that the focus has already been changed to this sequence.

Static Private Attributes

- static int m_initial_snap

  Static data members.
- static int m_initial_note_length
- static int m_initial_chord

Additional Inherited Members

10.85.1 Detailed Description

- perform
- seqroll
- seqkeys
- seqdata
- seqtime
- seqevent
- sequence

This class has a metric ton of user-interface objects and other members.

10.85.2 Constructor & Destructor Documentation

10.85.2.1 seqedit()

```
seq64::seqedit::seqedit (
            perform & p,
            sequence & seq,
            int pos,
            int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

If provided, override the scale, key, and background-sequence with the values stored in the file with the sequence, if they are set to non-default values. This is a new feature.

Todo Offload most of the work into an initialization function like options does.

Horizontal Gtk::Adjustment constructor: The initial value was 0 on a range from 0 to 1, with step and page increments of 1, and a page_size of 1. We can fix these values here, or create an h_adjustment() function similar to eventedit↵ ::v_adjustment(), which first gets called in on_realize().

Parameters

p	The performance object of which the sequence is a part.
seq	The seqeuence object this window object represents.
pos	The sequence number (pattern slot number) for this sequence and window.
ppqn	The optional PPQN parameter for this sequence. Warning: not really used by the caller, need to square that!

10.85.2.2 ∼seqedit()

```
seq64::seqedit::∼seqedit ( )  [virtual]
```

10.85.3 Member Function Documentation

10.85.3.1 set_zoom()

```
void seq64::seqedit::set_zoom (
            int z )  [private]
```

It is passed to the seqroll, seqtime, seqdata, and seqevent objects, as well. This function doesn't check if the zoom will change, because this function might be used to initialize the zoom of the children.

The notation for zoom in the user-interface is in pixels:ticks, but I would prefer to use pulses/pixel (pulses per pixel). Oh well. Note that this value of zoom is saved to the "user" configuration file when Sequencer64 exit.

Parameters

z	The prospective zoom value to set. It is applied only if between the minimum and maximum allowed zoom values, inclusive. See the usr().min_zoom() and usr().max_zoom() function.

10.85.3.2 set_snap()

```
void seq64::seqedit::set_snap (
             int s )  [private]
```

It is passed to the seqroll, seqevent, and sequence objects, as well.

The default initial snap is the default PPQN divided by 4, or the equivalent of a 16th note (48 ticks). The snap divisor is 192 $*$ 4 / 48 or 16.

Parameters

s	The prospective snap value to set. It is checked only to make sure it is greater than 0, to avoid a numeric exception.

10.85.3.3 set_note_length()

```
void seq64::seqedit::set_note_length (
             int notelength )  [private]
```

It is passed to the seqroll object, as well.

Warning

> Currently, we don't handle changes in the global PPQN after the creation of the menu. The creation of the menu hard-wires the values of note-length. To adjust for a new global PQN, we will need to store the original PPQN (m_original_ppqn = m_ppqn), and then adjust the notelength based on the new PPQN. For example if the new PPQN is twice as high as 192, then the notelength should double, though the text displayed in the "Note length" field should remain the same. However, we do adjust for a non-default PPQN at startup time.

Parameters

notelength	Provides the note length in units of MIDI pulses.

10.85.3.4 set_beats_per_bar()

```
void seq64::seqedit::set_beats_per_bar (
             int bpb )  [private]
```

Todo Check if verification is needed at this point.

Parameters

bpb	Provides the BPM (beats per measure) value to set. Not beats/minute!

10.85.3.5 set_beats_per_bar_manual()

```
void seq64::seqedit::set_beats_per_bar_manual ( )  [private]
```

For issue #77, pulled from the jean-emmanual-manul-bpm-and-measure branch. The setting is limited to 0 to 128.

10.85.3.6 set_beat_width()

```
void seq64::seqedit::set_beat_width (
             int bw )  [private]
```

Todo Check if verification is needed at this point.

Parameters

bw	Provides the beat-width value to set.

10.85.3.7 set_transpose_image()

```
void seq64::seqedit::set_transpose_image (
             bool istransposable )  [private]
```

Can we leverage this variation?

```
m_toggle_transpose->add_pixlabel("info.xpm", "duh");
```

Parameters

istransposable	If true, set the image to the "Transpose" icon. Otherwise, set it to the "Drum" (not transposable) icon.

10.85.3.8 set_mousemode_image()

```
void seq64::seqedit::set_mousemode_image (
             bool isfruity )  [private]
```

Parameters

isfruity	If true, set the image to the "Fruity" icon. Otherwise, set it to the "Tux" icon.

10.85.3.9 set_rec_vol()

```
void seq64::seqedit::set_rec_vol (
             int recvol )  [private]
```

This function also changes the button's text to match the selection, and also changes the global velocity-override setting in user_settings. Note that the setting will not be saved to the "usr" configuration file unless Sequencer64 was run with the "--user-save" option.

Parameters

recvol	The setting to be made, obtained from the recording-volume ("Vol") menu.

10.85.3.10 set_rec_type()

```
void seq64::seqedit::set_rec_type (
             loop_record_t rectype )  [private]
```

10.85.3.11 horizontal_adjust()

```
void seq64::seqedit::horizontal_adjust (
             double step )  [inline], [private]
```

A duplicate of the one in seqroll.

Parameters

step	Provides the step value to use for adjusting the horizontal scrollbar. See gui_drawingarea_gtk2::scroll_hadjust() for more information.

10.85.3.12 vertical_adjust()

```
void seq64::seqedit::vertical_adjust (
             double step )  [inline], [private]
```

A near-duplicate of the one in seqroll.

Parameters

step	Provides the step value to use for adjusting the vertical scrollbar. See gui_drawingarea_gtk2::scroll_vadjust() for more information.

10.85.3.13 horizontal_set()

```
void seq64::seqedit::horizontal_set (
             double value )  [inline], [private]
```

Parameters

value	The desired position. Mostly this is either 0.0 or 9999999.0 (an "infinite" value to select the start or end position.

10.85.3.14 vertical_set()

```
void seq64::seqedit::vertical_set (
             double value )  [inline], [private]
```

Parameters

value	The desired position. Mostly this is either 0.0 or 9999999.0 (an "infinite" value to select the start or end position.

10.85.3.15 get_measures()

```
int seq64::seqedit::get_measures ( )  [private]
```

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

10.85.3.16 set_measures()

```
void seq64::seqedit::set_measures (
             int len )  [private]
```

Todo Check if verification is needed at this point.

Parameters

len	Provides the sequence length, in measures.

10.85.3.17 set_measures_manual()

```
void seq64::seqedit::set_measures_manual ( )  [private]
```

For issue #77, pulled from the jean-emmanual-manul-bpm-and-measure branch. The setting is limited to 0 to 1024.

10.85.3.18 apply_length()

```
void seq64::seqedit::apply_length (
             int bpb,
             int bw,
             int measures )  [private]
```

There's an implicit "adjust-triggers = true" parameter used in sequence::set_length(). Then the seqroll, seqtime, seqdata, and seqevent objects are reset(), to cause redraw operations.

Parameters

bpb	Provides the beats per bar.
bw	Provides the beatwidth (typically 4) from the time signature.
measures	Provides the number of measures the sequence should cover, obtained from the user-interface.

10.85.3.19 set_midi_channel()

```
void seq64::seqedit::set_midi_channel (
             int midichannel,
             bool user_change = false )  [private]
```

Should this change set the is-modified flag? Where should validation occur?

Parameters

midichannel	The MIDI channel value to set.
user_change	True if the user made this change, and thus has potentially modified the song.

10.85.3.20 set_midi_bus()

```
void seq64::seqedit::set_midi_bus (
             int bus,
             bool user_change = false )  [private]
```

Should this change set the is-modified flag? Where should validation against the ALSA or JACK buss limits occur?

Also, it would be nice to be able to update this display of the MIDI bus in the field if we set it from the seqmenu.

Parameters

bus	The buss value to set. If this value changes the selected buss, then the MIDI channel popup menu is repopulated.
user_change	True if the user made this change, and thus has potentially modified the song.

10.85.3.21 set_scale()

```
void seq64::seqedit::set_scale (
             int scale )  [private]
```

It is passed to the seqroll and seqkeys objects, as well. As a new feature, it is also passed to the sequence, so that it can be saved as part of the sequence data.

Note that the "initial value" for this parameter is a static variable that gets set to the new value, so that opening up another sequence causes the sequence to take on the new "initial value" as well. A feature, but should it be optional? Now it is, based on the setting of usr().global_seq_feature().

10.85.3.22 set_chord()

```
void seq64::seqedit::set_chord (
             int chord )  [private]
```

10.85.3.23 set_key()

```
void seq64::seqedit::set_key (
            int key )  [private]
```

It is passed to the seqroll and seqkeys objects, as well. As a new feature, it is also passed to the sequence, so that it can be saved as part of the sequence data.

Note that the "initial value" for this parameter is a static variable that gets set to the new value, so that opening up another sequence causes the sequence to take on the new "initial value" as well. A feature, but should it be optional? Now it is, based on the setting of usr().global_seq_feature().

10.85.3.24 set_background_sequence()

```
void seq64::seqedit::set_background_sequence (
            int seqnum )  [private]
```

As a new feature, it is also passed to the sequence, so that it can be saved as part of the sequence data, but only if less or equal to the maximum single-byte MIDI value, 127.

Note that the "initial value" for this parameter is a static variable that gets set to the new value, so that opening up another sequence causes the sequence to take on the new "initial value" as well. A feature, but should it be optional? Now it is, based on the setting of usr().global_seq_feature().

10.85.3.25 transpose_change_callback()

```
void seq64::seqedit::transpose_change_callback ( )  [private]
```

10.85.3.26 name_change_callback()

```
void seq64::seqedit::name_change_callback ( )  [private]
```

That name is the name the user has given to the sequence being edited.

10.85.3.27 follow_change_callback()

```
void seq64::seqedit::follow_change_callback ( )  [private]
```

10.85.3.28 play_change_callback()

```
void seq64::seqedit::play_change_callback ( )  [private]
```

10.85.3.29 record_change_callback()

```
void seq64::seqedit::record_change_callback ( )  [private]
```

Stazed:

```
Both record_change_callback() and thru_change_callback() will call
set_sequence_input() for the same sequence. We only need to call it if
it is not already set, if setting. And, we should not unset it if the
m_toggle_thru->get_active() is true.
```

10.85.3.30 q_rec_change_callback()

```
void seq64::seqedit::q_rec_change_callback ( )  [private]
```

Stazed fix:

```
If we set Quantized recording, then also set recording, but do not
unset recording if we unset Quantized recording.
```

This is not necessarily the most intuitive thing to do. See midi_record.txt.

10.85.3.31 thru_change_callback()

```
void seq64::seqedit::thru_change_callback ( )  [private]
```

Stazed:

```
Both record_change_callback() and thru_change_callback() will call
set_sequence_input() for the same sequence. We only need to call it if
it is not already set, if setting. And, we should not unset it if the
m_toggle_thru->get_active() is true.
```

10.85.3.32 undo_callback()

```
void seq64::seqedit::undo_callback ( )  [private]
```

10.85.3.33 redo_callback()

```
void seq64::seqedit::redo_callback ( )  [private]
```

10.85.3.34 update_all_windows()

```
void seq64::seqedit::update_all_windows ( )  [private]
```

10.85.3.35 fill_top_bar()

```
void seq64::seqedit::fill_top_bar ( )  [private]
```

Note that, if a non-default title for the sequence is in force, then we immediately force the focus to the seqroll "widget", so that the space bar can be used to control playback, instead of immediately erasing the name of the sequence. The following commented radio-buttons were a visual way to select the modes of note editing (select, draw, and grow). These can easily be done with the left mouse button, keystrokes, or some other tricks, though.

10.85.3.36 create_menus()

```
void seq64::seqedit::create_menus ( )  [private]
```

The first menu is the Zoom menu, represented in the pattern/sequence editor by a button with a magnifying glass. The values are "pixels to ticks", where "ticks" are actually the "pulses" of "pulses per quarter note". We would prefer the notation "n" instead of "1:n", as in "n pulses per pixel".

Note that many of the setups here could be loops through data structures. The Snap menu is actually the Grid Snap button, which shows two arrows pointing to a central bar. This menu somewhat duplicates the same menu in perfedit.

To reduce the amount of written code, we now use a static array to initialize some of the seqedit menu entries. 0 denotes the separator. This same setup is used to set up both the snap and note menu, since they are exactly the same. Saves a *lot* of code.

This menu lets one set the key of the sequence, and is brought up by the button with the "golden key" image on it.

This button shows a down around for the bottom half of the time signature. It's tooltip is "Time signature. Length of beat." But it is called bw, or beat width, in the code.

This menu is shown when pressing the button at the bottom of the window that has "Vol" as its label. Let's show the numbers as well to help the user. And we'll have to document this change.

This menu sets the scale to show on the panel, and the button shows a "staircase" image. See the c_music_scales enumeration defined in the globals module.

This section sets up two different menus. The first is m_menu_length. This menu lets one set the sequence length in bars. The second menu is the m_menu_bpm, or BPM, which here means "beats per measure" (not "beats per minute").

10.85.3.37 set_data_type()

```
void seq64::seqedit::set_data_type (
            midibyte status,
            midibyte control = 0 )  [private]
```

This function uses the hardwired array c_controller_names.

Parameters

status	The current editing status.
control	The control value. However, we really need to validate it!

10.85.3.38 set_event_entry()

```
void seq64::seqedit::set_event_entry (
            Gtk::Menu * menu,
            const std::string & text,
            bool present,
            midibyte status,
            midibyte control = 0 )  [private]
```

Too damn big!

10.85.3.39 popup_menu()

```
void seq64::seqedit::popup_menu (
            Gtk::Menu * menu )  [private]
```

At construction, this function is set as the signal handler for each Gtk::Menu object, and that function is bound with the Menu object as a parameter.

10.85.3.40 popup_event_menu()

```
void seq64::seqedit::popup_event_menu ( )  [private]
```

Also see the handling of the m_button_data and m_entry_data objects.

10.85.3.41 repopulate_event_menu()

```
void seq64::seqedit::repopulate_event_menu (
            int buss,
            int channel )  [private]
```

This menu has a large number of items. They are filled in by code, but can also be loaded from sequencer64.usr.

This function first loops through all of the existing events in the sequence in order to determine what events exist in it. If any of the following events are found, their entry in the menu is marked by a filled square, rather than a hollow square:

```
-   Note On
-   Note off
-   Aftertouch
-   Program Change
-   Channel Pressure
-   Pitch Wheel
-   Control Changes from 0 to 127
```

Parameters

buss	The selected bus number.
channel	The selected channel number.

Create the 8 sub-menus for the various ranges of controller changes, shown 16 per sub-menu.

10.85.3.42 popup_mini_event_menu()

```
void seq64::seqedit::popup_mini_event_menu ( )  [private]
```

Also see the handling of the m_button_minidata and m_entry_data objects.

10.85.3.43 repopulate_mini_event_menu()

```
void seq64::seqedit::repopulate_mini_event_menu (
             int buss,
             int channel )  [private]
```

This menu has a much smaller number of items, only the ones that actually exist in the track/pattern/loop/sequence.

Parameters

buss	The selected bus number.
channel	The selected channel number.

Create the one menu for the controller changes that actually exist in the track, if any.

10.85.3.44 popup_record_menu()

```
void seq64::seqedit::popup_record_menu ( )  [private]
```

10.85.3.45 popup_midibus_menu()

```
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.

However, JACK counts the playback ports, such as "yoshimi:midi in", as "input" ports... the application outputs to the input ports. So we have to deal with that somehow.

10.85.3.46 popup_sequence_menu()

```
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 for screen-set 0. If more screensets have active sequences, then their screen-set number appears in the screen-set section of the menu.

Now, at present, we can only save background sequence numbers that are less than 128, which means the sequences from 0 to 127, or the first four screen sets. Higher sequences can be selected, but, right now, they cannot be saved. We'll probably fix that at some point, low priority.

10.85.3.47 popup_tool_menu()

```
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.

10.85.3.48 popup_midich_menu()

```
void seq64::seqedit::popup_midich_menu ( )  [private]
```

10.85.3.49 repopulate_midich_menu()

```
void seq64::seqedit::repopulate_midich_menu (
             int buss )  [private]
```

This action is needed at startup of the seqedit window, and when the user changes the active buss for the sequence.

When the output buss or channel are changed, we get the 16 "channels" from the new buss's definition, get the corresponding instrument, and load its name into this midich popup. Then we need to go to the instrument/channel that has been selected, and repopulate the event menu with that item's controller values/names.

Parameters

buss	The new value for the buss from which to get the [user-instrument-N] settings in the [user-instrument-definitions] section.

10.85.3.50 create_menu_image()

```
Gtk::Image * seq64::seqedit::create_menu_image (
             bool state = false )  [private]
```

10.85.3.51 timeout()

```
bool seq64::seqedit::timeout ( ) [private]
```

Note the new call to seqroll::follow_progress(). This allows the seqroll to pop to the next frame of events to continue to show the moving progress bar. Does this need to be an option? It only affects patterns longer than a measure or two, whatever the width of the seqroll window is. This is a new feature that is not in seq24.

What about seqtime? That doesn't change.

10.85.3.52 do_action()

```
void seq64::seqedit::do_action (
             int action,
             int 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).

10.85.3.53 mouse_action()

```
void seq64::seqedit::mouse_action (
             mouse_action_e action ) [private]
```

10.85.3.54 start_playing()

```
void seq64::seqedit::start_playing ( ) [private]
```

10.85.3.55 stop_playing()

```
void seq64::seqedit::stop_playing ( ) [private]
```

10.85.3.56 change_focus()

```
void seq64::seqedit::change_focus (
             bool set_it = true ) [private]
```

Similar to the same function in eventedit.

Parameters

set←→_it	If true (the default value), indicates we want focus, otherwise we want to give up focus.

10.85.3.57 handle_close()

```
void seq64::seqedit::handle_close ( )  [private]
```

10.85.3.58 on_realize()

```
void seq64::seqedit::on_realize ( )  [private]
```

10.85.3.59 on_set_focus()

```
void seq64::seqedit::on_set_focus (
            Widget * focus )  [private]
```

Only works in certain circumstances.

10.85.3.60 on_focus_in_event()

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

10.85.3.61 on_focus_out_event()

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

10.85.3.62 on_delete_event()

```
bool seq64::seqedit::on_delete_event (
            GdkEventAny * 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.

10.85.3.63 on_scroll_event()

```
bool seq64::seqedit::on_scroll_event (
            GdkEventScroll * ev )  [private]
```

This handles moving the scroll wheel on a mouse or do a two-fingered scrolling action on a touchpad. If no modifier key is pressed, this moves the view up or down on the "notes" coordinate, showing different piano keys. This behavior is implemented in seqkeys::on_scroll_event(), and is called into play by returning false here.

If the Ctrl key is pressed, then the scrolling action causes the view to zoom in or out. This behavior is implemented here.

If the Shift key is pressed, then the scrolling action moves the view horizontally on the time-line (measures-line) of the piano roll. This behavior is implemented here.

10.85.3.64 on_key_press_event()

```
bool seq64::seqedit::on_key_press_event (
            GdkEventKey * ev )  [private]
```

A number of new keystrokes are processed, so that we can lessen the reliance on the mouse and work a little faster.

```
-   Ctrl-W keypress.  This keypress closes the sequence/pattern editor
    window by way of calling on_delete_event().  We could apply this
    convention to all the other windows.
-   z 0 Z zoom keys.  "z" zooms out, "Z" (Shift-z) zooms in, and "0"
    resets the zoom to the default.
-   Page-Up and Page-Down.  Moves up and down in the piano roll.
-   Home and End.  Page to the top or the bottom of the piano roll.
-   Shift-Page-Up and Shift-Page-Down.  Move left and right in the
    piano roll.
-   Shift-Home and Shift-End.  Page to the start or the end of the
    piano roll.
-   Ctrl-Page-Up and Ctrl-Page-Down.  Mirrors the zoom-in and zoom-out
    capabilities of scrolling up and down with the mouse while the
    Ctrl key is pressed.
```

The Keypad-End key is an issue on our ASUS "gaming" laptop. Whether it is seen as a "1" or an "End" key depends on an interaction between the Shift and the Num Lock key. Annoying, takes some time to get used to.

Change Note layk 2016-10-17 Issue #46. Undoing (ctrl-z) removes two instances of history. To reproduce this bug, if one makes three notes one at a time and presses ctrl-z once only the first one remains. Same goes for moving notes. This is due to this else-if statement where we call seqroll::on_key_press_event() making first removal. This if statement is never true and seqroll::on_key_press_event() is called again as Gtk::Window::on_key_press_event(), making another m_seq.pop_undo() in seqroll. Note that the code here was an (ill-advised) attempt to avoid the pattern title field from grabbing the initial keystrokes; better to just get used to clicking the piano roll first. Finally, fixing the undo bug also let's ctrl-page-up/page-down change the zoom. Lastly, we've removed the undo here... seqroll already handles both undo and redo keystrokes.

Change Note ca 2016-10-18 Issue #46. In addition to layk's fixes, we have to properly determine if we're inside the "Sequence Name" ("GtkEntry") field, as opposed to the "GtkDrawingArea" field, to avoid grabbing and using keystrokes intended for the text-entry field. We may have to rethink the whole seqroll vs. seqedit key-press process at some point, as this is a bit too tricky. Please note that the name "gtkmm__GtkEntry" likely applies only to GNU's C++ compiler, g++. This will be an issue in any port to Microsoft's C++ compiler.

Parameters

ev	Provides the keystroke event to be handled.

Returns

Returns true if we handled the keystroke here. Otherwise, returns the value of Gtk::Window::on_key_press↩_event(ev).

10.85.4 Field Documentation

10.85.4.1 seqmenu

```
friend seq64::seqedit::seqmenu  [private]
```

10.85.4.2 m_initial_snap

```
int seq64::seqedit::m_initial_snap  [static], [private]
```

These items apply to all of the instances of seqedit, and are passed on to the following constructors:

- seqdata
- seqevent
- seqroll
- seqtime

The snap and note-length defaults would be good to write to the "user" configuration file. The scale and key would be nice to write to the proprietary section of the MIDI song. Or, even more flexibly, to each sequence, if that makes sense to do, since all tracks would generally be in the same key. Right, Charles Ives?

Note that, currently, that some of these "initial values" are modified, so that they are "contagious". That is, the next sequence to be opened in the sequence editor will adopt these values. This is a long-standing feature of Seq24, but strikes us as a bit surprising.

Change Note ca 2016-04-10 If we just double the PPQN, then the snap divisor becomes 32, and the snap interval is a 32nd note. We would like to keep it at a 16th note. We correct the snap ticks to the actual PPQN ratio.

10.85.4.3 m_initial_note_length

```
int seq64::seqedit::m_initial_note_length  [static], [private]
```

10.85.4.4 m_initial_chord

```
int seq64::seqedit::m_initial_chord  [static], [private]
```

10.85.4.5 m_initial_zoom

```
const int seq64::seqedit::m_initial_zoom  [private]
```

10.85.4.6 m_zoom

```
int seq64::seqedit::m_zoom  [private]
```

The value of zoom is the same as the number of pixels per tick on the piano roll.

10.85.4.7 m_snap

```
int seq64::seqedit::m_snap  [private]
```

10.85.4.8 m_note_length

```
int seq64::seqedit::m_note_length  [private]
```

10.85.4.9 m_scale

```
int seq64::seqedit::m_scale  [private]
```

10.85.4.10 m_chord

```
int seq64::seqedit::m_chord  [private]
```

10.85.4.11 m_key

```
int seq64::seqedit::m_key  [private]
```

10.85.4.12 m_bgsequence

```
int seq64::seqedit::m_bgsequence  [private]
```

10.85.4.13 m_measures

```
long seq64::seqedit::m_measures  [private]
```

10.85.4.14 m_ppqn

```
int seq64::seqedit::m_ppqn  [private]
```

10.85.4.15 m_pp_whole

```
int seq64::seqedit::m_pp_whole  [private]
```

10.85.4.16 m_pp_eighth

```
int seq64::seqedit::m_pp_eighth  [private]
```

10.85.4.17 m_pp_sixteenth

```
int seq64::seqedit::m_pp_sixteenth  [private]
```

10.85.4.18 m_seq

```
sequence& seq64::seqedit::m_seq  [private]
```

10.85.4.19 m_menubar

```
Gtk::MenuBar* seq64::seqedit::m_menubar  [private]
```

Many of these are menu items, and are associated with buttons that, when pressed, bring up the menu for display and selection of its entries.The top bar with menu buttons.

10.85.4.20 m_menu_tools

```
Gtk::Menu* seq64::seqedit::m_menu_tools  [private]
```

10.85.4.21 m_menu_zoom

```
Gtk::Menu* seq64::seqedit::m_menu_zoom  [private]
```

10.85.4.22 m_menu_snap

```
Gtk::Menu* seq64::seqedit::m_menu_snap  [private]
```

10.85.4.23 m_menu_note_length

```
Gtk::Menu* seq64::seqedit::m_menu_note_length  [private]
```

10.85.4.24 m_menu_length

```
Gtk::Menu* seq64::seqedit::m_menu_length  [private]
```

10.85.4.25 m_toggle_transpose

```
Gtk::ToggleButton* seq64::seqedit::m_toggle_transpose  [private]
```

10.85.4.26 m_image_transpose

```
Gtk::Image* seq64::seqedit::m_image_transpose  [private]
```

10.85.4.27 m_menu_midich

```
Gtk::Menu* seq64::seqedit::m_menu_midich  [private]
```

10.85.4.28 m_menu_midibus

```
Gtk::Menu* seq64::seqedit::m_menu_midibus  [private]
```

10.85.4.29 m_menu_data

```
Gtk::Menu* seq64::seqedit::m_menu_data  [private]
```

10.85.4.30 m_menu_minidata

```
Gtk::Menu* seq64::seqedit::m_menu_minidata  [private]
```

10.85.4.31 m_menu_key

```
Gtk::Menu* seq64::seqedit::m_menu_key  [private]
```

10.85.4.32 m_menu_scale

```
Gtk::Menu* seq64::seqedit::m_menu_scale  [private]
```

10.85.4.33 m_menu_chords

```
Gtk::Menu* seq64::seqedit::m_menu_chords  [private]
```

10.85.4.34 m_menu_sequences

```
Gtk::Menu* seq64::seqedit::m_menu_sequences  [private]
```

10.85.4.35 m_menu_bpm

```
Gtk::Menu* seq64::seqedit::m_menu_bpm  [private]
```

10.85.4.36 m_menu_bw

```
Gtk::Menu* seq64::seqedit::m_menu_bw  [private]
```

10.85.4.37 m_menu_rec_vol

```
Gtk::Menu* seq64::seqedit::m_menu_rec_vol  [private]
```

10.85.4.38 m_menu_rec_type

```
Gtk::Menu* seq64::seqedit::m_menu_rec_type  [private]
```

10.85.4.39 m_vadjust

```
Gtk::Adjustment* seq64::seqedit::m_vadjust  [private]
```

Vertical position descriptor.

10.85.4.40 m_hadjust

```
Gtk::Adjustment* seq64::seqedit::m_hadjust  [private]
```

10.85.4.41 m_vscroll_new

```
Gtk::VScrollbar* seq64::seqedit::m_vscroll_new  [private]
```

10.85.4.42 m_hscroll_new

```
Gtk::HScrollbar* seq64::seqedit::m_hscroll_new [private]
```

10.85.4.43 m_seqkeys_wid

```
seqkeys* seq64::seqedit::m_seqkeys_wid [private]
```

This item draws the piano-keys at the left of the seqedit window.

10.85.4.44 m_seqtime_wid

```
seqtime* seq64::seqedit::m_seqtime_wid [private]
```

This is the location where the measure numbers and the END marker are shown.

10.85.4.45 m_seqdata_wid

```
seqdata* seq64::seqedit::m_seqdata_wid [private]
```

This is the area at the bottom of the window that shows value lines for the selected kinds of events.

10.85.4.46 m_seqevent_wid

```
seqevent* seq64::seqedit::m_seqevent_wid [private]
```

10.85.4.47 m_seqroll_wid

```
seqroll* seq64::seqedit::m_seqroll_wid [private]
```

10.85.4.48 m_button_lfo

```
Gtk::Button* seq64::seqedit::m_button_lfo [private]
```

This item will always be an optional part of the build, enabled by defining SEQ64_STAZED_LFO_SUPPORT.

10.85.4.49 m_lfo_wnd

```
lfownd* seq64::seqedit::m_lfo_wnd [private]
```

This item get the seqdata window hooked into it, and so must follow that item in the C++ initializer list.

10.85.4.50 m_table

```
Gtk::Table* seq64::seqedit::m_table [private]
```

These items provide a number of buttons and text-entry fields, as well as their layout.The layout table for editor.

10.85.4.51 m_vbox

```
Gtk::VBox* seq64::seqedit::m_vbox [private]
```

10.85.4.52 m_hbox

```
Gtk::HBox* seq64::seqedit::m_hbox [private]
```

10.85.4.53 m_hbox2

```
Gtk::HBox* seq64::seqedit::m_hbox2 [private]
```

10.85.4.54 m_button_undo

```
Gtk::Button* seq64::seqedit::m_button_undo [private]
```

10.85.4.55 m_button_redo

```
Gtk::Button* seq64::seqedit::m_button_redo [private]
```

10.85.4.56 m_button_quantize

```
Gtk::Button* seq64::seqedit::m_button_quantize [private]
```

10.85.4.57 m_button_tools

```
Gtk::Button* seq64::seqedit::m_button_tools [private]
```

10.85.4.58 m_button_sequence

```
Gtk::Button* seq64::seqedit::m_button_sequence  [private]
```

10.85.4.59 m_entry_sequence

```
Gtk::Entry* seq64::seqedit::m_entry_sequence  [private]
```

10.85.4.60 m_button_bus

```
Gtk::Button* seq64::seqedit::m_button_bus  [private]
```

10.85.4.61 m_entry_bus

```
Gtk::Entry* seq64::seqedit::m_entry_bus  [private]
```

10.85.4.62 m_button_channel

```
Gtk::Button* seq64::seqedit::m_button_channel  [private]
```

10.85.4.63 m_entry_channel

```
Gtk::Entry* seq64::seqedit::m_entry_channel  [private]
```

10.85.4.64 m_button_snap

```
Gtk::Button* seq64::seqedit::m_button_snap  [private]
```

10.85.4.65 m_entry_snap

```
Gtk::Entry* seq64::seqedit::m_entry_snap  [private]
```

10.85.4.66 m_button_note_length

```
Gtk::Button* seq64::seqedit::m_button_note_length  [private]
```

10.85.4.67 m_entry_note_length

```
Gtk::Entry* seq64::seqedit::m_entry_note_length  [private]
```

10.85.4.68 m_button_zoom

```
Gtk::Button* seq64::seqedit::m_button_zoom  [private]
```

10.85.4.69 m_entry_zoom

```
Gtk::Entry* seq64::seqedit::m_entry_zoom  [private]
```

10.85.4.70 m_button_length

```
Gtk::Button* seq64::seqedit::m_button_length  [private]
```

10.85.4.71 m_entry_length

```
Gtk::Entry* seq64::seqedit::m_entry_length  [private]
```

10.85.4.72 m_button_key

```
Gtk::Button* seq64::seqedit::m_button_key  [private]
```

10.85.4.73 m_entry_key

```
Gtk::Entry* seq64::seqedit::m_entry_key  [private]
```

10.85.4.74 m_button_scale

```
Gtk::Button* seq64::seqedit::m_button_scale  [private]
```

10.85.4.75 m_entry_scale

```
Gtk::Entry* seq64::seqedit::m_entry_scale  [private]
```

10.85.4.76 m_button_chord

```
Gtk::Button* seq64::seqedit::m_button_chord  [private]
```

10.85.4.77 m_entry_chord

```
Gtk::Entry* seq64::seqedit::m_entry_chord  [private]
```

10.85.4.78 m_tooltips

```
Gtk::Tooltips* seq64::seqedit::m_tooltips  [private]
```

10.85.4.79 m_button_data

```
Gtk::Button* seq64::seqedit::m_button_data  [private]
```

10.85.4.80 m_button_minidata

```
Gtk::Button* seq64::seqedit::m_button_minidata  [private]
```

10.85.4.81 m_entry_data

```
Gtk::Entry* seq64::seqedit::m_entry_data  [private]
```

10.85.4.82 m_button_bpm

```
Gtk::Button* seq64::seqedit::m_button_bpm  [private]
```

10.85.4.83 m_entry_bpm

```
Gtk::Entry* seq64::seqedit::m_entry_bpm  [private]
```

10.85.4.84 m_button_bw

```
Gtk::Button* seq64::seqedit::m_button_bw  [private]
```

10.85.4.85 m_entry_bw

```
Gtk::Entry* seq64::seqedit::m_entry_bw  [private]
```

10.85.4.86 m_button_rec_vol

```
Gtk::Button* seq64::seqedit::m_button_rec_vol  [private]
```

10.85.4.87 m_button_rec_type

```
Gtk::Button* seq64::seqedit::m_button_rec_type  [private]
```

10.85.4.88 m_toggle_follow

```
Gtk::ToggleButton* seq64::seqedit::m_toggle_follow  [private]
```

10.85.4.89 m_toggle_play

```
Gtk::ToggleButton* seq64::seqedit::m_toggle_play  [private]
```

10.85.4.90 m_toggle_record

```
Gtk::ToggleButton* seq64::seqedit::m_toggle_record  [private]
```

10.85.4.91 m_toggle_q_rec

```
Gtk::ToggleButton* seq64::seqedit::m_toggle_q_rec  [private]
```

10.85.4.92 m_toggle_thru

```
Gtk::ToggleButton* seq64::seqedit::m_toggle_thru  [private]
```

10.85.4.93 m_entry_seqnumber

```
Gtk::Entry* seq64::seqedit::m_entry_seqnumber  [private]
```

10.85.4.94 m_entry_name

```
Gtk::Entry* seq64::seqedit::m_entry_name  [private]
```

10.85.4.95 m_image_mousemode

```
Gtk::Image* seq64::seqedit::m_image_mousemode  [private]
```

10.85.4.96 m_editing_status

```
midibyte seq64::seqedit::m_editing_status  [private]
```

10.85.4.97 m_editing_cc

```
midibyte seq64::seqedit::m_editing_cc  [private]
```

10.85.4.98 m_first_event

```
midibyte seq64::seqedit::m_first_event  [private]
```

If no events exist, the value is 0x00.

10.85.4.99 m_first_event_name

```
std::string seq64::seqedit::m_first_event_name  [private]
```

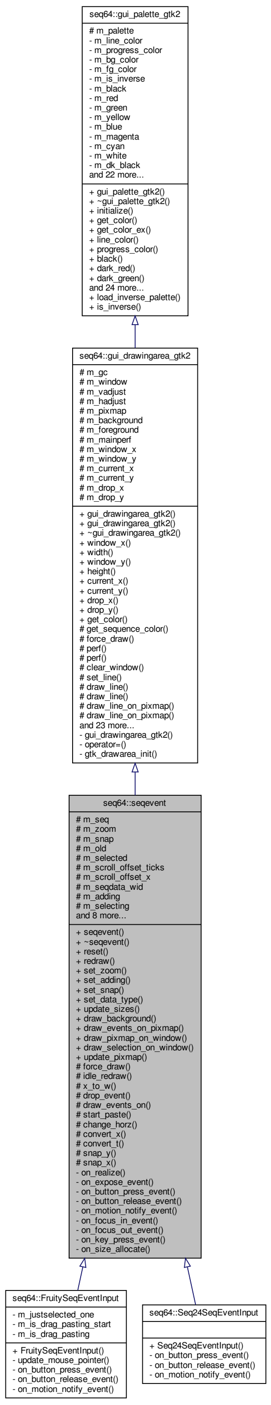
10.85.4.100 m_have_focus

```
bool seq64::seqedit::m_have_focus  [private]
```

10.86 seq64::seqevent Class Reference

Implements the piano event drawing area.

Inheritance diagram for seq64::seqevent:



Public Member Functions

- seqevent (perform &p, sequence &seq, int zoom, int snap, seqdata &seqdata_wid, Gtk::Adjustment &hadjust)

    Principal constructor.
- virtual ∼seqevent ()

    Let's provide a do-nothing virtual destructor.
- 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 zoom)

  Sets zoom to the given value, and resets if the value ended up being changed.
- void set_adding (bool adding)

  Changes the mouse cursor to a pencil or a left pointer in the given seqevent object, depending on the first parameter.
- void set_snap (int snap)

  'Setter' function for member m_snap Simply sets the snap member.
- void set_data_type (midibyte status, midibyte 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 the window dimensions, then 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.

Protected Member Functions

- virtual void force_draw ()

  Forces a draw on the current drawable area of the window.
- int idle_redraw ()

  Implements redraw while idling.
- void x_to_w (int x1, int x2, int &x, int &w)

  This function checks the mins / maxes.
- void drop_event (midipulse tick, bool istempo=false)

  Drops (adds) an event at the given tick.
- void draw_events_on (Glib::RefPtr< Gdk::Drawable > 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 convert_x (int x, midipulse &tick)

  Takes the screen x coordinate, multiplies it by the current zoom, and returns the tick value in the given parameter.
- void convert_t (midipulse tick, 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 &x)

  This function performs a 'snap' on x.

Protected Attributes

- sequence & m_seq

  Provides a reference to the sequence whose data is represented in this seqevent object.
- int m_zoom

  Zoom setting, means that one pixel == m_zoom ticks.
- int m_snap

  The grid-snap setting for the event bar grid.
- GdkRectangle m_old

  Used in drawing the event selection in the thing event row.
- GdkRectangle m_selected

  Used in moving and pasting the selected events in the thin event row.
- int m_scroll_offset_ticks

  Provides the offset of the ticks in the event view based on where the scroll-bar has moved the view "window".
- int m_scroll_offset_x

  Provides the offset of the pixels in the event view based on where the scroll-bar has moved the view "window".
- seqdata & m_seqdata_wid

  The data view that parallels this event view.
- bool m_adding

  True if we're adding events via the mouse.
- bool m_selecting

  Used when highlighting a bunch of events.
- bool m_moving_init

  Used externally by the fruityseq and seq24seq modules, to initialize the act of moving events.
- bool m_moving

  Indicates that this pane is in the act of moving a selection.
- bool m_growing

  Used externally by the fruityseq and seq24seq modules, when growing the event duration.
- bool m_painting

  Used externally by the fruityseq and seq24seq modules, in painting the selected events.
- bool m_paste

  Indicates that we've selected some events and are in paste mode.
- int m_move_snap_offset_x

  Used externally by the fruityseq and seq24seq modules, in snapping.
- midibyte m_status

  Indicates what is the data window currently editing.
- midibyte m_cc

  Indicates what is the data window currently editing.

Private Member Functions

- virtual void on_realize ()

  Implements the on-realize callback.
- virtual bool on_expose_event (GdkEventExpose ∗ev)

  Implements the on-expose event callback.
- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Implements the on-button-press event callback.
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Implements the on-button-release event callback.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

Implements the on-motion-notify event callback.

- virtual bool on_focus_in_event (GdkEventFocus ∗)

  Responds to a focus event by setting the HAS_FOCUS flag.
- virtual bool on_focus_out_event (GdkEventFocus ∗)

  Responds to a unfocus event by resetting the HAS_FOCUS flag.
- virtual bool on_key_press_event (GdkEventKey ∗p0)

  Implements the key-press event callback function.
- virtual void on_size_allocate (Gtk::Allocation &)

  Implements the on-size-allocate event callback.

Additional Inherited Members

10.86.1 Constructor & Destructor Documentation

10.86.1.1 seqevent()

```
seq64::seqevent::seqevent (
             perform & p,
             sequence & seq,
             int zoom,
             int snap,
             seqdata & seqdata_wid,
             Gtk::Adjustment & hadjust )
```

Parameters

p	The "parent" perform object controlling all of the sequences.
seq	The current sequence operated on by this object.
zoom	The initial zoom value.
snap	The initial snap value.
seqdata_wid	The data pane that this event pane is associated with.
hadjust	The horizontal scroll-bar.

10.86.1.2 ∼seqevent()

```
virtual seq64::seqevent::∼seqevent ( )  [inline], [virtual]
```

10.86.2 Member Function Documentation

10.86.2.1 reset()

```
void seq64::seqevent::reset ( )
```

Basically identical to seqtime::reset().

10.86.2.2 redraw()

```
void seq64::seqevent::redraw ( )
```

Somewhat similar to seqroll::redraw().

10.86.2.3 set_zoom()

```
void seq64::seqevent::set_zoom (
             int z )
```

Parameters

z	The desired zoom value, assumed to be validated already. See the seqedit::set_zoom() function.

10.86.2.4 set_adding()

```
void seq64::seqevent::set_adding (
             bool adding )
```

Modifies m_adding as well.

Parameters

adding	The value to set m_adding to, and if true, sets the mouse cursor to a pencil icon, otherwise sets it to a standard mouse-pointer icon.

10.86.2.5 set_snap()

```
void seq64::seqevent::set_snap (
             int snap ) [inline]
```

The parameter is not validated.

10.86.2.6 set_data_type()

```
void seq64::seqevent::set_data_type (
            midibyte status,
            midibyte control )
```

Then redraws.

Parameters

status	The status/event byte to set. For example, EVENT_NOTE_ON and EVENT_NOTE off. This byte should have the channel nybble cleared.
control	The MIDI CC byte to set.

10.86.2.7 update_sizes()

```
void seq64::seqevent::update_sizes ( )
```

This ends up filling the background with dotted lines, etc.

10.86.2.8 draw_background()

```
void seq64::seqevent::draw_background ( )
```

It sets the foreground to white, draws the rectangle, in order to clear the pixmap. The build-time option SEQ64←_SOLID_PIANOROLL_GRID causes solid lines to be drawn, in gray, instead of dotted black lines, for a smoother look.

Also, as a trial option, if the current data type is EVENT_NOTE_ON, EVENT_NOTE_OFF, and EVENT_AFTER←TOUCH, we draw the background in light grey to remind the user that there are issues in copying or moving these events around (unlinked) by themselves.

10.86.2.9 draw_events_on_pixmap()

```
void seq64::seqevent::draw_events_on_pixmap ( )
```

10.86.2.10 draw_pixmap_on_window()

```
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.
```

10.86.2.11 draw_selection_on_window()

```
void seq64::seqevent::draw_selection_on_window ( )
```

10.86.2.12 update_pixmap()

```
void seq64::seqevent::update_pixmap ( )
```

10.86.2.13 force_draw()

```
void seq64::seqevent::force_draw ( )  [protected], [virtual]
```

Reimplemented from seq64::gui_drawingarea_gtk2.

10.86.2.14 idle_redraw()

```
int seq64::seqevent::idle_redraw ( )  [protected]
```

Who calls this routine? Probably the default timer routine, but not sure.

Returns

Always returns true.

10.86.2.15 x_to_w()

```
void seq64::seqevent::x_to_w (
            int x1,
            int x2,
            int & x,
            int & w )  [protected]
```

Then it fills in x and the width.

Parameters

	x1	The "left" x value.
	x2	The "right" x value.
out	*x*	The destination for the converted x value.
out	*w*	The destination for the converted width value.

10.86.2.16 drop_event()

```
void seq64::seqevent::drop_event (
            midipulse tick,
            bool istempo = false )  [protected]
```

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.

Parameters

tick	The destination time (division, pulse, tick) for the event to be dropped at.
istempo	Indicates if the event is a tempo event. If so, we add a fake tempo event of BPM = 120. Defaults to false.

10.86.2.17 draw_events_on()

```
void seq64::seqevent::draw_events_on (
            Glib::RefPtr< Gdk::Drawable > drawable )  [protected]
```

Very similar to seqdata::draw_events_on().

This function exercises the new version of get_next_event(), get_next_event_ex(), which allows (and forces) the caller to provide the event iterator.

Parameters

drawable	The given drawable object.

10.86.2.18 start_paste()

```
void seq64::seqevent::start_paste ( )  [protected]
```

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.

10.86.2.19 change_horz()

```
void seq64::seqevent::change_horz ( )  [protected]
```

Very similar to seqroll::change_horz(). Basically identical to seqdata::change_horz().

10.86.2.20 convert_x()

```
void seq64::seqevent::convert_x (
            int x,
            midipulse & tick )  [inline], [protected]
```

Why not just return it normally?

Parameters

	x	The x (pixel) value to convert.
out	*tick*	The destination for the converted x value.

10.86.2.21 convert_t()

```
void seq64::seqevent::convert_t (
            midipulse tick,
            int & x )  [inline], [protected]
```

Why not just return it normally?

Parameters

	tick	The tick (pulse) value to convert.
out	*x*	The destination for the converted tick value.

10.86.2.22 snap_y()

```
void seq64::seqevent::snap_y (
            int & y )  [inline], [protected]
```

Parameters

out	*y*	The return parameter for the conversion. Why not just return the value?

10.86.2.23 snap_x()

```
void seq64::seqevent::snap_x (
            int & x )  [protected]
```

- snap = number pulses to snap to

- m_zoom = number of pulses per pixel
- Therefore snap / m_zoom = number of pixels to snap to.

Parameters

out	*x*	The output destination for the snapped x value.

10.86.2.24 on_realize()

```
void seq64::seqevent::on_realize ( ) [private], [virtual]
```

It calls the base-class version, and then allocates additional resource not allocated in the constructor. Finally, it connects up the change_horz function.

10.86.2.25 on_expose_event()

```
bool seq64::seqevent::on_expose_event (
            GdkEventExpose * e ) [private], [virtual]
```

Parameters

e	The expose event.

10.86.2.26 on_button_press_event()

```
bool seq64::seqevent::on_button_press_event (
            GdkEventButton * ev ) [private], [virtual]
```

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. Added some fixes, but then commented them out until better testing can be done.

Parameters

ev	The button event.

Returns

Returns true if the button-press was handled. Not sure the return code is meaningful.

Needs update. m_seq.unselect(); ???????

Reimplemented in seq64::FruitySeqEventInput, and seq64::Seq24SeqEventInput.

10.86.2.27 on_button_release_event()

```
bool seq64::seqevent::on_button_release_event (
            GdkEventButton * ev )  [private], [virtual]
```

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. Added some fixes, but then commented them out until better testing can be done.

Parameters

ev	The button event.

Returns

Returns true if the button-press was handled.

Reimplemented in seq64::FruitySeqEventInput, and seq64::Seq24SeqEventInput.

10.86.2.28 on_motion_notify_event()

```
bool seq64::seqevent::on_motion_notify_event (
            GdkEventMotion * ev )  [private], [virtual]
```

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. Added some fixes, but then commented them out until better testing can be done.

Parameters

ev	The motion event.

Returns

Returns true if the motion-event was handled.

Reimplemented in seq64::FruitySeqEventInput, and seq64::Seq24SeqEventInput.

10.86.2.29 on_focus_in_event()

```
bool seq64::seqevent::on_focus_in_event (
            GdkEventFocus * )  [private], [virtual]
```

Parameter "ev" is the focus event, unused.

Returns

Always returns false.

10.86.2.30 on_focus_out_event()

```
bool seq64::seqevent::on_focus_out_event (
            GdkEventFocus * )  [private], [virtual]
```

Parameter "ev" is the focus event, unused.

Returns

Always returns false.

10.86.2.31 on_key_press_event()

```
bool seq64::seqevent::on_key_press_event (
            GdkEventKey * ev )  [private], [virtual]
```

It handles deleting 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. :-)

Parameters

ev	The key-press event.

Returns

Returns true if an event was handled. Only some of the handled events also cause the perform modification flag to be set as a side-effect.

10.86.2.32 on_size_allocate()

```
void seq64::seqevent::on_size_allocate (
            Gtk::Allocation & a )  [private], [virtual]
```

The m_window_x and m_window_y values are set to the allocation width and height, respectively.

Parameters

a	The allocation to be processed.

10.86.3 Field Documentation

10.86.3.1 m_seq

```
sequence& seq64::seqevent::m_seq  [protected]
```

10.86.3.2 m_zoom

```
int seq64::seqevent::m_zoom  [protected]
```

10.86.3.3 m_snap

```
int seq64::seqevent::m_snap  [protected]
```

Same meaning as for the piano roll. This value is the denominator of the note size used for the snap.

10.86.3.4 m_old

```
GdkRectangle seq64::seqevent::m_old  [protected]
```

10.86.3.5 m_selected

```
GdkRectangle seq64::seqevent::m_selected  [protected]
```

10.86.3.6 m_scroll_offset_ticks

```
int seq64::seqevent::m_scroll_offset_ticks [protected]
```

10.86.3.7 m_scroll_offset_x

```
int seq64::seqevent::m_scroll_offset_x [protected]
```

Set to m_scroll_offset_ticks divided by m_zoom.

10.86.3.8 m_seqdata_wid

```
seqdata& seq64::seqevent::m_seqdata_wid [protected]
```

10.86.3.9 m_adding

```
bool seq64::seqevent::m_adding [protected]
```

10.86.3.10 m_selecting

```
bool seq64::seqevent::m_selecting [protected]
```

10.86.3.11 m_moving_init

```
bool seq64::seqevent::m_moving_init [protected]
```

10.86.3.12 m_moving

```
bool seq64::seqevent::m_moving [protected]
```

WARNING: This operation seems to have a bug. It makes the events very very long. This bug exists in Seq24.

10.86.3.13 m_growing

```
bool seq64::seqevent::m_growing [protected]
```

Does growing work in this view? Need to do some better testing.

10.86.3.14 m_painting

```
bool seq64::seqevent::m_painting  [protected]
```

10.86.3.15 m_paste

```
bool seq64::seqevent::m_paste  [protected]
```

10.86.3.16 m_move_snap_offset_x

```
int seq64::seqevent::m_move_snap_offset_x  [protected]
```

10.86.3.17 m_status

```
midibyte seq64::seqevent::m_status  [protected]
```

The current status/event byte.

10.86.3.18 m_cc

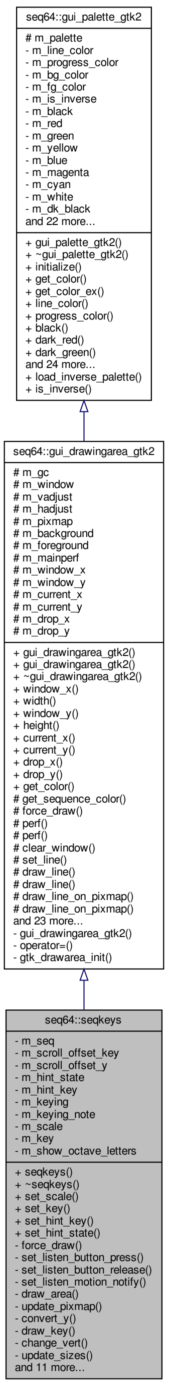
```
midibyte seq64::seqevent::m_cc  [protected]
```

The current MIDI CC value.

10.87 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.
- virtual ∼seqkeys ()

    Let's provide a do-nothing virtual destructor.
- void set_scale (int scale)

Sets the musical scale, then resets.
- void set_key (int key)

  Sets the musical key, then resets.
- void set_hint_key (int key)

  Sets a key to grey so that it can serve as a scale hint.
- void set_hint_state (bool state)

  Sets the hint state to the given value.

Private Member Functions

- virtual void force_draw ()

  Forces a draw operation on the whole window.
- void set_listen_button_press (GdkEventButton ∗ev)

  Sneaky accessors for the seqroll friend.
- void set_listen_button_release (GdkEventButton ∗ev)
- void set_listen_motion_notify (GdkEventMotion ∗ev)
- 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 y, int &note)

  Takes the screen y coordinate, and returns the note value in the second parameter.
- void draw_key (int key, bool 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 update_sizes ()
- void reset ()

  Resetting the keys view updates the pixmap and queues up a draw operation.
- bool is_black_key (int key) const

  Detects a black key.
- void on_realize ()

  Implements the on-realize event.
- bool on_expose_event (GdkEventExpose ∗ev)

  Implements the on-expose event, by drawing on the window.
- bool on_button_press_event (GdkEventButton ∗ev)

  Implements the on-button-press event callback.
- bool on_button_release_event (GdkEventButton ∗ev)

  Implements the on-button-release event callback.
- bool on_motion_notify_event (GdkEventMotion ∗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 ∗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

- sequence & m_seq

  The sequence object that the keys pane will be using.
- int m_scroll_offset_key

  Provides the value of the current top key in the keys pane.
- int m_scroll_offset_y

  Provides the value of the current top key in the keys pane in units of relative pixels.
- bool m_hint_state

  Indicates if a piano key is set to indicate where on the pitch scale the mouse cursor is sitting.
- int m_hint_key

  Indicates the current y-value of the mouse pointer in units of key value.
- bool m_keying

  Set to true while the left mouse button is being pressed.
- int m_keying_note

  The note to be played when selected in the seqkeys pane.
- int m_scale

  This member holds the scale value for the musical scale for the current edit of the sequence.
- int m_key

  This member holds the key value for the musical key for the current edit of the sequence.
- bool m_show_octave_letters

  The default value is to show the octave letters on the vertical virtual keyboard.

Friends

- class seqroll
- class FruitySeqRollInput

Additional Inherited Members

10.87.1 Detailed Description

Note the friends of this class, seqroll and FruitySeqRollInput. Where is Seq24SeqRollInput? Gone. It has been folded back into seqroll.

10.87.2 Constructor & Destructor Documentation

10.87.2.1 seqkeys()

```
seq64::seqkeys::seqkeys (
            sequence & seq,
            perform & p,
            Gtk::Adjustment & vadjust )
```

Parameters

seq	Provides the sequence object to which this seqkeys pane is associated.
p	Provides the performance object to which this seqkeys pane (and all sequences) are associated.
vadjust	The range object for the vertical scrollbar linked to the position in the seqkeys pane.

10.87.2.2 ∼seqkeys()

```
virtual seq64::seqkeys::∼seqkeys ( )  [inline], [virtual]
```

10.87.3 Member Function Documentation

10.87.3.1 set_scale()

```
void seq64::seqkeys::set_scale (
             int scale )
```

This function is called by the seqedit class.

Parameters

scale	The musical scale value to be set.

10.87.3.2 set_key()

```
void seq64::seqkeys::set_key (
             int key )
```

Parameters

key	The musical key value to be set.

10.87.3.3 set_hint_key()

```
void seq64::seqkeys::set_hint_key (
             int key )
```

If m_hint_state is true, the key is drawn (again).

Parameters

key	The key value to set the hint-key to.

10.87.3.4 set_hint_state()

```
void seq64::seqkeys::set_hint_state (
             bool state )
```

Parameters

state	Provides the value for hinting, where true == on, false == off.

10.87.3.5 force_draw()

```
void seq64::seqkeys::force_draw ( )  [private], [virtual]
```

Unlike most other overridden versions of force_draw(), this one does not call the base-class version.

Reimplemented from seq64::gui_drawingarea_gtk2.

10.87.3.6 set_listen_button_press()

```
void seq64::seqkeys::set_listen_button_press (
             GdkEventButton * ev )  [inline], [private]
```

From the stazed code.

Parameters

ev	The event to be forwarded from the seqroll.

10.87.3.7 set_listen_button_release()

```
void seq64::seqkeys::set_listen_button_release (
             GdkEventButton * ev )  [inline], [private]
```

10.87.3.8 set_listen_motion_notify()

```
void seq64::seqkeys::set_listen_motion_notify (
            GdkEventMotion * ev )  [inline], [private]
```

10.87.3.9 draw_area()

```
void seq64::seqkeys::draw_area ( )  [private]
```

10.87.3.10 update_pixmap()

```
void seq64::seqkeys::update_pixmap ( )  [private]
```

This function draws the keys, which range from 0 to 127 (SEQ64_MIDI_COUNT_MAX - 1 = c_num_keys - 1). Every octave, a key letter and number (e.g. "C4") is shown. The letter is adjusted to match the current scale (e.g. "C#4").

We want to support an option to show the key number rather than the note letter/number combination, and perhaps to toggle between them. The current difficulty is that the fonts used are just a little to high to fit within the vertical limits of each key. We really don't want to change the vertical size at this time, so we just print every other note value.

Also note that this algorithm draws from the top down, so we have to account for that.

10.87.3.11 convert_y()

```
void seq64::seqkeys::convert_y (
            int y,
            int & note )  [private]
```

Parameters

	y	The y (vertical) screen coordinate to convert.
out	*note*	The destination for the note calculation. This would be better as a return value.

10.87.3.12 draw_key()

```
void seq64::seqkeys::draw_key (
            int key,
            bool state )  [private]
```

It accounts for the black keys and the white keys, and for the highlighting of the active key.

Parameters

key	The key to be drawn.
state	How the key is to be drawn, where false == normal, true == grayed. A key is greyed when the mouse cursor is at the same vertical location on the piano as the key.

10.87.3.13 change_vert()

```
void seq64::seqkeys::change_vert ( )  [private]
```

Weird, in seq24 and here, the following was used, completely by accident! We fixed it, but must beware!

```
    m_scroll_offset_y = m_scroll_offset_key * c_key_y,  // comma operator!!!
    force_draw();
```

10.87.3.14 update_sizes()

```
void seq64::seqkeys::update_sizes ( )  [private]
```

10.87.3.15 reset()

```
void seq64::seqkeys::reset ( )  [private]
```

10.87.3.16 is_black_key()

```
bool seq64::seqkeys::is_black_key (
             int key ) const  [inline], [private]
```

Parameters

key	The key to analyze.

Returns

Returns true if the key is black (value 1, 3, 6, 8, or 10).

10.87.3.17 on_realize()

```
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.

10.87.3.18 on_expose_event()

```
bool seq64::seqkeys::on_expose_event (
            GdkEventExpose * ev )  [private]
```

Parameters

ev	The expose-event object.

10.87.3.19 on_button_press_event()

```
bool seq64::seqkeys::on_button_press_event (
            GdkEventButton * ev )  [private]
```

It handles the left and right buttons. The left button, pressed on the piano keyboard, causes m_keying to be set to true, and the given note to play. The right button toggles the note display between letter/number and MIDI note number.

Parameters

ev	The mouse-button event to use.

Returns

Always returns true.

10.87.3.20 on_button_release_event()

```
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.

Parameters

ev	The button-event.

Returns

Always returns true.

10.87.3.21 on_motion_notify_event()

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

This allows rolling down the keyboard, playing the notes one-by-one.

Parameters

p0	The motion event.

Returns

Always returns false.

10.87.3.22 on_enter_notify_event()

```
bool seq64::seqkeys::on_enter_notify_event (
            GdkEventCrossing * p0 )  [private]
```

This greys the current key.

10.87.3.23 on_leave_notify_event()

```
bool seq64::seqkeys::on_leave_notify_event (
            GdkEventCrossing * p0 )  [private]
```

This un-greys the current key and stops playing the note.

10.87.3.24 on_scroll_event()

```
bool seq64::seqkeys::on_scroll_event (
            GdkEventScroll * ev )  [private]
```

Note that there is no usage of the modifier keys (e.g. Shift or Ctrl). Compare this function to seqedit::on_scroll_↩ event().

Parameters

ev	Provides the direction of the scroll event.

Returns

Always returns true.

10.87.3.25 on_size_allocate()

```
void seq64::seqkeys::on_size_allocate (
            Gtk::Allocation & all )  [private]
```

Parameters

all	Provies the allocation and its width and height.

10.87.4 Friends And Related Function Documentation

10.87.4.1 seqroll

```
friend class seqroll  [friend]
```

10.87.4.2 FruitySeqRollInput

```
friend class FruitySeqRollInput  [friend]
```

10.87.5 Field Documentation

10.87.5.1 m_seq

```
sequence& seq64::seqkeys::m_seq  [private]
```

10.87.5.2 m_scroll_offset_key

```
int seq64::seqkeys::m_scroll_offset_key  [private]
```

Modified in change_vert().

10.87.5.3 m_scroll_offset_y

```
int seq64::seqkeys::m_scroll_offset_y  [private]
```

Modified in change_vert().

10.87.5.4 m_hint_state

```
bool seq64::seqkeys::m_hint_state  [private]
```

10.87.5.5 m_hint_key

```
int seq64::seqkeys::m_hint_key  [private]
```

10.87.5.6 m_keying

```
bool seq64::seqkeys::m_keying  [private]
```

Used in playing the sound for each note as it is clicked in the seqkeys pane.

10.87.5.7 m_keying_note

```
int seq64::seqkeys::m_keying_note  [private]
```

10.87.5.8 m_scale

```
int seq64::seqkeys::m_scale  [private]
```

10.87.5.9 m_key

```
int seq64::seqkeys::m_key  [private]
```

10.87.5.10 m_show_octave_letters

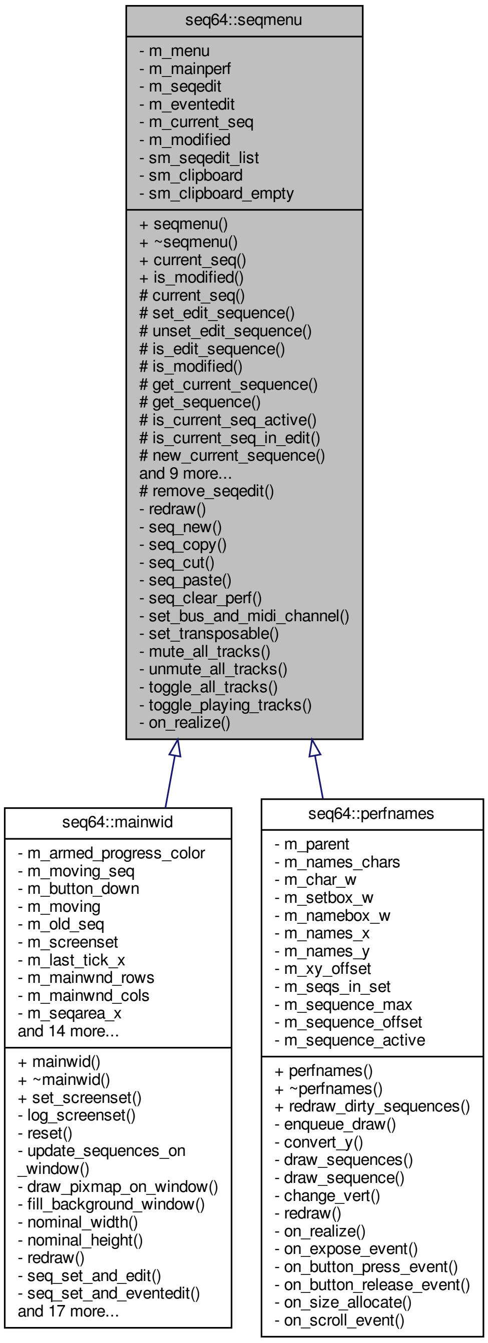
```
bool seq64::seqkeys::m_show_octave_letters  [private]
```

If false, then the MIDI key numbers are shown instead. This is a new feature of Sequencer64.

10.88 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_seq () const

'Getter' function for member m_current_seq We're changing the name, so that "seq" indicates an integer by (an imperfect) convention.

- bool is_modified () const

  'Getter' function for member m_modified

Protected Member Functions

- void current_seq (int seq)

  'Setter' function for member m_current_seq
- void set_edit_sequence (int seqnum)

  'Setter' function for member m_edit_sequence Pass in -1 to disable the edit-sequence number.
- void unset_edit_sequence (int seqnum)

  'Setter' function for member m_edit_sequence Disable the edit-sequence number if it matches the parameter.
- bool is_edit_sequence (int seqnum) const

  'Getter' function for member m_edit_sequence Tests the parameter against m_edit_sequence.
- void is_modified (bool flag)

  'Setter' function for member m_modified
- sequence ∗ get_current_sequence () const

  'Getter' function for member m_mainperf.get_sequence(current_seq()) This call is used many, many times, and well worth wrapping.
- sequence ∗ get_sequence (int seqnum) const

  Forwards the get-sequence call to the perform object.
- bool is_current_seq_active () const

  Forwards the is-sequence-active check to the perform object.
- bool is_current_seq_in_edit () const

  Forwards the is-sequence-in-edit check to the perform object.
- void new_current_sequence ()

  Forwards the new-current-sequence call to the perform object.
- void new_sequence (int seqnum)

  Forwards the new-sequence call to the perform object.
- void delete_current_sequence ()

  Forwards the delete-sequence call to the perform object.
- void toggle_current_sequence ()

  Forwards the sequence-playing-toggle call to the perform object.
- void popup_menu ()

  This function sets up the pattern menu entries.
- void seq_edit ()

  This menu callback launches the sequence-editor (pattern editor) window.
- void seq_event_edit ()

  This menu callback launches the new event editor window.
- seqedit ∗ create_seqedit (sequence &s)

  A wrapper function so that we can not only create a new seqedit object, but have some management over it.
- virtual void seq_set_and_edit (int seqnum)

  Sets the current sequence and then acts as if the user had clicked on its slot.
- virtual void seq_set_and_eventedit (int seqnum)

  Sets the current sequence and then acts as if the user had right-clicked on its slot and selected "Event Edit".

Static Protected Member Functions

- static void remove_seqedit (sequence &s)

  A wrapper function to make sure the seqedit object is removed from the list when it goes away.

Private Types

- typedef std::map< int, seqedit ∗ > SeqeditMap

  An easy type definition for a map of seqedit pointers keyed by the sequence number.
- typedef std::pair< int, seqedit ∗ > SeqeditPair

  A pair to make an entry to add to the seqedit map.
- typedef std::map< int, seqedit ∗ >::iterator iterator

  An iterator for the seqedit map.
- typedef std::map< int, seqedit ∗ >::const_iterator const_iterator

  A const iterator for the seqedit map.

Private Member Functions

- virtual void redraw (int a_sequence)=0
- 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 set_transposable (bool flag)

  Sets the "is-transposable" flag of the current sequence.
- void mute_all_tracks ()

  Mutes all tracks in the main perform object.
- void unmute_all_tracks ()

  Unmutes all tracks in the main perform object.
- void toggle_all_tracks ()

  Toggles the mute-status of all tracks in the main perform object.
- void toggle_playing_tracks ()

  Toggles the mute-status of only the playing tracks in the main perform object.
- void on_realize ()

Private Attributes

- Gtk::Menu ∗ m_menu

  The menu to pop up when the right-click action is used either on a mainwid pattern slot or on a perfedit pattern name.
- perform & m_mainperf

  Provides a reference to the central (non-UI) object involved in managing a song and performance.
- seqedit ∗ m_seqedit

  Points to the latest seqedit object, if created.
- eventedit ∗ m_eventedit

  Points to the latest eventedit object, if created.
- int m_current_seq

  References the current sequence by sequence number.
- bool m_modified

  Indicates if a sequence has been created.

Static Private Attributes

- static SeqeditMap sm_seqedit_list

  Holds a list of the currently open seqedit objects, stored as pointers keyed by the sequence number.
- static sequence sm_clipboard

  Holds a copy of data concerning a sequence, which can then be pasted into another pattern slot.
- static bool sm_clipboard_empty

  Indicates if the common clipboard is empty.

Friends

- class mainwnd
- class seqedit

10.88.1 Detailed Description

It is an abstract base class.

10.88.2 Member Typedef Documentation

10.88.2.1 SeqeditMap

```
typedef std::map<int, seqedit *> seq64::seqmenu::SeqeditMap  [private]
```

10.88.2.2 SeqeditPair

```
typedef std::pair<int, seqedit *> seq64::seqmenu::SeqeditPair  [private]
```

10.88.2.3 iterator

```
typedef std::map<int, seqedit *>::iterator seq64::seqmenu::iterator  [private]
```

10.88.2.4 const_iterator

```
typedef std::map<int, seqedit *>::const_iterator seq64::seqmenu::const_iterator  [private]
```

10.88.3 Constructor & Destructor Documentation

10.88.3.1 seqmenu()

```
seq64::seqmenu::seqmenu (
            perform & 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.

Parameters

p	The main performance object representing the whole MIDI song.

10.88.3.2 ∼seqmenu()

```
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.

10.88.4 Member Function Documentation

10.88.4.1 current_seq() [1/2]

```
int seq64::seqmenu::current_seq ( ) const [inline]
```

10.88.4.2 is_modified() [1/2]

```
bool seq64::seqmenu::is_modified ( ) const [inline]
```

10.88.4.3 current_seq() [2/2]

```
void seq64::seqmenu::current_seq (
             int seq ) [inline], [protected]
```

10.88.4.4 set_edit_sequence()

```
void seq64::seqmenu::set_edit_sequence (
             int seqnum ) [inline], [protected]
```

Now a pass-along to the perform object.

10.88.4.5 unset_edit_sequence()

```
void seq64::seqmenu::unset_edit_sequence (
             int seqnum )  [inline], [protected]
```

10.88.4.6 is_edit_sequence()

```
bool seq64::seqmenu::is_edit_sequence (
             int seqnum ) const  [inline], [protected]
```

Returns true if that member is not -1, and the parameter matches it. Now a pass-along to the perform object.

10.88.4.7 is_modified() [2/2]

```
void seq64::seqmenu::is_modified (
             bool flag )  [inline], [protected]
```

10.88.4.8 get_current_sequence()

```
sequence* seq64::seqmenu::get_current_sequence ( ) const  [inline], [protected]
```

10.88.4.9 get_sequence()

```
sequence* seq64::seqmenu::get_sequence (
             int seqnum ) const  [inline], [protected]
```

10.88.4.10 is_current_seq_active()

```
bool seq64::seqmenu::is_current_seq_active ( ) const  [inline], [protected]
```

10.88.4.11 is_current_seq_in_edit()

```
bool seq64::seqmenu::is_current_seq_in_edit ( ) const  [inline], [protected]
```

10.88.4.12 new_current_sequence()

```
void seq64::seqmenu::new_current_sequence ( )  [inline], [protected]
```

10.88.4.13 new_sequence()

```
void seq64::seqmenu::new_sequence (
             int seqnum )  [inline], [protected]
```

10.88.4.14 delete_current_sequence()

```
void seq64::seqmenu::delete_current_sequence ( )  [inline], [protected]
```

10.88.4.15 toggle_current_sequence()

```
void seq64::seqmenu::toggle_current_sequence ( )  [inline], [protected]
```

10.88.4.16 popup_menu()

```
void seq64::seqmenu::popup_menu ( )  [protected]
```

It also sets up the pattern popup menu entries that are used in mainwid. Note that, for the selected sequence, the "Edit" and "Event Edit" menu entries are not included if a pattern editor or event editor is already running. The new event editor seems to create far-reaching problems that we do not yet understand, so it is now possible to disable it at build time. We have mitigated most of those problems by not allowing both a seq_edit() and a seq_event_edit() at the same time.

10.88.4.17 seq_edit()

```
void seq64::seqmenu::seq_edit ( )  [protected]
```

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!

An oddity is that calling show_all() here does not work unless the seqedit() constructor makes its show_all() call.

10.88.4.18 seq_event_edit()

```
void seq64::seqmenu::seq_event_edit ( )  [protected]
```

If it is already open for that sequence, this function just raises it.

Note that the m_eventedit member to which we save the new pointer is currently there just to avoid a compiler warning.

This menu entry is available only if the selected sequence is active. That is, if the sequence has already been created.

An oddity is that we need the show_all() call here in order to see the dialog. A situation different from that for seqedit! However, now it doesn't seem to be needed, and we have put it back into the eventedit constructor.

10.88.4.19 create_seqedit()

```
seqedit * seq64::seqmenu::create_seqedit (
              sequence & s )  [protected]
```

We don't bother checking here if the insert succeeded. If it doesn't, all bets are off.

Parameters

s	Provides the sequence for which the seqedit will be created. The perform object and the current_seq() value are implicit parameters. This object can obviously be modified by the sequence editor, so cannot be constant.

Returns

Returns the pointer to the new seqedit object.

10.88.4.20 remove_seqedit()

```
void seq64::seqmenu::remove_seqedit (
              sequence & s )  [static], [protected]
```

Called by seqedit::on_delete_event().

10.88.4.21 seq_set_and_edit()

```
void seq64::seqmenu::seq_set_and_edit (
              int seqnum )  [protected], [virtual]
```

How do we account for the current screenset? It might not matter if the mute/unmute keystrokes were designed to work only with the current screenset.

Change Note ca 2016-11-01 We would like to be able to right-click on a given pattern slot in mainwid, and figure out if it has a seqedit window open, so that we can update that window. So we need to add that seqedit window to a map of seqedits, keyed by the slot number. Then we can look up that slot and see if it has a seqedit window open. If the seqedit window closes, that window needs to remove itself from the map. This won't be needed for the event editor, which has no functionality from seqmenu.

Parameters

seqnum	The number of the sequence to edit.

Reimplemented in seq64::mainwid.

10.88.4.22 seq_set_and_eventedit()

```
void seq64::seqmenu::seq_set_and_eventedit (
             int seqnum )  [protected], [virtual]
```

Parameters

seqnum	The number of the sequence to event-edit.

Reimplemented in seq64::mainwid.

10.88.4.23 redraw()

```
virtual void seq64::seqmenu::redraw (
             int a_sequence )  [private], [pure virtual]
```

Implemented in seq64::mainwid, and seq64::perfnames.

10.88.4.24 seq_new()

```
void seq64::seqmenu::seq_new ( )  [private]
```

For one thing, if current_seq() is either a -1 or is greater than the maximum allowed sequence number, perform↩ ::is_active() will return false, and we have no idea whether the sequence is not active or the sequence number is just invalid. So we need to check the pointer we got before trying to use it.

10.88.4.25 seq_copy()

```
void seq64::seqmenu::seq_copy ( )  [private]
```

We use a more appropriate function than operator =() here: sequence::partial_assign().

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

10.88.4.26 seq_cut()

```
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.

10.88.4.27 seq_paste()

```
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.

10.88.4.28 seq_clear_perf()

```
void seq64::seqmenu::seq_clear_perf ( )  [private]
```

10.88.4.29 set_bus_and_midi_channel()

```
void seq64::seqmenu::set_bus_and_midi_channel (
            int bus,
            int ch )  [private]
```

Parameters

bus	The MIDI buss number to set (bus vs buss? You decide.)
ch	The MIDI channel number to set.

10.88.4.30 set_transposable()

```
void seq64::seqmenu::set_transposable (
            bool flag )  [private]
```

Parameters

flag	The value to use to set the flag.

10.88.4.31 mute_all_tracks()

```
void seq64::seqmenu::mute_all_tracks ( )  [inline], [private]
```

10.88.4.32 unmute_all_tracks()

```
void seq64::seqmenu::unmute_all_tracks ( )  [inline], [private]
```

10.88.4.33 toggle_all_tracks()

```
void seq64::seqmenu::toggle_all_tracks ( )  [inline], [private]
```

10.88.4.34 toggle_playing_tracks()

```
void seq64::seqmenu::toggle_playing_tracks ( )  [inline], [private]
```

Note that the perform object will do this action only in Live mode.

10.88.4.35 on_realize()

```
void seq64::seqmenu::on_realize ( )  [private]
```

10.88.5 Friends And Related Function Documentation

10.88.5.1 mainwnd

```
friend class mainwnd  [friend]
```

10.88.5.2 seqedit

```
friend class seqedit  [friend]
```

10.88.6 Field Documentation

10.88.6.1 sm_seqedit_list

```
seqmenu::SeqeditMap seq64::seqmenu::sm_seqedit_list  [static], [private]
```

The single map of seqedit objects, for seqedit updates and management.

We can use this map to look up patterns that we want to change from the right-click seqmenu, and modify the seqedit affected if it is found in the list.

Currently selectable by the USE_SEQEDIT_MACRO until we can make it foolproof.

10.88.6.2 sm_clipboard

```
sequence seq64::seqmenu::sm_clipboard  [static], [private]
```

Current saved sequence data.

10.88.6.3 sm_clipboard_empty

```
bool seq64::seqmenu::sm_clipboard_empty  [static], [private]
```

Indicates if sequence data is present or not.

10.88.6.4 m_menu

```
Gtk::Menu* seq64::seqmenu::m_menu  [private]
```

10.88.6.5 m_mainperf

```
perform& seq64::seqmenu::m_mainperf  [private]
```

10.88.6.6 m_seqedit

```
seqedit* seq64::seqmenu::m_seqedit  [private]
```

Change Note Added by Chris on 2015-08-02 based on compiler warnings and a comment warning in the seq_edit() function. We'll save the result of that function here, and will let valgrind tell us later if Gtkmm takes care of it.

10.88.6.7 m_eventedit

```
eventedit* seq64::seqmenu::m_eventedit  [private]
```

10.88.6.8 m_current_seq

```
int seq64::seqmenu::m_current_seq  [private]
```

10.88.6.9 m_modified

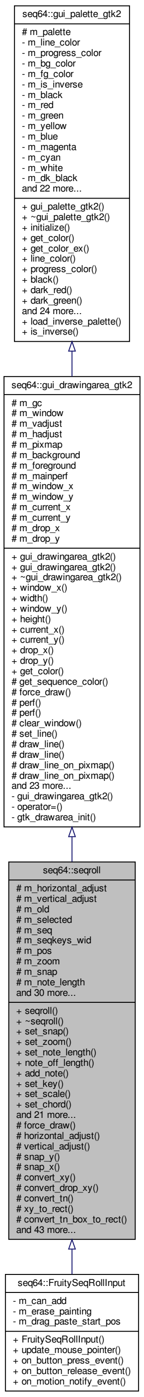
```
bool seq64::seqmenu::m_modified  [private]
```

Todo We need to make sure that the perform object is in control of the modification flag.

10.89 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)

    Principal constructor.
- virtual ~seqroll ()

    Provides a destructor to delete allocated objects.

- 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
- int note_off_length () const

    'Getter' function for member m_note_length, adjusted for the note_off_margin.
- bool add_note (midipulse tick, int note, bool paint=true)

    Convenience wrapper for sequence::add_note().
- 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_chord (int chord)

    Sets the current chord to the given value.
- void set_data_type (midibyte status, midibyte 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 selecton on the main window.
- void draw_progress_on_window ()

    Draw a progress line on the window.
- void reset ()

    This function basically resets the whole widget as if it were realized again.
- void update_and_draw (int force=false)

    Wraps up some common code.
- void redraw ()

    Redraws unless m_ignore_redraw is true.
- void redraw_events ()

    Redraws events unless m_ignore_redraw is true.
- void start_paste ()

    Starts a paste operation.
- void complete_paste ()
- void complete_paste (int x, int y)

    Completes a paste operation.
- void follow_progress ()

    Checks the position of the tick, and, if it is in a different piano-roll "page" than the last page, moves the page to the next page.

- void set_expanded_recording (bool expand)

  'Getter' function for member m_expanded_recording
- bool get_expanded_record ()

  'Setter' function for member m_expanded_recording
- void set_progress_follow (bool follow)

  'Getter' function for member m_progress_follow
- bool get_progress_follow ()

  'Setter' function for member m_progress_follow

Protected Member Functions

- virtual void force_draw ()

  Set the pixmap into the window and then draws the selection on it.
- void horizontal_adjust (double step)

  This function provides optimization for the on_scroll_event() function.
- void vertical_adjust (double step)

  This function provides optimization for the on_scroll_event() function.
- void snap_y (int &y)

  Snaps the y value to the piano-key "height".
- void snap_x (int &x)

  Performs a 'snap' operation on the x coordinate.
- void convert_xy (int x, int y, midipulse &tick, int &note)
- void convert_drop_xy (midipulse &tick, int &note)

  Convenience function that calls convert_xy() for the drop and y values.
- void convert_tn (midipulse tick, int note, int &x, int &y)

  This function takes the given note and tick, and returns the screen coordinates via the pointer parameters.
- void xy_to_rect (int x1, int y1, int x2, int y2, int &x, int &y, int &w, int &h)
- void convert_tn_box_to_rect (midipulse tick_s, midipulse 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 convert_tn_box_to_rect (midipulse tick_s, midipulse tick_f, int note_h, int note_l, rect &r)

  Converts a tick/note box to an x/y rectangle.
- void convert_sel_box_to_rect (midipulse tick_s, midipulse tick_f, int note_h, int note_l)

  A convenience function wrapping a common call to convert_tn_box_to_rect().
- void get_selected_box (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l)

  A convenience function wrapping a common call to m_seq.get_selected_box() and convert_tn_box_to_rect().
- void draw_events_on (Glib::RefPtr< Gdk::Drawable > draw)

  Draws events on the given drawable area.
- int idle_redraw ()

  Draw the events on the main window and on the pixmap.
- int idle_progress ()
- void change_horz ()

  Change the horizontal scrolling offset and redraw.
- void change_vert ()

  Change the vertical scrolling offset and redraw.
- void move_selection_box (int dx, int dy)

  Function to allow motion of the selection box via the arrow keys.
- void move_selected_notes (int dx, int dy)

  Proposed new function to encapsulate the movement of selections even more fully.
- void grow_selected_notes (int dx)

Proposed new function to encapsulate the movement of selections even more fully.

- void set_adding (bool adding)

  Changes the mouse cursor pixmap according to whether a note is being added or not.
- void update_mouse_pointer (bool adding=false)

  Updates the mouse pointer, implementing a context-sensitive mouse.
- bool button_press_initial (GdkEventButton ∗ev, int &norm_x, int &snapped_x, int &snapped_y)
- void align_selection (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l, int snapped_x)

  Get the box that selected elements are in.
- bool button_press (GdkEventButton ∗ev)

  Implements the on-button-press event handling for the Seq24 style of mouse interaction.
- bool button_release (GdkEventButton ∗ev)

  Implements the on-button-release event handling for the Seq24 style of mouse interaction.
- bool motion_notify (GdkEventMotion ∗ev)

  Seq24-style on-motion mouse interaction.
- void clear_flags ()

  Clears all the mouse-action flags.
- void set_scroll_x ()

  Sets the horizontal scroll value according to the current value of the horizontal scroll-bar.
- void set_scroll_y ()

  Sets the vertical scroll value according to the current value of the vertical scroll-bar.
- int scroll_offset_x (int x) const

  Useful x calculation.
- int scroll_offset_y (int y) const

  Useful y calculation.
- void set_current_offset_x_y (int x, int y)

  Useful x and y calculation.
- bool adding () const

  'Getter' function for member m_adding
- bool selecting () const

  'Getter' function for member m_selecting
- bool growing () const

  'Getter' function for member m_growing
- bool normal_action () const

  Indicates if we're drag-pasting, selecting, moving, growing, or pasting.
- bool select_action () const

  Indicates if we're selecting, moving, growing, or pasting.
- bool drop_action () const

  Indicates if we're moving or pasting.
- bool moving () const

  'Getter' function for member m_moving
- virtual void on_realize ()

  Implements the on-realize event handling.
- virtual bool on_expose_event (GdkEventExpose ∗ev)

  Implements the on-expose event handling.
- virtual bool on_button_press_event (GdkEventButton ∗ev)

  Implements the on-button-press event handling.
- virtual bool on_button_release_event (GdkEventButton ∗ev)

  Implements the on-button-release event handling.
- virtual bool on_motion_notify_event (GdkEventMotion ∗ev)

  Implements the on-motion-notify event handling.
- virtual bool on_focus_in_event (GdkEventFocus ∗)

Implements the on-focus event handling.
- virtual bool on_focus_out_event (GdkEventFocus ∗)

  Implements the on-unfocus event handling.
- virtual bool on_key_press_event (GdkEventKey ∗ev)

  Implements the on-key-press event handling.
- virtual bool on_scroll_event (GdkEventScroll ∗a_ev)

  Implements the on-scroll event handling.
- virtual void on_size_allocate (Gtk::Allocation &)

  Implements the on-size-allocate event handling.
- virtual bool on_leave_notify_event (GdkEventCrossing ∗p0)

  Implements the on-leave-notify event handling.
- virtual bool on_enter_notify_event (GdkEventCrossing ∗p0)

  Implements the on-enter-notify event handling.

Protected Attributes

- Gtk::Adjustment & m_horizontal_adjust

  For accessing on_key_press_event().
- Gtk::Adjustment & m_vertical_adjust

  We need direct access to the vertical scrollbar if we want to be able to make it follow PageUp and PageDown.
- rect m_old

  The previous selection rectangle, used for undrawing it.
- rect m_selected

  Used in moving and pasting notes.
- sequence & m_seq

  Provides a reference to the sequence represented by piano roll.
- seqkeys & m_seqkeys_wid

  Holds a reference to the seqkeys pane that is associated with the seqroll piano roll.
- int m_pos

  A position value.
- int m_zoom

  Zoom setting, means that one pixel == m_zoom ticks.
- int m_snap

  The grid-snap setting for the piano roll grid.
- int m_note_length

  Holds the note length in force for this sequence.
- int m_scale

  Indicates the musical scale in force for this sequence.
- int m_chord

  Indicates the current chord in force for this sequence for inserting notes.
- int m_key

  Indicates the musical key in force for this sequence.
- bool m_adding

  Set when in note-adding mode.
- bool m_selecting

  Set when highlighting a bunch of events.
- bool m_moving

  Set when moving a bunch of events.
- bool m_moving_init

  Indicates the beginning of moving some events.

- bool m_growing

  Indicates that the notes are to be extended or reduced in length.
- bool m_painting

  Indicates the painting of events.
- bool m_paste

  Indicates that we are in the process of pasting notes.
- bool m_is_drag_pasting

  Indicates the drag-pasting of events.
- bool m_is_drag_pasting_start

  Indicates the drag-pasting of events.
- bool m_justselected_one

  Indicates the selection of one event.
- int m_move_delta_x

  Tells where the dragging started, the x value.
- int m_move_delta_y

  Tells where the dragging started, the y value.
- int m_move_snap_offset_x

  This item is used in the fruityseqroll module.
- int m_progress_x

  Provides the location of the progress bar.
- int m_scroll_offset_ticks

  The horizontal value of the scroll window in units of ticks/pulses/divisions.
- int m_scroll_offset_key

  The vertical offset of the scroll window in units of MIDI notes/keys.
- int m_scroll_offset_x

  The horizontal value of the scroll window in units of pixels.
- int m_scroll_offset_y

  The vertical value of the scroll window in units of pixels.
- int m_scroll_page

  Provides the current scroll page in which the progress bar resides.
- bool m_progress_follow

  Progress bar follow state.
- bool m_transport_follow

  Indicates if we are going to follow the transport in the GUI.
- bool m_trans_button_press

  TBD.
- int m_background_sequence

  Holds the value of the musical background sequence that is shown in cyan (formerly grey) on the background of the piano roll.
- bool m_drawing_background_seq

  Set to true if the drawing of the background sequence is to be done.
- bool m_expanded_recording

  Provides an option for expanding the number of measures while recording.
- midibyte m_status

  The current status/event selected in the seqedit.
- midibyte m_cc

  The current MIDI control value selected in the seqedit.

Additional Inherited Members

10.89.1 Constructor & Destructor Documentation

10.89.1.1 seqroll()

```
seq64::seqroll::seqroll (
             perform & p,
             sequence & seq,
             int zoom,
             int snap,
             seqkeys & seqkeys_wid,
             int pos,
             Gtk::Adjustment & hadjust,
             Gtk::Adjustment & vadjust )
```

Parameters

p	The performance object that helps control this piano roll. Note that we can get the perform object from the sequence, and save a parameter. Low priority change.
seq	The sequence object represented by this piano roll.
zoom	The initial zoom of this piano roll.
snap	The initial grid snap of this piano roll.
seqkeys_wid	A reference to the piano keys window that is shown to the left of this piano roll.
pos	A position parameter. See the description of seqroll::m_pos. This is actually the sequence number, and is currently unused. However, we're sure we can find a use for it sometime.
hadjust	Represents the horizontal scrollbar of this window. It is actually created by the "parent" seqedit object.
vadjust	Represents the vertical scrollbar of this window. It is actually created by the "parent" seqedit object.

10.89.1.2 ∼seqroll()

```
seq64::seqroll::∼seqroll ( ) [virtual]
```

The only thing to delete here is the clipboard. Except it is never used, so is commented out.

10.89.2 Member Function Documentation

10.89.2.1 set_snap()

```
void seq64::seqroll::set_snap (
             int snap ) [inline]
```

Parameters

snap	Provides the sname value to set.

10.89.2.2 set_zoom()

```
void seq64::seqroll::set_zoom (
            int zoom )
```

Parameters

zoom	The desired zoom value, assumed to be validated already. See the seqedit::set_zoom() function.

10.89.2.3 set_note_length()

```
void seq64::seqroll::set_note_length (
            int note_length )  [inline]
```

10.89.2.4 note_off_length()

```
int seq64::seqroll::note_off_length ( ) const  [inline]
```

10.89.2.5 add_note()

```
bool seq64::seqroll::add_note (
            midipulse tick,
            int note,
            bool paint = true )
```

The length parameters is obtained from the note_off_length() function. This sets the note length at a little less than the snap value.

Parameters

tick	The time destination of the new note, in pulses.
note	The pitch destination of the new note.
paint	If true, repaint to be left with just the inserted event. The default is true. The value of false is useful in inserting a number of events and saving the repainting until last. It is a bit tricky, as the default paint value for sequence::add_note() is false.

10.89.2.6 set_key()

```
void seq64::seqroll::set_key (
             int key )
```

Parameters

key	The desired key value.

10.89.2.7 set_scale()

```
void seq64::seqroll::set_scale (
             int scale )
```

Parameters

scale	The desired scale value.

10.89.2.8 set_chord()

```
void seq64::seqroll::set_chord (
             int chord )
```

Parameters

chord	The desired chord value.

10.89.2.9 set_data_type()

```
void seq64::seqroll::set_data_type (
             midibyte status,
             midibyte control ) [inline]
```

Unlike the same function in seqevent, this version does not redraw. Used by seqedit.

10.89.2.10 set_background_sequence()

```
void seq64::seqroll::set_background_sequence (
             bool state,
             int seq )
```

The state parameter sets the boolean m_drawing_background_seq.

Parameters

state	If true, the background sequence will be drawn.
seq	Provides the sequence number, which is checked against the SEQ64_IS_LEGAL_SEQUENCE() macro before being used. This macro allows the value SEQ64_SEQUENCE_LIMIT, which disables the background sequence.

10.89.2.11 update_pixmap()

```
void seq64::seqroll::update_pixmap ( )
```

10.89.2.12 update_sizes()

```
void seq64::seqroll::update_sizes ( )
```

It brings the scrollbar back to the beginning, resets the upper limit to the number of ticks in the sequence, sets the page-size based on the window size and the zoom factor.

The horizontal step increment is 1 semiquaver (1/16) note per zoom level. The horizontal page increment is currently always one bar. We may want to make that larger for scrolling after the progress bar.

Tha maximum value set for the scrollbar brings it to the last "page" of the piano roll.

The vertical size are also adjusted. More on the story later.

10.89.2.13 update_background()

```
void seq64::seqroll::update_background ( )
```

The first thing done is to clear the background, painting it white.

10.89.2.14 draw_background_on_pixmap()

```
void seq64::seqroll::draw_background_on_pixmap ( )
```

10.89.2.15 draw_events_on_pixmap()

```
void seq64::seqroll::draw_events_on_pixmap ( )
```

Just calls draw_events_on().

10.89.2.16 draw_selection_on_window()

```
void seq64::seqroll::draw_selection_on_window ( )
```

Note the parameters of draw_drawable(), which we need to be sure of to draw thicker boxes.

```
-   x and y position of rectangle to draw
-   x and y position in drawable where rectangle should be drawn
-   width and height of rectangle to draw
```

A final parameter of false draws an unfilled rectangle. Orange makes it a little more clear that we're pasting, I think. We also want to try to thicken the lines somehow.

10.89.2.17 draw_progress_on_window()

```
void seq64::seqroll::draw_progress_on_window ( )
```

This is done by first blanking out the line with the background, which contains white space and grey lines, using the the draw_drawable function. Remember that we wrap the draw_drawable() function so it's parameters are xsrc, ysrc, xdest, ydest, width, and height.

Note that the progress-bar position is based on the sequence::get_last_tick() value, the current zoom, and the current scroll-offset x value.

Finally, we had an issue with the selection box flickering, which seems to be solved satisfactorily by not drawing it if a select action is in force. Hopefully no one needs to select notes on the fly and see the progress bar moving at the same time! Another tactic is to draw progress only when the performance is running. This has the benefit/drawback that the progress bar is left where it stops. Consider an enumeration of options: normal, when-not-selecting, and when-running.

10.89.2.18 reset()

```
void seq64::seqroll::reset ( )
```

It's almost identical to the change_horz() function, just calling update_sizes() before update_and_draw().

10.89.2.19 update_and_draw()

```
void seq64::seqroll::update_and_draw (
             int force = false )
```

Parameters

force	If true, force an immediate draw, otherwise just queue up a draw. This value defaults to false.

10.89.2.20 redraw()

```
void seq64::seqroll::redraw ( )
```

Somewhat similar to seqevent::redraw(). Actually, we don't seem to need to ignore redraw when making settings in the seqedit constructor, so this member no longer exists.

10.89.2.21 redraw_events()

```
void seq64::seqroll::redraw_events ( )
```

Actually, that member is not needed and no longer exists.

10.89.2.22 start_paste()

```
void seq64::seqroll::start_paste ( )
```

10.89.2.23 complete_paste() [1/2]

```
void seq64::seqroll::complete_paste ( )  [inline]
```

10.89.2.24 complete_paste() [2/2]

```
void seq64::seqroll::complete_paste (
            int x,
            int y )
```

10.89.2.25 follow_progress()

```
void seq64::seqroll::follow_progress ( )
```

We don't want to do any of this if the length of the sequence fits in the window, but for now it doesn't hurt; the progress bar just never meets the criterion for moving to the next page.

Todo

- If playback is disabled (such as by a trigger), then do not update the page;
- When it comes back, make sure we're on the correct page;
- When it stops, put the window back to the beginning, even if the beginning is not defined as "0".

10.89.2.26 set_expanded_recording()

```
void seq64::seqroll::set_expanded_recording (
            bool expand )  [inline]
```

10.89.2.27 get_expanded_record()

```
bool seq64::seqroll::get_expanded_record ( )  [inline]
```

10.89.2.28 set_progress_follow()

```
void seq64::seqroll::set_progress_follow (
            bool follow )  [inline]
```

10.89.2.29 get_progress_follow()

```
bool seq64::seqroll::get_progress_follow ( )  [inline]
```

10.89.2.30 force_draw()

```
void seq64::seqroll::force_draw ( )  [protected], [virtual]
```

Reimplemented from seq64::gui_drawingarea_gtk2.

10.89.2.31 horizontal_adjust()

```
void seq64::seqroll::horizontal_adjust (
            double step )  [inline], [protected]
```

A duplicate of the one in seqedit.

Parameters

step	Provides the step value to use for adjusting the horizontal scrollbar. See gui_drawingarea_gtk2::scroll_hadjust() for more information.

10.89.2.32 vertical_adjust()

```
void seq64::seqroll::vertical_adjust (
            double step )  [inline], [protected]
```

A duplicate of the one in seqedit.

Parameters

step	Provides the step value to use for adjusting the vertical scrollbar. See gui_drawingarea_gtk2::scroll_vadjust() for more information.

10.89.2.33 snap_y()

```
void seq64::seqroll::snap_y (
             int & y )  [inline], [protected]
```

Parameters

out	*y*	The y-value to be snapped.

10.89.2.34 snap_x()

```
void seq64::seqroll::snap_x (
             int & x )  [protected]
```

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.

Parameters

out	*x*	Provides the x-value to be snapped and returned. A return value would be better.

10.89.2.35 convert_xy()

```
void seq64::seqroll::convert_xy (
             int x,
             int y,
             midipulse & tick,
             int & note )  [protected]
```

10.89.2.36 convert_drop_xy()

```
void seq64::seqroll::convert_drop_xy (
            midipulse & tick,
            int & note ) [inline], [protected]
```

Parameters

tick	The horizontal location of the drop.
note	The vertical location of the drop.

10.89.2.37 convert_tn()

```
void seq64::seqroll::convert_tn (
            midipulse tick,
            int note,
            int & x,
            int & y ) [protected]
```

This function is the "inverse" of convert_xy().

Parameters

	tick	Provides the horizontal value in MIDI pulses.
	note	Provides the vertical value, a note value.
out	*x*	Provides the destination x value of the coordinate.
out	*y*	Provides the destination y value of the coordinate.

10.89.2.38 xy_to_rect()

```
void seq64::seqroll::xy_to_rect (
            int x1,
            int y1,
            int x2,
            int y2,
            int & x,
            int & y,
            int & w,
            int & h ) [protected]
```

10.89.2.39 convert_tn_box_to_rect() [1/2]

```
void seq64::seqroll::convert_tn_box_to_rect (
            midipulse tick_s,
            midipulse tick_f,
            int note_h,
            int note_l,
            int & x,
            int & y,
            int & w,
            int & h )  [protected]
```

We should refactor this function to use the utility class seqroll::rect as the destination for the conversion.

Parameters

	tick_s	The starting tick of the rectangle.
	tick_f	The finishing tick of the rectangle.
	note↩_h	The high note of the rectangle.
	note↩_l	The low note of the rectangle.
out	*x*	The destination for the x value in pixels.
out	*y*	The destination for the y value in pixels.
out	*w*	The destination for the rectangle width in pixels.
out	*h*	The destination for the rectangle height value in pixels.

10.89.2.40 convert_tn_box_to_rect() [2/2]

```
void seq64::seqroll::convert_tn_box_to_rect (
            midipulse tick_s,
            midipulse tick_f,
            int note_h,
            int note_l,
            rect & r )  [protected]
```

We should refactor this function to use the utility class seqroll::rect as the destination for the conversion.

Parameters

	tick_s	The starting tick of the rectangle.
	tick_f	The finishing tick of the rectangle.
	note↩_h	The high note of the rectangle.
	note↩_l	The low note of the rectangle.
out	*r*	The destination rectangle for the values in pixels.

10.89.2.41 convert_sel_box_to_rect()

```
void seq64::seqroll::convert_sel_box_to_rect (
            midipulse tick_s,
            midipulse tick_f,
            int note_h,
            int note_l )  [protected]
```

We made a version taking a reference to an seq64::rect.

Parameters

tick_s	The starting tick of the rectangle.
tick_f	The finishing tick of the rectangle.
note←↩ _h	The high note of the rectangle.
note←↩ _l	The low note of the rectangle.

10.89.2.42 get_selected_box()

```
void seq64::seqroll::get_selected_box (
            midipulse & tick_s,
            int & note_h,
            midipulse & tick_f,
            int & note_l )  [protected]
```

Parameters

out	*tick_s*	The starting tick of the rectangle.
out	*tick_f*	The finishing tick of the rectangle.
out	*note←↩ _h*	The high note of the rectangle.
out	*note←↩ _l*	The low note of the rectangle.

10.89.2.43 draw_events_on()

```
void seq64::seqroll::draw_events_on (
            Glib::RefPtr< Gdk::Drawable > draw )  [protected]
```

"Method 0" draws the background sequence, if active. "Method 1" draws the sequence itself.

Parameters

draw	The "drawable" area to draw on.

10.89.2.44 idle_redraw()

```
int seq64::seqroll::idle_redraw ( )  [protected]
```

10.89.2.45 idle_progress()

```
int seq64::seqroll::idle_progress ( )  [protected]
```

10.89.2.46 change_horz()

```
void seq64::seqroll::change_horz ( )  [protected]
```

Roughly similar to seqevent::change_horz().

10.89.2.47 change_vert()

```
void seq64::seqroll::change_vert ( )  [protected]
```

10.89.2.48 move_selection_box()

```
void seq64::seqroll::move_selection_box (
             int dx,
             int dy )  [protected]
```

We now let the Enter key to finish pasting and deselect the moved notes. With the mouse, selecting all notes, copying them, and moving the selection box, pasting can be completed with either a left-click or the Enter key.

We have a weird problem on our main system where the selection box is very flickery. But it works fine on another system. A Gtk-2 issue? Now it seems to work fine, after an update. No, it seems to work well in sequences that have non-note events amongst the note events.

Parameters

dx	The amount to move the selection box. Values are -1, 0, or 1. -1 is left one snap, 0 is no movement horizontally, and 1 is right one snap.
dy	The amount to move the selection box. Values are -1, 0, or 1. -1 is up one snap, 0 is no movement vertically, and 1 is down one snap.

10.89.2.49 move_selected_notes()

```
void seq64::seqroll::move_selected_notes (
            int dx,
            int dy ) [protected]
```

Works with the four arrow keys.

Note that the movement vertically is different for the selection box versus the notes. While the movement values are -1, 0, or 1, the differences are as follows:

```
-   Selection box vertical movement:
    -   -1 is up one note snap.
    -   0 is no vertical movement.
    -   +1 is down one note snap.
-   Note vertical movement:
    -   -1 is down one note.
    -   0 is no note vertical movement.
    -   +1 is up one note.
```

Parameters

dx	The amount to move the selection box or the selection horizontally. Values are -1 (left one time snap), 0 (no movement), and +1 (right one snap). Obviously values other than +-1 can be used for larger movement, but the GUI doesn't yet support that ... we could implement movement by "pages" some day.
dy	The amount to move the selection box or the selection vertically. See the notes above.

10.89.2.50 grow_selected_notes()

```
void seq64::seqroll::grow_selected_notes (
            int dx ) [protected]
```

Parameters

dx	The amount to grow the selection horizontally. Values are -1 (left one time snap), 0 (no stretching), and +1 (right one snap). Obviously values other than +-1 can be used for larger stretching, but the GUI doesn't yet support that.

10.89.2.51 set_adding()

```
void seq64::seqroll::set_adding (
            bool isadding ) [protected]
```

What calls this? It is actually a right click. Not present in the "fruity" implementation. Now moved to the normal seqroll class.

Parameters

adding	True if adding a note.

10.89.2.52 update_mouse_pointer()

```
void seq64::seqroll::update_mouse_pointer (
            bool isadding = false ) [protected]
```

Moved here from the "fruity" seqroll class.

10.89.2.53 button_press_initial()

```
bool seq64::seqroll::button_press_initial (
            GdkEventButton * ev,
            int & norm_x,
            int & snapped_x,
            int & snapped_y ) [protected]
```

10.89.2.54 align_selection()

```
void seq64::seqroll::align_selection (
            midipulse & tick_s,
            int & note_h,
            midipulse & tick_f,
            int & note_l,
            int snapped_x ) [protected]
```

Save offset that we get from the snap above. Align selection for drawing. Could be used in XRollInput::on_button←
_press_event().

10.89.2.55 button_press()

```
bool seq64::seqroll::button_press (
            GdkEventButton * ev ) [protected]
```

This function now uses the needs_update flag to determine if the perform object should modify().

Parameters

ev	Provides the button-press event to process.

Returns

Returns the value of needs_update. It used to return only true.

10.89.2.56 button_release()

```
bool seq64::seqroll::button_release (
            GdkEventButton * ev )  [protected]
```

This function now uses the needs_update flag to determine if the perform object should modify().

Parameters

ev	Provides the button-release event to process.

Returns

Returns the value of needs_update. It used to return only true.

If in moving mode, adjust for snap and convert deltas into screen coordinates. Since delta_note was from delta_y, it will be flipped (delta_y[0] = note[127], etc.), so we have to adjust.

A left/middle click converts deltas into screen coordinates, then pushs the undo state. Shift causes a "stretch selected" which currently acts like a "move selected" operation. BUG? Otherwise, Ctrl indirectly allows a "grow selected" operation.

Minor new feature. If the Super (Mod4, Windows) key is pressed when release, keep the adding state in force. One can then use the unadorned left-click key to add notes. Right click to reset the adding mode. This feature is enabled only if allowed by the settings (but is true by default). See the same code in perfrollinput.cpp.

10.89.2.57 motion_notify()

```
bool seq64::seqroll::motion_notify (
            GdkEventMotion * ev )  [protected]
```

We could allow move painting for chords, but that would take some tricky code to move all of the notes of the chord. And allowing painting here currently affects only one note after the chord itself is created.

Parameters

ev	Provides the button-release event to process.

Returns

Returns true if the event was processed.

10.89.2.58 clear_flags()

```
void seq64::seqroll::clear_flags ( )  [inline], [protected]
```

10.89.2.59 set_scroll_x()

```
void seq64::seqroll::set_scroll_x ( )  [protected]
```

10.89.2.60 set_scroll_y()

```
void seq64::seqroll::set_scroll_y ( )  [protected]
```

10.89.2.61 scroll_offset_x()

```
int seq64::seqroll::scroll_offset_x (
             int x ) const  [inline], [protected]
```

Offsets the x value by the x origin of the current page.

Parameters

x	The x value to offset.

10.89.2.62 scroll_offset_y()

```
int seq64::seqroll::scroll_offset_y (
             int y ) const  [inline], [protected]
```

Offsets the y value by the y origin of the current page.

Parameters

y	The y value to offset.

10.89.2.63 set_current_offset_x_y()

```
void seq64::seqroll::set_current_offset_x_y (
            int x,
            int y )  [inline], [protected]
```

Offsets the current x and y values by the x and y origin of the current page.

Parameters

x	The y value to offset.
y	The y value to offset.

10.89.2.64 adding()

```
bool seq64::seqroll::adding ( ) const  [inline], [protected]
```

10.89.2.65 selecting()

```
bool seq64::seqroll::selecting ( ) const  [inline], [protected]
```

10.89.2.66 growing()

```
bool seq64::seqroll::growing ( ) const  [inline], [protected]
```

10.89.2.67 normal_action()

```
bool seq64::seqroll::normal_action ( ) const  [inline], [protected]
```

Returns

Returns true if one of those five flags are set.

10.89.2.68 select_action()

```
bool seq64::seqroll::select_action ( ) const  [inline], [protected]
```

Returns

Returns true if one of those four flags are set.

10.89.2.69 drop_action()

```
bool seq64::seqroll::drop_action ( ) const  [inline], [protected]
```

Returns

Returns true if one of those two flags are set.

10.89.2.70 moving()

```
bool seq64::seqroll::moving ( ) const  [inline], [protected]
```

10.89.2.71 on_realize()

```
void seq64::seqroll::on_realize ( )  [protected], [virtual]
```

10.89.2.72 on_expose_event()

```
bool seq64::seqroll::on_expose_event (
            GdkEventExpose * ev )  [protected], [virtual]
```

Parameters

ev	The expose event to process.

Returns

Always returns true.

10.89.2.73 on_button_press_event()

```
bool seq64::seqroll::on_button_press_event (
            GdkEventButton * ev )  [protected], [virtual]
```

Parameters

ev	The expose event to process.

Returns

Returns the result of the Seq24 interaction or the Fruity interaction, that is, the return value of Seq24Seq↩ RollInput::on_button_press_event() or FruitySeqRollInput::on_button_press_event().

Reimplemented in seq64::FruitySeqRollInput.

10.89.2.74 on_button_release_event()

```
bool seq64::seqroll::on_button_release_event (
            GdkEventButton * ev )  [protected], [virtual]
```

This function checks the "rc" interaction-method option, and calls the forwarding function for the seq24 or the fruity interaction method. Might be a good case to prefer inheritance and not try to support changing the interaction method without a restart of Sequencer64.

Parameters

ev	The button release event to process.

Returns

Returns the return value of Seq24SeqRollInput::on_button_release_event() or FruitySeqRollInput::on_↩ button_release_event().

Reimplemented in seq64::FruitySeqRollInput.

10.89.2.75 on_motion_notify_event()

```
bool seq64::seqroll::on_motion_notify_event (
            GdkEventMotion * ev )  [protected], [virtual]
```

Parameters

ev	The motion-notification event to process.

Returns

Returns the return value of Seq24SeqRollInput::on_motion_notify_event() or FruitySeqRollInput::on_motion↩ _notify_event().

Reimplemented in seq64::FruitySeqRollInput.

10.89.2.76 on_focus_in_event()

```
bool seq64::seqroll::on_focus_in_event (
            GdkEventFocus * )  [protected], [virtual]
```

Sets the GDK HAS_FOCUS flag. Parameter "ev" is the event-focus event, not used.

Returns

Always returns false.

10.89.2.77 on_focus_out_event()

```
bool seq64::seqroll::on_focus_out_event (
            GdkEventFocus * )  [protected], [virtual]
```

Resets the GDK HAS_FOCUS flag. Parameter "ev" is the event-focus event, not used.

Returns

Always returns false.

10.89.2.78 on_key_press_event()

```
bool seq64::seqroll::on_key_press_event (
            GdkEventKey * ev )  [protected], [virtual]
```

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).

Concerning the usage of the arrow keys in this function: This code is reached, but has no visible effect. Why? I think they were meant to move the point for playback. We may have a bug with our new handling of triggers (unlikely), or maybe these depend upon the proper playback mode. In any case, the old functionality is preserved. However, if there are notes selected, then these keys support selection movement.

Since the Up and Down arrow keys are used for movement, we'd have to check selection status before trying to use them to move up and down in the piano roll, in smaller steps than the new Page-Up and Page-Down key support.

Parameters

ev	The key-press event to process.

Returns

Returns true if the key-press was handled.

I think we should be able to move and remove notes while playing, which is already supported using the mouse.

if (! perf().is_playing)

10.89.2.79 on_scroll_event()

```
bool seq64::seqroll::on_scroll_event (
             GdkEventScroll * ev )  [protected], [virtual]
```

This scroll event only handles basic scrolling without any modifier keys such as the Ctrl or Shift masks. The seqedit class handles that fun stuff.

Note that this function seems to duplicate the functionality of seqkeys::on_scroll_event(). Do we really need both? Which one do we need?

Parameters

ev	The scroll event to process.

Returns

Returns true if the scroll event was handled.

10.89.2.80 on_size_allocate()

```
void seq64::seqroll::on_size_allocate (
             Gtk::Allocation & a )  [protected], [virtual]
```

Calls the base-class version of this function and sets m_window_x and m_window_y to the width and height of the allocation parameter. Then calls update_sizes().

Parameters

a	The GDK allocation event object.

10.89.2.81 on_leave_notify_event()

```
bool seq64::seqroll::on_leave_notify_event (
             GdkEventCrossing * p0 )  [protected], [virtual]
```

Calls m_seqkeys_wid.set_hint_state(false). Parameter "ev" is the event-crossing event, not used.

Returns

Always returns false.

10.89.2.82 on_enter_notify_event()

```
bool seq64::seqroll::on_enter_notify_event (
            GdkEventCrossing * p0 )  [protected], [virtual]
```

Calls m_seqkeys_wid.set_hint_state(true). Parameter "ev" is the event-crossing event, not used.

Returns

Always returns false.

10.89.3 Field Documentation

10.89.3.1 m_horizontal_adjust

```
Gtk::Adjustment& seq64::seqroll::m_horizontal_adjust  [protected]
```

It would be good to be able to avoid this access!

Change Note layk 2016-10-17 Issue #46. No need for this declaration now, due to the fix in seqedit.

friend class seqedit; We need direct access to the horizontal scrollbar if we want to be able to make it follow the progress bar.

10.89.3.2 m_vertical_adjust

```
Gtk::Adjustment& seq64::seqroll::m_vertical_adjust  [protected]
```

10.89.3.3 m_old

```
rect seq64::seqroll::m_old  [protected]
```

10.89.3.4 m_selected

```
rect seq64::seqroll::m_selected  [protected]
```

10.89.3.5 m_seq

```
sequence& seq64::seqroll::m_seq  [protected]
```

10.89.3.6 m_seqkeys_wid

```
seqkeys& seq64::seqroll::m_seqkeys_wid  [protected]
```

10.89.3.7 m_pos

```
int seq64::seqroll::m_pos  [protected]
```

Need to clarify what exactly this member is used for.

10.89.3.8 m_zoom

```
int seq64::seqroll::m_zoom  [protected]
```

10.89.3.9 m_snap

```
int seq64::seqroll::m_snap  [protected]
```

Same meaning as for the event-bar grid. This value is the denominator of the note size used for the snap.

10.89.3.10 m_note_length

```
int seq64::seqroll::m_note_length  [protected]
```

Used in the seq24seqroll module only.

10.89.3.11 m_scale

```
int seq64::seqroll::m_scale  [protected]
```

10.89.3.12 m_chord

```
int seq64::seqroll::m_chord  [protected]
```

10.89.3.13 m_key

```
int seq64::seqroll::m_key  [protected]
```

10.89.3.14 m_adding

```
bool seq64::seqroll::m_adding  [protected]
```

This flag was moved from both the fruity and the seq24 seqroll classes.

10.89.3.15 m_selecting

```
bool seq64::seqroll::m_selecting  [protected]
```

10.89.3.16 m_moving

```
bool seq64::seqroll::m_moving  [protected]
```

10.89.3.17 m_moving_init

```
bool seq64::seqroll::m_moving_init  [protected]
```

Used in the fruity and seq24 mouse-handling modules.

10.89.3.18 m_growing

```
bool seq64::seqroll::m_growing  [protected]
```

10.89.3.19 m_painting

```
bool seq64::seqroll::m_painting  [protected]
```

Used in the fruity and seq24 mouse-handling modules.

10.89.3.20 m_paste

```
bool seq64::seqroll::m_paste  [protected]
```

10.89.3.21 m_is_drag_pasting

```
bool seq64::seqroll::m_is_drag_pasting  [protected]
```

Used in the fruity mouse-handling module.

10.89.3.22 m_is_drag_pasting_start

```
bool seq64::seqroll::m_is_drag_pasting_start  [protected]
```

Used in the fruity mouse-handling module.

10.89.3.23 m_justselected_one

```
bool seq64::seqroll::m_justselected_one  [protected]
```

Used in the fruity mouse-handling module.

10.89.3.24 m_move_delta_x

```
int seq64::seqroll::m_move_delta_x  [protected]
```

10.89.3.25 m_move_delta_y

```
int seq64::seqroll::m_move_delta_y  [protected]
```

10.89.3.26 m_move_snap_offset_x

```
int seq64::seqroll::m_move_snap_offset_x  [protected]
```

10.89.3.27 m_progress_x

```
int seq64::seqroll::m_progress_x  [protected]
```

10.89.3.28 m_scroll_offset_ticks

```
int seq64::seqroll::m_scroll_offset_ticks  [protected]
```

10.89.3.29 m_scroll_offset_key

```
int seq64::seqroll::m_scroll_offset_key  [protected]
```

10.89.3.30 m_scroll_offset_x

```
int seq64::seqroll::m_scroll_offset_x  [protected]
```

10.89.3.31 m_scroll_offset_y

```
int seq64::seqroll::m_scroll_offset_y  [protected]
```

10.89.3.32 m_scroll_page

```
int seq64::seqroll::m_scroll_page  [protected]
```

10.89.3.33 m_progress_follow

```
bool seq64::seqroll::m_progress_follow  [protected]
```

10.89.3.34 m_transport_follow

```
bool seq64::seqroll::m_transport_follow  [protected]
```

Progress follow?

10.89.3.35 m_trans_button_press

```
bool seq64::seqroll::m_trans_button_press  [protected]
```

10.89.3.36 m_background_sequence

```
int seq64::seqroll::m_background_sequence  [protected]
```

10.89.3.37 m_drawing_background_seq

```
bool seq64::seqroll::m_drawing_background_seq  [protected]
```

10.89.3.38 m_expanded_recording

```
bool seq64::seqroll::m_expanded_recording  [protected]
```

In essence, the "infinite" track we've wanted, thanks to Stazed and his Seq32 project. Defaults to false.

10.89.3.39 m_status

```
midibyte seq64::seqroll::m_status  [protected]
```

Not used in seqroll at present.

10.89.3.40 m_cc

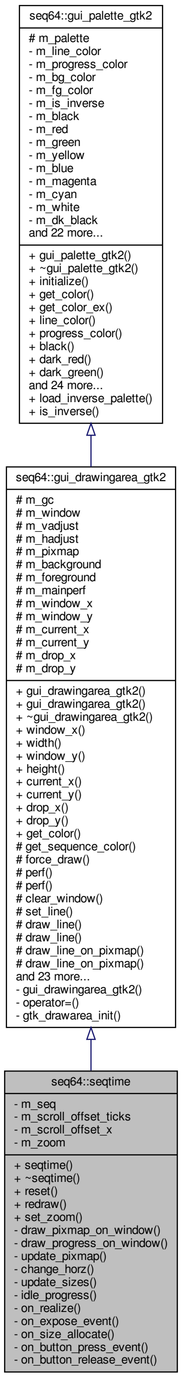
```
midibyte seq64::seqroll::m_cc  [protected]
```

Not used in seqroll at present.

10.90 seq64::seqtime Class Reference

This class implements the piano time, whatever that is.

Inheritance diagram for seq64::seqtime:



Public Member Functions

- seqtime (sequence &seq, perform &p, int zoom, Gtk::Adjustment &hadjust)

    Principal constructor.
- virtual ∼seqtime ()

    Let's provide a do-nothing virtual destructor.
- void reset ()

Sets the scroll offset tick and x values, updates the sizes and the pixmap, and resets the window.
- void redraw ()

  Very similar to the reset() function, except it doesn't update the sizes.
- void set_zoom (int zoom)

  Sets the zoom to the given value and resets the window.

Private Member Functions

- void draw_pixmap_on_window ()

  Draws the pixmap on the window.
- void draw_progress_on_window ()
- void update_pixmap ()

  Updates the pixmap.
- void change_horz ()

  Changes the scrolling horizontal offset, updates the pixmap, and forces a redraw.
- void update_sizes ()

  Updates the pixmap to a new size and queues up a draw operation.
- bool idle_progress ()

  Simply returns true.
- void on_realize ()

  Called when the window is drawn.
- bool on_expose_event (GdkEventExpose ∗a_ev)

  Implements the on-expose event handler.
- void on_size_allocate (Gtk::Allocation &)

  Implements the on-size-allocate event handler.
- 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

- sequence & m_seq
- int m_scroll_offset_ticks
- int m_scroll_offset_x
- int m_zoom

  one pixel == m_zoom ticks

Additional Inherited Members

10.90.1 Constructor & Destructor Documentation

10.90.1.1 seqtime()

```
seq64::seqtime::seqtime (
             sequence & seq,
             perform & p,
             int zoom,
             Gtk::Adjustment & hadjust )
```

In the constructor you can only allocate colors; get_window() returns 0 because the window is not yet realized>

10.90.1.2 ∼seqtime()

```
virtual seq64::seqtime::∼seqtime ( )  [inline], [virtual]
```

10.90.2 Member Function Documentation

10.90.2.1 reset()

```
void seq64::seqtime::reset ( )
```

Basically identical to seqevent::reset().

10.90.2.2 redraw()

```
void seq64::seqtime::redraw ( )
```

10.90.2.3 set_zoom()

```
void seq64::seqtime::set_zoom (
             int zoom )
```

Parameters

zoom	The desired zoom value, assumed to be validated already. See the seqedit::set_zoom() function.

10.90.2.4 draw_pixmap_on_window()

```
void seq64::seqtime::draw_pixmap_on_window ( )  [private]
```

10.90.2.5 draw_progress_on_window()

```
void seq64::seqtime::draw_progress_on_window ( )  [private]
```

10.90.2.6 update_pixmap()

```
void seq64::seqtime::update_pixmap ( )  [private]
```

When the zoom is at 32 ticks per pixel, there is a thick bar for every measure, and a measure number and major time division every 4 measures.at the default PPQN of 192.

A major line is a line that has a measure number in the timeline. The number of measures in a major line is 1 for zooms from 1:1 to 1:8; 2 for zoom 1:16; 4 for zoom 1:32; 8 for zoom 1:64 (new); and 16 for zoom 1:128. Zooms 1:64 and above look good only for high PPQN values.

We calculate the measure length in 32nd notes. This value is, of course, 32, when the time signature is 4/4. Then calculate measures/line. "measures_per_major" is more like "measures per major line". With a higher zoom than 32, this calculation yields a floating-point exception if m_zoom

32, so we rearrange the calculation and hope that it still works out the

same for smaller values.

Stazed:

At 32, a bar every measure.

zoom	32	16	8	4	1
ml					
1	128				
2	64				
4	32	16	8		
8	16m	8	4	2	1
16	8m	4	2	1	1
32	4m	2	1	1	1
64	2m	1	1	1	1
128	1m	1	1	1	1

Todo Sizing needs to be controlled by font parameters. Instead of 19 or 20, estimate the width of 3 letters. Instead of 9 pixels down, use the height of the seqtime and the height of a character.

10.90.2.7 change_horz()

```
void seq64::seqtime::change_horz ( )  [private]
```

10.90.2.8 update_sizes()

```
void seq64::seqtime::update_sizes ( )  [private]
```

10.90.2.9 idle_progress()

```
bool seq64::seqtime::idle_progress ( )  [inline], [private]
```

10.90.2.10 on_realize()

```
void seq64::seqtime::on_realize ( )  [private]
```

Call the base-class version of this function first. Then addition resources are allocated.

10.90.2.11 on_expose_event()

```
bool seq64::seqtime::on_expose_event (
             GdkEventExpose * a_ev )  [private]
```

10.90.2.12 on_size_allocate()

```
void seq64::seqtime::on_size_allocate (
             Gtk::Allocation & a )  [private]
```

10.90.2.13 on_button_press_event()

```
bool seq64::seqtime::on_button_press_event (
             GdkEventButton *  )  [inline], [private]
```

Simply returns false.

10.90.2.14 on_button_release_event()

```
bool seq64::seqtime::on_button_release_event (
             GdkEventButton *  )  [inline], [private]
```

Simply returns false.

10.90.3 Field Documentation

10.90.3.1 m_seq

```
sequence& seq64::seqtime::m_seq  [private]
```

10.90.3.2 m_scroll_offset_ticks

```
int seq64::seqtime::m_scroll_offset_ticks  [private]
```

10.90.3.3 m_scroll_offset_x

```
int seq64::seqtime::m_scroll_offset_x  [private]
```

10.90.3.4 m_zoom

```
int seq64::seqtime::m_zoom  [private]
```

10.91 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_t {
  e_select,
  e_select_one,
  e_is_selected,
  e_would_select,
  e_deselect,
  e_toggle_selection,
  e_remove_one,
  e_select_onset,
  e_is_selected_onset }

  This enumeration is used in selecting events and note.

Public Member Functions

- sequence (int ppqn=SEQ64_USE_DEFAULT_PPQN)

  Principal constructor.
- ∼sequence ()

  A rote destructor.
- void partial_assign (const sequence &rhs)

  A cut-down version of principal assignment operator.
- event_list & events ()

  'Getter' function for member m_events Non-const version.
- const event_list & events () const

  'Getter' function for member m_events Const version.
- bool any_selected_notes () const

  'Getter' function for member m_events.any_selected_notes()
- const triggers::List & triggerlist () const

  'Getter' function for member m_triggers This is the const version.
- triggers::List & triggerlist ()

  'Getter' function for member m_triggers
- int trigger_count () const

  Gets the trigger count, useful for exporting a sequence.
- int selected_trigger_count () const

  Gets the number of selected triggers.
- void set_trigger_paste_tick (midipulse tick)

  Sets the tick for pasting.
- midipulse get_trigger_paste_tick () const

  Gets the tick for pasting.
- std::string seq_number () const

  'Getter' function for member m_seq_number as a string
- int number () const

  'Getter' function for member m_seq_number
- void number (int seqnum)

  'Setter' function for member m_seq_number This setter will set the sequence number only if it has not already been set.
- int color () const

  'Getter' function for member m_seq_color
- void color (int c)

  'Setter' function for member m_seq_color Provides the color-palette value to set.
- edit_mode_t edit_mode () const

  'Getter' function for member m_seq_edit_mode A feature adapted from Kepler34.
- void edit_mode (edit_mode_t mode)

  'Setter' function for member m_seq_edit_mode A feature adapted from Kepler34.
- void modify ()

  A convenience function that we have to put here so that the m_parent pointer can be used without an additional include-file in the sequence.hpp module.
- int event_count () const

  Returns the number of events stored in m_events.
- void set_hold_undo (bool hold)

  Modifies the undo-hold container.
- int get_hold_undo () const

  'Getter' function for member m_events_undo_hold.count()
- void set_have_undo ()

'Setter' function for member m_have_undo

- bool have_undo () const

  'Getter' function for member m_have_undo
- void set_have_redo ()

  'Setter' function for member m_have_redo No reliable way to "unmodify" the performance here.
- bool have_redo () const

  'Getter' function for member m_have_redo
- void push_undo (bool hold=false)

  Pushes the event-list into the undo-list or the upcoming undo-hold-list.
- void pop_undo ()

  If there are items on the undo list, this function pushes the event-list into the redo-list, puts the top of the undo-list into the event-list, 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 event-list into the undo-list, puts the top of the redo-list into the event-list, pops from the redo-list, calls verify_and_link(), and then calls unselect.
- void push_trigger_undo ()

  Calls triggers::push_undo() with locking.
- void pop_trigger_undo ()

  Calls triggers::pop_undo() with locking.
- void pop_trigger_redo ()

  Calls triggers::pop_redo() with locking.
- void set_name (const std::string &name="")

  Sets the sequence name member, m_name.
- int calculate_measures () const

  Calculates the number of measures in the sequence based on the unit-measure and the current length, in pulses, of the sequence.
- int get_ppqn () const

  'Getter' function for member m_ppqn Provided as a convenience for the editable_events class.
- void set_beats_per_bar (int beatspermeasure)

  'Setter' function for member m_time_beats_per_measure
- int get_beats_per_bar () const

  'Getter' function for member m_time_beats_per_measure
- void set_beat_width (int beatwidth)

  'Setter' function for member m_time_beat_width
- int get_beat_width () const

  'Getter' function for member m_time_beat_width
- midipulse measures_to_ticks (int measures=1) const

  A convenience function for calculating the number of ticks in the given number of measures.
- void clocks_per_metronome (int cpm)

  'Setter' function for member m_clocks_per_metronome
- int clocks_per_metronome () const

  'Getter' function for member m_clocks_per_metronome
- void set_32nds_per_quarter (int tpq)

  'Setter' function for member m_32nds_per_quarter
- int get_32nds_per_quarter () const

  'Getter' function for member m_32nds_per_quarter
- void us_per_quarter_note (long upqn)

  'Setter' function for member m_us_per_quarter_note
- long us_per_quarter_note () const

  'Getter' function for member m_us_per_quarter_note
- void set_rec_vol (int rec_vol)

'Setter' function for member m_rec_vol If this velocity is greater than zero, then m_note_on_velocity will be set as well.

- void set_song_mute (bool mute)

  'Setter' function for member m_song_mute This function also calls set_dirty_mp() to make sure that the perfnames panel is updated to show the new mute status of the sequence.
- void toggle_song_mute ()

  'Setter' function for member m_song_mute This function toogles the song muting status.
- bool get_song_mute () const

  'Getter' function for member m_song_mute
- void apply_song_transpose ()

  Applies the transpose value held by the master MIDI buss object, if non-zero, and if the sequence is set to be transposable.
- void set_transposable (bool flag)

  'Setter' function for member m_transposable Changing this flag modifies the sequence and performance.
- bool get_transposable () const

  'Getter' function for member m_transposable
- std::string title () const

  Gets the title of the pattern, to show in the pattern slot.
- const std::string & name () const

  'Getter' function for member m_name
- bool is_default_name () const

  Tests the name for being changed.
- 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 (midipulse len=0, bool adjust_triggers=true, bool verify=true)

  Sets the length (m_length) and adjusts triggers for it, if desired.
- void set_num_measures (int measures)

  Kepler34.
- int get_num_measures ()

  Kepler34.
- void apply_length (int bpb, int ppqn, int bw, int measures=1)

  Sets the sequence length based on the three given parameters.
- int extend (midipulse len)

  Extends the length of the sequence.
- void apply_length (int meas=1)

  An overload that gets its values from this sequence object.
- midipulse get_length () const

  'Getter' function for member m_length
- midipulse get_last_tick () const

  Returns the last tick played, and is used by the editor's idle function.
- void set_last_tick (midipulse tick)

  'Setter' function for member m_last_tick This function used to be called "set_orig_tick()", now renamed to match up with get_last_tick().
- midipulse mod_last_tick ()

  Some MIDI file errors and other things can lead to an m_length of 0, which causes arithmetic errors when m_last_tick is modded against it.

- void set_playing (bool)

  Sets the playing state of this sequence.
- bool get_playing () const

  'Getter' function for member m_playing
- void toggle_playing ()
- void toggle_playing (midipulse tick, bool resumenoteons)

  Toggles the playing status of this sequence.
- void toggle_queued ()

  'Setter' function for member m_queued and m_queued_tick Toggles the queued flag and sets the dirty-mp flag.
- bool get_queued () const

  'Getter' function for member m_queued
- midipulse get_queued_tick () const

  'Getter' function for member m_queued_tick
- bool check_queued_tick (midipulse tick) const

  Helper function for perform.
- void set_recording (bool record_active)

  'Setter' function for member m_recording and m_notes_on
- void set_quantized_recording (bool qr)

  'Setter' function for member m_quantized_rec
- void set_input_recording (bool record_active, bool toggle=false)

  Like perform::set_sequence_input(), but it uses the internal recording status directly, rather than getting it from seqedit.
- bool get_recording () const

  'Getter' function for member m_recording
- bool recording_next_measure () const

  Makes a calculation for expanded recording, used in seqedit.
- midipulse get_snap_tick () const

  'Getter' function for member m_snap_tick
- void set_snap_tick (int st)

  'Setter' function for member m_snap_tick
- bool get_quantized_rec () const

  'Getter' function for member m_quantized_rec
- void set_thru (bool thru_active)

  'Setter' function for member m_thru
- void set_input_thru (bool thru_active, bool toggle=false)

  Like perform::set_sequence_input(), but it uses the internal thru status directly, rather than getting it from seqedit.
- bool get_thru () const

  'Getter' function for member m_thru
- void off_one_shot ()

  Sets the dirty flag, sets m_one_shot to false, and m_off_from_snap to true.
- void song_recording_start (midipulse tick, bool snap)

  Starts the growing of the sequence for Song recording.
- void song_recording_stop (midipulse tick)

  Stops the growing of the sequence for Song recording.
- midipulse one_shot_tick () const

  'Getter' function for member m_one_shot_tick
- bool song_recording () const

  'Getter' function for member m_song_recording
- bool one_shot () const

  'Getter' function for member m_one_shot
- bool off_from_snap () const

  'Getter' function for member m_off_from_snap

- bool song_playback_block () const

  'Getter' function for member m_song_playback_block
- bool song_recording_snap () const

  'Getter' function for member m_song_recording_snap
- midipulse song_record_tick () const

  'Getter' function for member m_song_recording_tic
- void resume_note_ons (midipulse tick)

  If the Note-On event is after the Note-Off event, the pattern wraps around, so that we play it now to resume.
- void toggle_one_shot ()

  Toggles the m_one_shot flag, sets m_off_from_snap to true, and adjusts m_one_shot_tick according to m_last_tick and m_length.
- 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.
- midibyte get_midi_channel () const

  'Getter' function for member m_midi_channel
- bool is_smf_0 () const

  Returns true if this sequence is an SMF 0 sequence.
- void set_midi_channel (midibyte ch, bool user_change=false)

  Sets the m_midi_channel number, which is the output channel for this sequence.
- void print () const

  Prints a list of the currently-held events.
- void print_triggers () const

  Prints a list of the currently-held triggers.
- void play (midipulse tick, bool playback_mode, bool resume=false)

  The play() function dumps notes starting from the given tick, and it pre-buffers ahead.
- void play_queue (midipulse tick, bool playbackmode, bool resume)

  Why don't we see this in kepler34? We do, in the MidiPerformance::play() function.
- bool add_note (midipulse tick, midipulse len, int note, bool paint=false, int velocity=SEQ64_PRESERVE_V↩ ELOCITY)

  Adds a note of a given length and note value, at a given tick location.
- bool add_chord (int chord, midipulse tick, midipulse len, int note)

  Adds a chord of a given length and note value, at a given tick location.
- bool add_event (const event &er)

  Adds an event to the internal event list in a sorted manner.
- bool add_event (midipulse tick, midibyte status, midibyte d0, midibyte d1, bool paint=false)

  Adds a event of a given status value and data values, at a given tick location.
- bool append_event (const event &er)

  An alternative to add_event() that does not sort the events, even if the event list is implemented by an std::list.
- void sort_events ()

  Calls event_list::sort().
- void add_trigger (midipulse tick, midipulse len, midipulse offset=0, bool adjust_offset=true)

Adds a trigger.
- void split_trigger (midipulse tick)

    Splits a trigger.
- void half_split_trigger (midipulse tick)

    Half-splits a trigger.
- void exact_split_trigger (midipulse tick)

    Exact-splits a trigger.
- void grow_trigger (midipulse tick_from, midipulse tick_to, midipulse len)

    Grows a trigger.
- void delete_trigger (midipulse tick)

    Deletes a trigger, that brackets the given tick, from the trigger-list.
- bool get_trigger_state (midipulse tick) const

    Checks the list of triggers against the given tick.
- bool select_trigger (midipulse tick)

    Checks the list of triggers against the given tick.
- triggers::List get_triggers () const

    Returns a copy of the triggers for this sequence.
- bool unselect_trigger (midipulse tick)

    Unselects the desired trigger.
- bool unselect_triggers ()

    Unselects all triggers.
- bool intersect_triggers (midipulse pos, midipulse &start, midipulse &end)

    This function examines each trigger in the trigger list.
- bool intersect_triggers (midipulse pos)
- bool intersect_notes (midipulse position, int position_note, midipulse &start, midipulse &ender, int &note)

    This function examines each note in the event list.
- bool intersect_events (midipulse posstart, midipulse posend, midibyte status, midipulse &start)

    This function examines each non-note event in the event list.
- void delete_selected_triggers ()

    Deletes the first selected trigger that is found.
- void cut_selected_trigger ()

    Copies and deletes the first selected trigger that is found.
- void copy_selected_trigger ()

    First, this function clears any unpasted middle-click tick setting.
- void paste_trigger (midipulse paste_tick=SEQ64_NO_PASTE_TRIGGER)

    If there is a copied trigger, then this function grabs it from the trigger clipboard and adds it.
- bool move_triggers (midipulse tick, bool adjust_offset, triggers::grow_edit_t which=triggers::GROW_MOVE)

    Moves selected triggers as per the given parameters.
- midipulse selected_trigger_start ()

    Gets the last-selected trigger's start tick.
- midipulse selected_trigger_end ()

    Gets the selected trigger's end tick.
- midipulse get_max_trigger () const

    Get the ending value of the last trigger in the trigger-list.
- void move_triggers (midipulse start_tick, midipulse distance, bool direction)

    Moves triggers in the trigger-list.
- void copy_triggers (midipulse start_tick, midipulse distance)

    Copies triggers to another location.
- void clear_triggers ()

    Clears the whole list of triggers.
- midipulse get_trigger_offset () const

'Getter' function for member m_trigger_offset

- void set_midi_bus (char mb, bool user_change=false)

  Sets the MIDI buss/port number to dump MIDI data to.
- char get_midi_bus () const

  'Getter' function for member m_bus
- void set_master_midi_bus (mastermidibus ∗mmb)

  'Setter' function for member m_master_bus Do we need to call set_dirty_mp() here? It doesn't affect any user-interface elements.
- int select_note_events (midipulse tick_s, int note_h, midipulse tick_f, int note_l, select_action_t action)

  Selects events in range provided: tick start, note high, tick end, and note low.
- int select_events (midipulse tick_s, midipulse tick_f, midibyte status, midibyte cc, select_action_t action)

  Select all events in the given range, and returns the number selected.
- int select_events (midibyte status, midibyte cc, bool inverse=false)

  Select all events with the given status, and returns the number selected.
- int select_events (midipulse tick_s, midipulse tick_f, midibyte status)
- int select_event_handle (midipulse tick_s, midipulse tick_f, midibyte status, midibyte cc, int data_s)

  Use selected note ons if any.
- int select_linked (long tick_s, long tick_f, midibyte status)

  Used with seqevent when selecting Note On or Note Off, this function will select the opposite linked event.
- int select_even_or_odd_notes (int note_len, bool even)

  Selects every other note.
- void select_all_notes (bool inverse=false)

  New convenience function.
- int get_num_selected_notes () const

  Counts the selected notes in the event list.
- int get_num_selected_events (midibyte status, midibyte cc) const

  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 cut_selected (bool copyevents=true)

  Cuts the selected events.
- void paste_selected (midipulse tick, int note)

  Pastes the selected notes (and only note events) at the given tick and the given note value.
- void get_selected_box (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l)

  Returns the 'box' of the selected items.
- void get_onsets_selected_box (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l)

  Returns the 'box' of the selected items for only Note On values.
- void get_clipboard_box (midipulse &tick_s, int &note_h, midipulse &tick_f, int &note_l)

  Returns the 'box' of the clipboard items.
- midipulse adjust_timestamp (midipulse t, bool isnoteoff)

  A new function to consolidate the adjustment of timestamps in a pattern.
- midipulse trim_timestamp (midipulse t)

  A new function to consolidate the adjustment of timestamps in a pattern.
- midipulse clip_timestamp (midipulse ontime, midipulse offtime)

  A new function to consolidate the growth/shrinkage of timestamps in a pattern.
- void move_selected_notes (midipulse deltatick, int deltanote)

  Removes and adds selected notes in position.
- bool stream_event (event &ev)

  Streams the given event.

- bool change_event_data_range (midipulse tick_s, midipulse tick_f, midibyte status, midibyte cc, int d_s, int d_f)

  Changes the event data range.
- void change_event_data_lfo (double value, double range, double speed, double phase, wave_type_t wave, midibyte status, midibyte cc)

  Modifies data events according to the parameters active in the LFO window (lfownd).
- void increment_selected (midibyte status, midibyte)

  Increments events the match the given status and control values.
- void decrement_selected (midibyte status, midibyte)

  Decrements events the match the given status and control values.
- void grow_selected (midipulse deltatick)

  The original description was "Moves note off event." But this also gets called when simply selecting a second note via a ctrl-left-click, even in seq24.
- void stretch_selected (midipulse deltatick)

  Performs a stretch operation on the selected events.
- bool mark_selected ()

  Marks the selected events.
- void remove_selected ()

  Removes selected events.
- bool remove_marked ()

  Removes marked events.
- void unpaint_all ()

  Unpaints all events in the event-list.
- void unselect ()

  Deselects all events, unconditionally.
- void verify_and_link ()

  This function verifies state: all note-ons have a note-off, and it links note-offs with their note-ons.
- void link_new ()

  Links a new event.
- void link_tempos ()

  A new function to re-link the tempo events added by the user.
- 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 stop (bool song_mode=false)

  Provides a helper function simplify and speed up perform :: reset_sequences().
- void pause (bool song_mode=false)

  A pause version of stop().
- void inc_draw_marker ()

  This increments the draw marker.
- void reset_draw_marker ()

  This refreshes the draw marker to the first event.
- void reset_draw_trigger_marker ()

  Sets the draw-trigger iterator to the beginning of the trigger list.
- void reset_ex_iterator (event_list::const_iterator &evi)

  Reset the caller's iterator.

- draw_type_t get_next_note_event (midipulse &tick_s, midipulse &tick_f, int &note, bool &selected, int &velocity)

  Each call to seqdata() fills the passed references with a events elements, and returns true.
- bool get_minmax_note_events (int &lowest, int &highest)

  A new function provided so that we can find the minimum and maximum notes with only one (not two) traversal of the event list.
- bool get_next_event (midibyte &status, midibyte &cc)

  Get the next event in the event list.
- bool get_next_event_ex (midibyte status, midibyte cc, event_list::const_iterator &ev, int evtype=EVENTS_↩ ALL)

  New version in progress.
- bool get_next_trigger (midipulse &tick_on, midipulse &tick_off, bool &selected, midipulse &tick_offset)

  Get the next trigger in the trigger list, and set the parameters based on that trigger.
- void quantize_events (midibyte status, midibyte cc, midipulse snap_tick, int divide, bool linked=false)

  Grabs the specified events, puts them into a list, quantizes them against the snap ticks, and merges them in to the event container.
- void push_quantize (midibyte status, midibyte cc, midipulse snap_tick, int divide, bool linked=false)

  A new convenience function.
- void transpose_notes (int steps, int scale)

  Transposes notes by the given steps, in accordance with the given scale.
- void shift_notes (midipulse ticks)

  We need to look into this function.
- void multiply_pattern (double multiplier)
- midibyte musical_key () const

  'Getter' function for member m_musical_key
- void musical_key (int key)

  'Setter' function for member m_musical_key
- midibyte musical_scale () const

  'Getter' function for member m_musical_scale
- void musical_scale (int scale)

  'Setter' function for member m_musical_scale
- int background_sequence () const

  'Getter' function for member m_background_sequence
- void background_sequence (int bs)

  'Setter' function for member m_background_sequence Only partial validation at present, we do not want the upper limit to be hard-wired at this time.
- void show_events () const

  A member function to dump a summary of events stored in the event-list of a sequence.
- void copy_events (const event_list &newevents)

  Copies an external container of events into the current container, effectively replacing all of its events.
- midipulse note_off_margin () const

  'Getter' function for member m_note_length
- void set_unit_measure () const

  Calculates and sets u = 4BP/W, where u is m_unit_measure, B is the beats/bar, P is the PPQN, and W is the beat-width.
- midipulse get_unit_measure () const

  'Getter' function for member m_unit_measure
- bool channel_match () const

  'Getter' function for member m_channel_match The master bus needs to know if the match feature is truly in force, otherwise it must pass the incoming events to all recording sequences.
- void set_overwrite_rec (bool ovwr)

  'Setter' function for member m_overwrite_recording

- bool get_overwrite_rec ()

  'Getter' function for member m_overwrite_recording
- void set_loop_reset (bool reset)

  'Setter' function for member m_loop_reset
- bool get_loop_reset ()

  'Getter' function for member m_loop_reset
- midipulse handle_size (midipulse start, midipulse finish)

  Actually, useful mainly for the user-interface, this function calculates the size of the left and right handles of a note.

Static Public Member Functions

- static const std::string & default_name ()

  'Getter' function for member sm_default_name

Private Types

- typedef std::stack< event_list > EventStack

  Provides a stack of event-lists for use with the undo and redo facility.

Private Member Functions

- sequence & operator= (const sequence &rhs)
- bool event_in_range (const event &e, midibyte status, midipulse tick_s, midipulse tick_f) const

  A convenience function used a couple of times.
- void set_parent (perform ∗p)

  'Setter' function for member m_parent Sets the "parent" of this sequence, so that it can get some extra information about the performance.
- void put_event_on_bus (event &ev)

  Takes an event that this sequence is holding, and places it on the MIDI buss.
- void reset_loop ()
- void set_trigger_offset (midipulse trigger_offset)

  Sets m_trigger_offset and wraps it to m_length.
- void adjust_trigger_offsets_to_length (midipulse newlen)

  Adjusts trigger offsets to the length specified for all triggers, and undo triggers.
- midipulse adjust_offset (midipulse offset)
- 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 event-list.
- void remove (event &e)

  A helper function, which does not lock/unlock, so it is unsafe to call without supplying an iterator from the event-list.
- void remove_all ()

  Clears all events from the event container.
- bool channels_match (const event &e) const

  Checks to see if the event's channel matches the sequence's nominal channel.
- void one_shot (bool f)

  'Setter' function for member m_one_shot
- void off_from_snap (bool f)

  'Setter' function for member m_off_from_snap
- void song_playback_block (bool f)

  'Setter' function for member m_song_playback_block

- void song_recording (bool f)

    'Setter' function for member m_song_recording
- void song_recording_snap (bool f)

    'Getter' function for member m_song_recording_snap
- void song_record_tick (midipulse t)

    'Getter' function for member m_song_record_tick

Private Attributes

- perform ∗ m_parent

    For pause support, we need a way for the sequence to find out if JACK transport is active.
- event_list m_events

    This list holds the current pattern/sequence events.
- triggers m_triggers

    Holds the list of triggers associated with the sequence, used in the performance/song editor.
- event_list m_events_undo_hold

    Provides a list of event actions to undo for the Stazed LFO and seqdata support.
- bool m_have_undo

    A stazed flag indicating that we have some undo information.
- bool m_have_redo

    A stazed flag indicating that we have some redo information.
- EventStack m_events_undo

    Provides a list of event actions to undo.
- EventStack m_events_redo

    Provides a list of event actions to redo.
- event_list::iterator m_iterator_draw

    An iterator for drawing events.
- bool m_channel_match

    A new feature for recording, based on a "stazed" feature.
- midibyte m_midi_channel

    Contains the proper MIDI channel for this sequence.
- midibyte m_bus

    Contains the proper MIDI bus number for this sequence.
- bool m_song_mute

    Provides a flag for the song playback mode muting.
- bool m_transposable

    Indicate if the sequence is transposable or not.
- short m_notes_on

    Provides a member to hold the polyphonic step-edit note counter.
- mastermidibus ∗ m_master_bus

    Provides the master MIDI buss which handles the output of the sequence to the proper buss and MIDI channel.
- short m_playing_notes [SEQ64_MIDI_NOTES_MAX]

    Provides a "map" for Note On events.
- bool m_was_playing

    Indicates if the sequence was playing.
- bool m_playing

    True if sequence playback currently is in progress for this sequence.
- bool m_recording

    True if sequence recording currently is in progress for this sequence.
- bool m_quantized_rec

True if recording in quantized mode.

- bool m_thru

  True if recording in MIDI-through mode.
- bool m_queued

  True if the events are queued.
- bool m_one_shot

  A member from the Kepler34 project to indicate we are in one-shot mode for triggering.
- midipulse m_one_shot_tick

  A Member from the Kepler34 project, set in sequence :: toggle_one_shot() to m_last_tick adjusted to the length of the sequence.
- bool m_off_from_snap

  Indicates if we have turned off from a snap operation.
- bool m_song_playback_block

  Used to temporarily block Song Mode events while recording new ones.
- bool m_song_recording

  Used to keep on blocking Song Mode events while recording new ones.
- bool m_song_recording_snap

  This value indicates that the following feature is active: the number of tick to snap recorded improvisations.
- midipulse m_song_record_tick

  Saves the tick from when we started recording live song data.
- bool m_overwrite_recording

  Indicates if overwrite recording more is in force.
- bool m_loop_reset

  Indicates if the play marker has gone to the beginning of the sequence upon looping.
- midipulse m_unit_measure

  Hold the current unit for a measure.
- bool m_dirty_main

  These flags indicate that the content of the sequence has changed due to recording, editing, performance management, or even (?) a name change.
- bool m_dirty_edit

  Provides the main is-edited flag.
- bool m_dirty_perf

  Provides performance dirty flagflag.
- bool m_dirty_names

  Provides the names dirtiness flag.
- bool m_editing

  Indicates that the sequence is currently being edited.
- bool m_raise

  Used in seqmenu and seqedit.
- std::string m_name

  Provides the name/title for the sequence.
- midipulse m_last_tick

  These members manage where we are in the playing of this sequence, including triggering.
- midipulse m_queued_tick

  Provides the tick for queuing.
- midipulse m_trigger_offset

  Provides the trigger offset.
- const int m_maxbeats

  This constant provides the scaling used to calculate the time position in ticks (pulses), based also on the PPQN value.
- unsigned short m_ppqn

  Holds the PPQN value for this sequence, so that we don't have to rely on a global constant value.

- short m_seq_number

  A new member so that the sequence number is carried along with the sequence.
- colorbyte m_seq_color

  Reserved for a potential feature from the Kepler34 project.
- edit_mode_t m_seq_edit_mode

  A feature adapted from Kepler34.
- midipulse m_length

  Holds the length of the sequence in pulses (ticks).
- midipulse m_snap_tick

  The size of snap in units of pulses (ticks).
- unsigned short m_time_beats_per_measure

  Provides the number of beats per bar used in this sequence.
- unsigned short m_time_beat_width

  Provides with width of a beat.
- int m_clocks_per_metronome

  Augments the beats/bar and beat-width with the additional values included in a Time Signature meta event.
- int m_32nds_per_quarter

  Augments the beats/bar and beat-width with the additional values included in a Time Signature meta event.
- long m_us_per_quarter_note

  Augments the beats/bar and beat-width with the additional values included in a Tempo meta event.
- short m_rec_vol

  The volume to be used when recording.
- short m_note_on_velocity

  The Note On velocity used.
- short m_note_off_velocity

  The Note Off velocity used.
- midibyte m_musical_key

  Holds a copy of the musical key for this sequence, which we now support writing to this sequence.
- midibyte m_musical_scale

  Holds a copy of the musical scale for this sequence, which we now support writing to this sequence.
- short m_background_sequence

  Holds a copy of the background sequence number for this sequence, which we now support writing to this sequence.
- mutex m_mutex

  Provides locking for the sequence.
- const midipulse m_note_off_margin

  Provides the number of ticks to shave off of the end of painted notes.

Static Private Attributes

- static event_list m_events_clipboard

  A static clipboard for holding pattern/sequence events.
- static const std::string sm_default_name

  Provides the default name/title for the sequence.

Friends

- class perform
- class triggers

10.91.1 Detailed Description

More members than you can shake a stick at.

10.91.2 Member Typedef Documentation

10.91.2.1 EventStack

```
typedef std::stack<event_list> seq64::sequence::EventStack  [private]
```

10.91.3 Member Enumeration Documentation

10.91.3.1 select_action_t

```
enum seq64::sequence::select_action_t
```

Se the select_note_events() and select_events() functions.

Enumerator

e_select	Selection in progress.
e_select_one	To select a single event.
e_is_selected	The events are selected.
e_would_select	The events would be selected.
e_deselect	To deselect event under the cursor.
e_toggle_selection	Toggle selection under cursor.
e_remove_one	To remove one note under the cursor.
e_select_onset	Kepler34, To select a single onset.
e_is_selected_onset	New, from Kepler34, onsets selected.

10.91.4 Constructor & Destructor Documentation

10.91.4.1 sequence()

```
seq64::sequence::sequence (
             int ppqn = SEQ64_USE_DEFAULT_PPQN )
```

Parameters

ppqn	Provides the PPQN parameter to perhaps alter the default PPQN value of this sequence.

10.91.4.2 ∼sequence()

```
seq64::sequence::∼sequence ( )
```

10.91.5 Member Function Documentation

10.91.5.1 operator=()

```
sequence& seq64::sequence::operator= (
             const sequence & rhs )   [private]
```

10.91.5.2 partial_assign()

```
void seq64::sequence::partial_assign (
             const sequence & rhs )
```

We're replacing that incomplete seq24 function (many members are not assigned) with the more accurately-named partial_assign() function. It did not assign them all, so we created this partial_assign() function to do this work, and replaced operator =() with this function in client code.

Threadsafe

Parameters

rhs	Provides the source of the new member values.

10.91.5.3 events() [1/2]

```
event_list& seq64::sequence::events ( )   [inline]
```

10.91.5.4 events() [2/2]

```
const event_list& seq64::sequence::events ( ) const  [inline]
```

10.91.5.5 any_selected_notes()

```
bool seq64::sequence::any_selected_notes ( ) const  [inline]
```

10.91.5.6 triggerlist() [1/2]

```
const triggers::List& seq64::sequence::triggerlist ( ) const  [inline]
```

10.91.5.7 triggerlist() [2/2]

```
triggers::List& seq64::sequence::triggerlist ( )  [inline]
```

10.91.5.8 trigger_count()

```
int seq64::sequence::trigger_count ( ) const  [inline]
```

10.91.5.9 selected_trigger_count()

```
int seq64::sequence::selected_trigger_count ( ) const  [inline]
```

That is, selected in the perfroll.

10.91.5.10 set_trigger_paste_tick()

```
void seq64::sequence::set_trigger_paste_tick (
             midipulse tick )  [inline]
```

Parameters

tick	Provides the pulse value to set.

10.91.5.11 get_trigger_paste_tick()

```
midipulse seq64::sequence::get_trigger_paste_tick ( ) const  [inline]
```

Returns

Returns the current pulse value.

10.91.5.12 seq_number()

```
std::string seq64::sequence::seq_number ( ) const  [inline]
```

10.91.5.13 number() [1/2]

```
int seq64::sequence::number ( ) const  [inline]
```

10.91.5.14 number() [2/2]

```
void seq64::sequence::number (
             int seqnum )  [inline]
```

10.91.5.15 color() [1/2]

```
int seq64::sequence::color ( ) const  [inline]
```

10.91.5.16 color() [2/2]

```
void seq64::sequence::color (
             int c )  [inline]
```

Parameters

c	Provides the index into the color-palette. The only rules here are that -1 represents no color or a default color, and values of zero and above (to an unknown limit) represent a legal palette color.

10.91.5.17 edit_mode() [1/2]

```
edit_mode_t seq64::sequence::edit_mode ( ) const  [inline]
```

10.91.5.18 edit_mode() [2/2]

```
void seq64::sequence::edit_mode (
             edit_mode_t mode )  [inline]
```

10.91.5.19 modify()

```
void seq64::sequence::modify ( )
```

One minor issue is how can we unmodify the performance? We'd need to keep a count/stack of modifications over all sequences in the performance. Probably not practical, in general. We will probably keep track of the modification of the buss (port) and channel numbers, as per GitHub Issue #47.

10.91.5.20 event_count()

```
int seq64::sequence::event_count ( ) const
```

Note that only playable events are counted in a sequence. If a sequence class function provides a mutex, call m_events.count() instead.

Threadsafe

Returns

Returns m_events.count().

10.91.5.21 set_hold_undo()

```
void seq64::sequence::set_hold_undo (
             bool hold )
```

Parameters

hold	If true, then the events in the m_events container are added to the m_events_undo_hold container. Otherwise, that container is cleared.

10.91.5.22 get_hold_undo()

```
int seq64::sequence::get_hold_undo ( ) const  [inline]
```

10.91.5.23 set_have_undo()

```
void seq64::sequence::set_have_undo ( )  [inline]
```

10.91.5.24 have_undo()

```
bool seq64::sequence::have_undo ( ) const  [inline]
```

10.91.5.25 set_have_redo()

```
void seq64::sequence::set_have_redo ( )  [inline]
```

10.91.5.26 have_redo()

```
bool seq64::sequence::have_redo ( ) const  [inline]
```

10.91.5.27 push_undo()

```
void seq64::sequence::push_undo (
             bool hold = false )
```

Threadsafe

Parameters

hold	A new parameter for the stazed undo/redo support, not yet used. If true, then the events go into the undo-hold-list.

10.91.5.28 pop_undo()

```
void seq64::sequence::pop_undo ( )
```

We would like to be able to set perform's modify flag to false here, but other sequences might still be in a modified state. We could add a modify flag to sequence, and falsify that flag here. Something to think about.

Threadsafe

10.91.5.29 pop_redo()

```
void seq64::sequence::pop_redo ( )
```

Threadsafe

10.91.5.30 push_trigger_undo()

```
void seq64::sequence::push_trigger_undo ( )
```

Threadsafe

10.91.5.31 pop_trigger_undo()

```
void seq64::sequence::pop_trigger_undo ( )
```

Threadsafe

10.91.5.32 pop_trigger_redo()

```
void seq64::sequence::pop_trigger_redo ( )
```

Threadsafe

10.91.5.33 set_name()

```
void seq64::sequence::set_name (
             const std::string & name = "" )
```

This is the name shown in the top of a mainwid pattern slot.

We now try to include the length of the sequences in measures at the end of the name, and limit the length of the entire string. As noted in the printing of sequence::get_name() in mainwid, this length is 13 characters.

10.91.5.34 calculate_measures()

```
int seq64::sequence::calculate_measures ( ) const
```

Used by seqedit. If m_unit_measure hasn't been calculated yet, it is calculated here.

Change Note ca 2017-08-15 Fixed issue #106, where the measure count of a pattern kept incrementing when edited.

Returns

Returns the sequence length divided by the measure length, roughly. m_unit_measure is 0. The lowest valid measure is 1.

10.91.5.35 get_ppqn()

```
int seq64::sequence::get_ppqn ( ) const  [inline]
```

10.91.5.36 set_beats_per_bar()

```
void seq64::sequence::set_beats_per_bar (
             int beatspermeasure )
```

Threadsafe

Parameters

beatspermeasure	The new setting of the beats-per-bar value.

10.91.5.37 get_beats_per_bar()

```
int seq64::sequence::get_beats_per_bar ( ) const  [inline]
```

10.91.5.38 set_beat_width()

```
void seq64::sequence::set_beat_width (
             int beatwidth )
```

Threadsafe

Parameters

beatwidth	The new setting of the beat width value.

10.91.5.39 get_beat_width()

```
int seq64::sequence::get_beat_width ( ) const  [inline]
```

Threadsafe

10.91.5.40 measures_to_ticks()

```
midipulse seq64::sequence::measures_to_ticks (
             int measures = 1 ) const  [inline]
```

10.91.5.41 clocks_per_metronome() [1/2]

```
void seq64::sequence::clocks_per_metronome (
             int cpm )  [inline]
```

10.91.5.42 clocks_per_metronome() [2/2]

```
int seq64::sequence::clocks_per_metronome ( ) const  [inline]
```

10.91.5.43 set_32nds_per_quarter()

```
void seq64::sequence::set_32nds_per_quarter (
             int tpq )  [inline]
```

10.91.5.44 get_32nds_per_quarter()

```
int seq64::sequence::get_32nds_per_quarter ( ) const  [inline]
```

10.91.5.45 us_per_quarter_note() [1/2]

```
void seq64::sequence::us_per_quarter_note (
            long upqn )  [inline]
```

10.91.5.46 us_per_quarter_note() [2/2]

```
long seq64::sequence::us_per_quarter_note ( ) const  [inline]
```

10.91.5.47 set_rec_vol()

```
void seq64::sequence::set_rec_vol (
            int recvol )
```

Threadsafe

Parameters

recvol	The new setting of the recording volume setting. It is used only if it ranges from 0 to SEQ64_MAX_NOTE_ON_VELOCITY, or is set to SEQ64_PRESERVE_VELOCITY.

10.91.5.48 set_song_mute()

```
void seq64::sequence::set_song_mute (
            bool mute )  [inline]
```

10.91.5.49 toggle_song_mute()

```
void seq64::sequence::toggle_song_mute ( )  [inline]
```

10.91.5.50 get_song_mute()

```
bool seq64::sequence::get_song_mute ( ) const  [inline]
```

10.91.5.51 apply_song_transpose()

```
void seq64::sequence::apply_song_transpose ( )
```

10.91.5.52 set_transposable()

```
void seq64::sequence::set_transposable (
            bool flag )
```

Note that when a sequence is being read from a MIDI file, it will not yet have a parent, so we have to check for that before setting the perform modify flag.

10.91.5.53 get_transposable()

```
bool seq64::sequence::get_transposable ( ) const  [inline]
```

10.91.5.54 title()

```
std::string seq64::sequence::title ( ) const
```

This function differs from name, which just returns the value of m_name. Here, we also include the length of the sequences in measures at the end of the name, and limit the length of the entire string. As noted in the printing of sequence::get_name() in mainwid, this length is 13 characters.

Returns

Returns the name of the sequence, with the length in measures of the pattern wedged in at the end, if non-zero.

10.91.5.55 name()

```
const std::string& seq64::sequence::name ( ) const  [inline]
```

10.91.5.56 is_default_name()

```
bool seq64::sequence::is_default_name ( ) const  [inline]
```

10.91.5.57 default_name()

```
static const std::string& seq64::sequence::default_name ( )  [inline], [static]
```

10.91.5.58 set_editing()

```
void seq64::sequence::set_editing (
             bool edit )  [inline]
```

10.91.5.59 get_editing()

```
bool seq64::sequence::get_editing ( ) const  [inline]
```

10.91.5.60 set_raise()

```
void seq64::sequence::set_raise (
             bool edit )  [inline]
```

10.91.5.61 get_raise()

```
bool seq64::sequence::get_raise (
             void  ) const  [inline]
```

10.91.5.62 set_length()

```
void seq64::sequence::set_length (
             midipulse len = 0,
             bool adjust_triggers = true,
             bool verify = true )
```

This function is called in seqedit::apply_length(), when the user selects a sequence length in measures. This function is also called when reading a MIDI file.

There's an issue, though. If the application is compiled to use the original std::list container for MIDI events, that implementation sorts the container after every event insertion. If the application is compiled to used the std::map container (to speed up the reading of large MIDI files *greatly*), sorting happens automatically. But, if we use the original std::list implementation, but leave the sorting until later (to speed up the reading of large MIDI files *greatly*), then the verify_and_link() call that happens with every new event happens before the events are sorted, and the result is elongated notes showing up in the pattern slot in the main window. Therefore, we need a way to skip the verification when reading a MIDI file, and do the verification only after all events are read.

That function calculates the length in ticks:

```
    L = M x B x 4 x P / W
        L == length (ticks or pulses)
        M == number of measures
        B == beats per measure
        P == pulses per quarter-note
        W == beat width in beats per measure


For our "b4uacuse" MIDI file, M can be about 100 measures, B is 4,
P can be 192 (but we want to support higher values), and W is 4.
So L = 100 * 4 * 4 * 192 / 4 = 76800 ticks.  Seems small.
```

Threadsafe

Parameters

len	The length value to be set. If it is smaller than ppqn/4, then it is set to that value, unless it is zero, in which case m_length is used and does not change. It also sets the length value for the sequence's triggers.
adjust_triggers	If true, m_triggers.adjust_offsets_to_length() is called. The value defaults to true.
verify	This new parameter defaults to true. If true, verify_and_link() is called. Otherwise, it is not, and the caller should call this function with the default value after reading all the events.

10.91.5.63 set_num_measures()

```
void seq64::sequence::set_num_measures (
             int measures )  [inline]
```

10.91.5.64 get_num_measures()

```
int seq64::sequence::get_num_measures ( )
```

10.91.5.65 apply_length() [1/2]

```
void seq64::sequence::apply_length (
             int bpb,
             int ppqn,
             int bw,
             int measures = 1 )
```

There's an implicit "adjust-triggers = true" parameter used in this function. Please note that there is an overload that takes only a measure number and uses the current beats/bar, PPQN, and beat-width values of this sequence. The set_unit_measure() function is called, but won't change any values just because the length (number of measures) changed.

Warning

The measures calculation is useless if the BPM (beats/minute) varies throughout the song.

Parameters

bpb	Provides the beats per bar (measure).
ppqn	Provides the pulses-per-quarter-note to apply to the length application.
bw	Provides the beatwidth (typically 4) from the time signature.
measures	Provides the number of measures the sequence should cover, obtained from the user-interface.

10.91.5.66 extend()

```
int seq64::sequence::extend (
            midipulse len )
```

Calls set_length() with the new length and its default parameters. Not sure how useful this function is.

Parameters

len	The new length of the sequence.

Returns

Returns the new number of measures.

10.91.5.67 apply_length() [2/2]

```
void seq64::sequence::apply_length (
            int meas = 1 )  [inline]
```

Parameters

meas	The number of measures to apply. Defaults to 1.

10.91.5.68 get_length()

```
midipulse seq64::sequence::get_length ( ) const  [inline]
```

10.91.5.69 get_last_tick()

```
midipulse seq64::sequence::get_last_tick ( ) const
```

If m_length is 0, this function returns m_last_tick - m_trigger_offset, to avoid an arithmetic exception. Should we return 0 instead?

Note that seqroll calls this function to help get the location of the progress bar. What does perfedit do?

10.91.5.70 set_last_tick()

```
void seq64::sequence::set_last_tick (
            midipulse tick )
```

Threadsafe

10.91.5.71 mod_last_tick()

```
midipulse seq64::sequence::mod_last_tick ( ) [inline]
```

This function replaces the "m_last_tick % m_length", returning m_last_tick if m_length is 0 or 1.

10.91.5.72 set_playing()

```
void seq64::sequence::set_playing (
            bool p )
```

When playing, and the sequencer is running, notes get dumped to the ALSA buffers.

Parameters

p	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.

10.91.5.73 get_playing()

```
bool seq64::sequence::get_playing ( ) const [inline]
```

10.91.5.74 toggle_playing() [1/2]

```
void seq64::sequence::toggle_playing ( ) [inline]
```

10.91.5.75 toggle_playing() [2/2]

```
void seq64::sequence::toggle_playing (
            midipulse tick,
            bool resumenoteons )
```

How exactly does this differ from toggling the mute status?

Parameters

tick	The position from which to resume Note Ons, if appplicable. Resuming is a song-recording feature.
resumenoteons	A song-recording option.

10.91.5.76 toggle_queued()

```
void seq64::sequence::toggle_queued ( )
```

Also calculates the queued tick based on m_last_tick.

Threadsafe

10.91.5.77 get_queued()

```
bool seq64::sequence::get_queued ( ) const  [inline]
```

10.91.5.78 get_queued_tick()

```
midipulse seq64::sequence::get_queued_tick ( ) const  [inline]
```

10.91.5.79 check_queued_tick()

```
bool seq64::sequence::check_queued_tick (
            midipulse tick ) const  [inline]
```

10.91.5.80 set_recording()

```
void seq64::sequence::set_recording (
            bool r )
```

This function sets m_notes_on to 0, but this should be done only if the recording status has changed.

Threadsafe

10.91.5.81 set_quantized_recording()

```
void seq64::sequence::set_quantized_recording (
            bool qr )
```

What about doing this?

```
m_master_bus->set_sequence_input(record_active, this);
```

Threadsafe

10.91.5.82 set_input_recording()

```
void seq64::sequence::set_input_recording (
            bool record_active,
            bool toggle = false )
```

Do we need a quantized recording version, or is setting the quantized-recording flag sufficient?

Parameters

record_active	Provides the desired status to set recording.
toggle	If true, ignore the first parameter and toggle the flag. The default value is false.

10.91.5.83 get_recording()

```
bool seq64::sequence::get_recording ( ) const  [inline]
```

10.91.5.84 recording_next_measure()

```
bool seq64::sequence::recording_next_measure ( ) const  [inline]
```

10.91.5.85 get_snap_tick()

```
midipulse seq64::sequence::get_snap_tick ( ) const  [inline]
```

10.91.5.86 set_snap_tick()

```
void seq64::sequence::set_snap_tick (
            int st )
```

Threadsafe

10.91.5.87 get_quantized_rec()

```
bool seq64::sequence::get_quantized_rec ( ) const  [inline]
```

10.91.5.88 set_thru()

```
void seq64::sequence::set_thru (
            bool r )
```

Threadsafe

10.91.5.89 set_input_thru()

```
void seq64::sequence::set_input_thru (
            bool thru_active,
            bool toggle = false )
```

Parameters

thru_active	Provides the desired status to set the through state.
toggle	If true, ignore the first parameter and toggle the flag. The default value is false.

10.91.5.90 get_thru()

```
bool seq64::sequence::get_thru ( ) const  [inline]
```

10.91.5.91 off_one_shot()

```
void seq64::sequence::off_one_shot ( )
```

This function remains unused here and in Kepler34.

10.91.5.92 song_recording_start()

```
void seq64::sequence::song_recording_start (
            midipulse tick,
            bool snap )
```

This process starts by adding a chunk of SEQ64_SONG_RECORD_INC ticks to the trigger, which allows the rest of the threads to notice the change.

Question Do we need to call set_dirty_mp() here?

Parameters

tick	Provides the current tick, which helps set the recorded block's boundaries, and is copied into m_song_record_tick.
snap	Indicates if we are to snap the recording to the configured boundary, and is copied into m_song_recording_snap.

10.91.5.93 song_recording_stop()

```
void seq64::sequence::song_recording_stop (
            midipulse tick )
```

If we have been recording, we snap the end of the trigger segment to the next whole sequence interval.

Question Do we need to call set_dirty_mp() here?

Parameters

tick	Provides the current tick, which helps set the recorded block's boundaries.

10.91.5.94 one_shot_tick()

```
midipulse seq64::sequence::one_shot_tick ( ) const  [inline]
```

10.91.5.95 song_recording() [1/2]

```
bool seq64::sequence::song_recording ( ) const  [inline]
```

10.91.5.96 one_shot() [1/2]

```
bool seq64::sequence::one_shot ( ) const  [inline]
```

10.91.5.97 off_from_snap() [1/2]

```
bool seq64::sequence::off_from_snap ( ) const  [inline]
```

10.91.5.98 song_playback_block() [1/2]

```
bool seq64::sequence::song_playback_block ( ) const  [inline]
```

10.91.5.99 song_recording_snap() [1/2]

```
bool seq64::sequence::song_recording_snap ( ) const  [inline]
```

10.91.5.100 song_record_tick() [1/2]

```
midipulse seq64::sequence::song_record_tick ( ) const  [inline]
```

10.91.5.101 resume_note_ons()

```
void seq64::sequence::resume_note_ons (
            midipulse tick )
```

Parameters

tick	The current tick-time, in MIDI pulses.

10.91.5.102 toggle_one_shot()

```
void seq64::sequence::toggle_one_shot ( )
```

10.91.5.103 is_dirty_main()

```
bool seq64::sequence::is_dirty_main ( )
```

resets it). This flag signals that a redraw is needed from recording.

Threadsafe

Returns

Returns the dirty status.

10.91.5.104 is_dirty_edit()

```
bool seq64::sequence::is_dirty_edit ( )
```

The m_dirty_edit flag is set by the function set_dirty().

Threadsafe

Returns

Returns the dirty status.

10.91.5.105 is_dirty_perf()

```
bool seq64::sequence::is_dirty_perf ( )
```

Threadsafe

Returns

Returns the dirty status.

10.91.5.106 is_dirty_names()

```
bool seq64::sequence::is_dirty_names ( )
```

Not sure that we need to lock a boolean on modern processors.

Threadsafe

Returns

Returns the dirty status.

10.91.5.107 set_dirty_mp()

```
void seq64::sequence::set_dirty_mp ( )
```

These flags are meant for causing user-interface refreshes, not for performance modification.

m_dirty_names is set to false in is_dirty_names(); m_dirty_names is set to false in is_dirty_main(); m_dirty_names is set to false in is_dirty_perf().

Not threadsafe

10.91.5.108 set_dirty()

```
void seq64::sequence::set_dirty ( )
```

Threadsafe

10.91.5.109 get_midi_channel()

```
midibyte seq64::sequence::get_midi_channel ( ) const [inline]
```

10.91.5.110 is_smf_0()

```
bool seq64::sequence::is_smf_0 ( ) const [inline]
```

10.91.5.111 set_midi_channel()

```
void seq64::sequence::set_midi_channel (
            midibyte ch,
            bool user_change = false )
```

Threadsafe

Parameters

ch	The MIDI channel to set as the output channel number for this sequence.
user_change	If true (the default value is false), the user has decided to change this value, and we might need to modify the perform's dirty flag, so that the user gets prompted for a change, This is a response to GitHub issue #47, where channel changes do not cause a prompt to save the sequence.

10.91.5.112 print()

```
void seq64::sequence::print ( ) const
```

Not threadsafe

10.91.5.113 print_triggers()

```
void seq64::sequence::print_triggers ( ) const
```

Not threadsafe

10.91.5.114 play()

```
void seq64::sequence::play (
            midipulse tick,
            bool playback_mode,
            bool resume_note_ons = false )
```

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.

Note

With pause support, the progress bar for the pattern/sequence editor does what we want: pause with the pause button, and rewind with the stop button. Works with JACK, with issues, but we'd like to have the stop button do a rewind in JACK, too.

If we are playing the song data (sequence on/off triggers, we are in playback mode. And if we are song-recording, we then keep growing the sequence's song-data triggers.

The trigger calculations have been offloaded to the triggers::play() function. Its return value and side-effects tell if there's a change in playing based on triggers, and provides the ticks that bracket it.

Parameters

tick	Provides the current end-tick value. The tick comes in as a global tick.
playback_mode	Provides how playback is managed. True indicates that it is performance/song-editor playback, controlled by the set of patterns and triggers set up in that editor, and saved with the song in seq24 format. False indicates that the playback is controlled by the main window, in live mode.
resume_note_ons	A song-recording parameter.

Threadsafe

10.91.5.115 play_queue()

```
void seq64::sequence::play_queue (
            midipulse tick,
            bool playbackmode,
            bool resumenoteons )
```

We refactored this, Chris. Remember? :-D

Parameters

tick	Provides the current active pulse position, the tick/pulse from which to start playing.
playbackmode	If true, we are in Song mode. Otherwise, Live mode.
resumenoteons	Indicates if we are to resume Note Ons. Used by perform::play().

10.91.5.116 add_note()

```
bool seq64::sequence::add_note (
            midipulse tick,
            midipulse len,
            int note,
            bool paint = false,
            int velocity = SEQ64_PRESERVE_VELOCITY )
```

It adds a single Note-On/Note-Off pair.

The 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.

Also note that push_undo() is not incorporated into this function, for the sake of speed.

Here, we could ignore events not on the sequence's channel, as an option. We have to be careful because this function can be used in painting notes.

Stazed:

```
http://www.blitter.com/~russtopia/MIDI/~jglatt/tech/midispec.htm

Note Off: The first data is the note number. There are 128 possible
notes on a MIDI device, numbered 0 to 127 (where Middle C is note
number 60). This indicates which note should be released.  The second
data byte is the velocity, a value from 0 to 127. This indicates how
quickly the note should be released (where 127 is the fastest). It's
up to a MIDI device how it uses velocity information. Often velocity
will be used to tailor the VCA release time.  MIDI devices that can
generate Note Off messages, but don't implement velocity features,
will transmit Note Off messages with a preset velocity of 64.
```

Also, we now see that seq24 never used the recording-velocity member (m_rec_vol). We use it to modify the new m_note_on_velocity member if the user changes it in the seqedit window.

Threadsafe

Parameters

tick	The time destination of the new note, in pulses.
len	The duration of the new note, in pulses.
note	The pitch destination of the new note.
paint	If true, repaint the whole set of events, in order to be left with a clean view of the inserted event. The default is false.
velocity	If not set to SEQ64_PRESERVE_VELOCITY, the velocity of the note is set to this value. Otherwise, it is hard-wired to the stored note-on velocity. The name of this macro is counter-intuitive here. Currently, the note-off velocity is HARD-WIRED!

Returns

Returns true if the event was added.

10.91.5.117 add_chord()

```
bool seq64::sequence::add_chord (
            int chord,
            midipulse tick,
            midipulse len,
            int note )
```

If SEQ64_STAZED_CHORD_GENERATOR is not defined, it devolves to add_note().

Todo Add the ability to preserve the incoming velocity.

Threadsafe

Parameters

chord	If greater than 0 (and less than c_chord_number), a chord (multiple notes) will be generated using this chord in the c_chord_table[] array. Otherwise, only a single note will be added.
tick	The time destination of the new note, in pulses.
len	The duration of the new note, in pulses.
note	The pitch destination of the new note.

Returns

Returns true if the events were added.

10.91.5.118 add_event() [1/2]

```
bool seq64::sequence::add_event (
            const event & er )
```

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. Well, actually, certain meta-events are also read, to obtain channel, buss, and more settings. Also read for a sequence, if the global-sequence flag is not set, are the new key, scale, and background sequence parameters.

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/usable.

Here, we could ignore events not on the sequence's channel, as an option. We have to be careful because this function can be used in painting events.

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. Actually, this is true only in Seq24, we've fixed that behavior for Sequencer64.

Parameters

er	Provide a reference to the event to be added; the event is copied into the events container.

Returns

Returns true if the event was added.

10.91.5.119 add_event() [2/2]

```
bool seq64::sequence::add_event (
            midipulse tick,
            midibyte status,
            midibyte d0,
            midibyte d1,
            bool paint = false )
```

The 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

Parameters

tick	The time destination of the event.
status	The type of event to add.
d0	The first data byte for the event.
d1	The second data byte for the event (if needed).
paint	If true, the inserted event is marked for painting.

10.91.5.120 append_event()

```
bool seq64::sequence::append_event (
            const event & er )
```

This function is meant mainly for reading the MIDI file, to save a lot of time.

Parameters

er	Provide a reference to the event to be added; the event is copied into the events container.

Returns

Returns true if the event was appended.

10.91.5.121 sort_events()

```
void seq64::sequence::sort_events ( )  [inline]
```

10.91.5.122 add_trigger()

```
void seq64::sequence::add_trigger (
            midipulse tick,
            midipulse len,
            midipulse offset = 0,
            bool fixoffset = true )
```

A pass-through function that calls triggers::add(). See that function for more details.

Threadsafe

Parameters

tick	The time destination of the trigger.
len	The duration of the trigger.
offset	The performance offset of the trigger.
fixoffset	If true, adjust the offset.

10.91.5.123 split_trigger()

```
void seq64::sequence::split_trigger (
            midipulse splittick )
```

This is the public overload of split_trigger.

Threadsafe

Parameters

splittick	The time location of the split.

10.91.5.124 half_split_trigger()

```
void seq64::sequence::half_split_trigger (
            midipulse splittick )
```

Parameters

splittick	The time location of the split.

10.91.5.125 exact_split_trigger()

```
void seq64::sequence::exact_split_trigger (
            midipulse splittick )
```

Parameters

splittick	The time location of the split.

10.91.5.126 grow_trigger()

```
void seq64::sequence::grow_trigger (
            midipulse tickfrom,
            midipulse tickto,
            midipulse len )
```

See triggers::grow() for more information.

Parameters

tickfrom	The desired from-value back which to expand the trigger, if necessary.
tickto	The desired to-value towards which to expand the trigger, if necessary.
len	The additional length to append to tickto for the check.

Threadsafe

10.91.5.127 delete_trigger()

```
void seq64::sequence::delete_trigger (
            midipulse tick )
```

See triggers::remove().

Threadsafe

Parameters

tick	Provides the tick to be used for finding the trigger to be erased.

10.91.5.128 get_trigger_state()

```
bool seq64::sequence::get_trigger_state (
            midipulse tick ) const
```

If any trigger is found to bracket that tick, then true is returned.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.91.5.129 select_trigger()

```
bool seq64::sequence::select_trigger (
            midipulse tick )
```

If any trigger is found to bracket that tick, then true is returned, and the trigger is marked as selected.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick; this is the return value of m_triggers.select().

10.91.5.130 get_triggers()

```
triggers::List seq64::sequence::get_triggers ( ) const
```

This function is basically a threadsafe version of sequence::triggerlist().

Returns

Returns of copy of m_triggers.triggerlist().

10.91.5.131 unselect_trigger()

```
bool seq64::sequence::unselect_trigger (
            midipulse tick )
```

Parameters

tick	Indicates the trigger to be unselected.

10.91.5.132 unselect_triggers()

```
bool seq64::sequence::unselect_triggers ( )
```

Returns

Returns the m_triggers.unselect() return value.

10.91.5.133 intersect_triggers() [1/2]

```
bool seq64::sequence::intersect_triggers (
            midipulse position,
            midipulse & start,
            midipulse & ender )
```

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. See triggers::intersect().

Threadsafe

Parameters

position	The position to examine.
start	The destination for the starting tick of the matching trigger.
ender	The destination for the ending tick 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.

10.91.5.134 intersect_triggers() [2/2]

```
bool seq64::sequence::intersect_triggers (
            midipulse pos )
```

10.91.5.135 intersect_notes()

```
bool seq64::sequence::intersect_notes (
            midipulse position,
            int position_note,
            midipulse & start,
            midipulse & ender,
            int & note )
```

If the given position is between the current note's on and off time values, the these values are copied to the start and end parameters, respectively, and the note value is copied to the note parameter, and then we exit.

Threadsafe

Parameters

	position	The tick position to examine; where the mouse pointer is horizontally, already converted to a tick number.
	position_note	This is the position of the mouse pointer vertically, already converted to a note number.
out	*start*	The destination for the starting timestamp of the matching note.
out	*ender*	The destination for the ending timestamp of the matching note.
out	*note*	The destination for the note of the matching event.

Returns

Returns true if a note-on 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.

10.91.5.136 intersect_events()

```
bool seq64::sequence::intersect_events (
            midipulse posstart,
            midipulse posend,
            midibyte status,
            midipulse & start )
```

If the given position is between the current notes's timestamp-start and timestamp-end values, the these values are copied to the posstart and posend parameters, respectively, and then we exit.

Threadsafe

Parameters

posstart	The starting position to examine.
posend	The ending position to examine.
status	The desired status value.
start	The destination for the starting timestamp of the matching trigger.

Returns

Returns true if a event was found whose start/end timestamps contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

10.91.5.137 delete_selected_triggers()

```
void seq64::sequence::delete_selected_triggers ( )
```

10.91.5.138 cut_selected_trigger()

```
void seq64::sequence::cut_selected_trigger ( )
```

10.91.5.139 copy_selected_trigger()

```
void seq64::sequence::copy_selected_trigger ( )
```

Then it copies the first selected trigger that is found.

10.91.5.140 paste_trigger()

```
void seq64::sequence::paste_trigger (
            midipulse paste_tick = SEQ64_NO_PASTE_TRIGGER )
```

Why isn't this protected by a mutex? We will enable this if anything bad happens, such as a deadlock, or corruption, that we can prove happens here.

Parameters

paste_tick	A new parameter that provides the tick for pasting, or SEQ64_NO_PASTE_TRIGGER (-1) if there is none.

10.91.5.141 move_triggers() [1/2]

```
bool seq64::sequence::move_triggers (
            midipulse tick,
            bool adjustoffset,
            triggers::grow_edit_t which = triggers::GROW_MOVE )
```

```
          min_tick][0                1][max_tick
                           2


The \a which parameter has three possible values:

-#  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

Parameters

tick	The tick at which the trigger starts.
adjustoffset	Set to true if the offset is to be adjusted.
which	Selects which movement will be done, as discussed above.

Returns

Returns the value of triggers::move_selected(), which indicates that the movement could be made. Used in Seq24PerfInput::handle_motion_key().

10.91.5.142 selected_trigger_start()

```
midipulse seq64::sequence::selected_trigger_start ( )
```

Threadsafe

Returns

Returns the tick_start() value of the last-selected trigger. If no triggers are selected, then -1 is returned.

10.91.5.143 selected_trigger_end()

```
midipulse seq64::sequence::selected_trigger_end ( )
```

Threadsafe

Returns

Returns the tick_end() value of the last-selected trigger. If no triggers are selected, then -1 is returned.

10.91.5.144 get_max_trigger()

```
midipulse seq64::sequence::get_max_trigger ( ) const
```

Threadsafe

Returns

Returns the maximum trigger value.

10.91.5.145 move_triggers() [2/2]

```
void seq64::sequence::move_triggers (
            midipulse starttick,
            midipulse distance,
            bool direction )
```

Note the dependence on the m_length member being kept in sync with the parent's value of m_length.

Threadsafe

Parameters

starttick	The current location of the triggers.
distance	The distance away from the current location to which to move the triggers.
direction	If true, the triggers are moved forward. If false, the triggers are moved backward.

10.91.5.146 copy_triggers()

```
void seq64::sequence::copy_triggers (
            midipulse starttick,
            midipulse distance )
```

Threadsafe

Parameters

starttick	The current location of the triggers.
distance	The distance away from the current location to which to copy the triggers.

10.91.5.147 clear_triggers()

```
void seq64::sequence::clear_triggers ( )
```

Threadsafe

10.91.5.148 get_trigger_offset()

```
midipulse seq64::sequence::get_trigger_offset ( ) const  [inline]
```

10.91.5.149 set_midi_bus()

```
void seq64::sequence::set_midi_bus (
             char mb,
             bool user_change = false )
```

Threadsafe

Parameters

mb	The MIDI buss to set as the buss number for this sequence. Also called the "MIDI port" number.
user_change	If true (the default value is false), the user has decided to change this value, and we might need to modify the perform's dirty flag, so that the user gets prompted for a change, This is a response to GitHub issue #47, where buss changes do not cause a prompt to save the sequence.

10.91.5.150 get_midi_bus()

```
char seq64::sequence::get_midi_bus ( ) const  [inline]
```

10.91.5.151 set_master_midi_bus()

```
void seq64::sequence::set_master_midi_bus (
             mastermidibus * mmb )
```

Threadsafe

Parameters

mmb	Provides a pointer to the master MIDI buss for this sequence. This should be a reference, but isn't, nor is it checked.

10.91.5.152 select_note_events()

```
int seq64::sequence::select_note_events (
            midipulse tick_s,
            int note_h,
            midipulse tick_f,
            int note_l,
            select_action_t action )
```

Be aware the the event::is_note() function is used, and that it includes Aftertouch events, which generally need to stick with their Note On counterparts.

If a "note" event is detected, then we skip it. This is necessary since channel pressure and control change use d0 for seqdata, and d0 is returned by get_note(). This causes note selection to occasionally select them when their seqdata values are within range of the tick selection. So therefore we want only Note Ons and Note Offs.

Note

The continuation below ("continue") is necessary since channel pressure and control change use d0 for seqdata [which is returned by get_note()]. This causes seqroll note selection to occasionally select them when their seqdata values are within the range of tick selection. So only, note ons and offs. What about Aftertouch? We have the event::is_note() function for that.

Parameters

tick_s	The starting tick.
note←↩ _h	The highest note selected.
tick_f	The ending, or finishing, tick.
note←↩ _l	The lowest note selected.
action	The action to perform on the selection.

Returns

Returns the number of notes selected.

10.91.5.153 select_events() [1/3]

```
int seq64::sequence::select_events (
            midipulse tick_s,
            midipulse tick_f,
            midibyte status,
            midibyte cc,
            select_action_t action )
```

Note that there is also an overloaded version of this function.

Threadsafe

Parameters

tick↩_s	The start time of the selection.
tick↩_f	The finish time of the selection.
status	The desired event in the selection. Now, as a new feature, tempo events are also selectable, in addition to events selected by this parameter.
cc	The desired control-change in the selection, if the event is a control-change.
action	The desired selection action.

Returns

Returns the number of events selected.

10.91.5.154 select_events() [2/3]

```
int seq64::sequence::select_events (
            midibyte status,
            midibyte 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.

Parameters

status	Provides the status value to be selected.
cc	If the status is EVENT_CONTROL_CHANGE, then data byte 0 must match this value.
inverse	If true, invert the selection.

Returns

Always returns 0.

10.91.5.155 select_events() [3/3]

```
int seq64::sequence::select_events (
            midipulse tick_s,
            midipulse tick_f,
            midibyte status )
```

10.91.5.156 select_event_handle()

```
int seq64::sequence::select_event_handle (
            midipulse tick_s,
            midipulse tick_f,
            midibyte status,
            midibyte cc,
            int dats )
```

Parameters

tick←→_s	Provides the starting tick.
tick←→_f	Provides the ending (finishing) tick.
status	Provides the desired MIDI event to be selected.
cc	Provides the desired MIDI control value to be selected.
dats	Provides the center of a small data value range of plus or minus 2.

Returns

Returns the number of events selected.

10.91.5.157 select_linked()

```
int seq64::sequence::select_linked (
            long tick_s,
            long tick_f,
            midibyte status )
```

This is a Stazed selection fix we have activated unilaterally.

Parameters

tick←→_s	Provides the starting tick.
tick←→_f	Provides the ending (finishing) tick.
status	Provides the desired MIDI event to be selected.

Returns

Returns the number of notes selected.

10.91.5.158 select_even_or_odd_notes()

```
int seq64::sequence::select_even_or_odd_notes (
             int note_len,
             bool even )
```

Enabled only if USE_STAZED_ODD_EVEN_SELECTION is defined.

Parameters

note_len	The desired note lengths for the selection.
even	True if we want the even notes.

Returns

Returns the number of notes selected.

10.91.5.159 select_all_notes()

```
void seq64::sequence::select_all_notes (
             bool inverse = false )  [inline]
```

What about Aftertouch events? I think we need to select them as well in seqedit, so let's add that selection here as well.

Parameters

inverse	If set to true (the default is false), then this causes the selection to be inverted.

10.91.5.160 get_num_selected_notes()

```
int seq64::sequence::get_num_selected_notes ( ) const
```

Threadsafe

Returns

Returns m_events.count_selected_notes().

10.91.5.161 get_num_selected_events()

```
int seq64::sequence::get_num_selected_events (
             midibyte status,
             midibyte cc ) const
```

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

Threadsafe

Parameters

status	The desired kind of event to count.
cc	The desired control-change to count, if the event is a control-change.

Returns

Returns m_events.count_selected_events().

10.91.5.162 select_all()

```
void seq64::sequence::select_all ( )
```

Threadsafe

10.91.5.163 copy_selected()

```
void seq64::sequence::copy_selected ( )
```

This function also has the danger, discovered by user 0rel, of events being modified after being added to the clipboard. So we add his reconstruction fix here as well. To summarize the steps:

```
-#  Clear the m_events_clipboard.  NO!  If we have no events to
    copy to the clipboard, we do not want to clear it.  This kills
    cut-and-paste functionality.
-#  Add all selected events in this clipboard to the sequence.
-#  Normalize the timestamps of the events in the clip relative to the
    timestamp of the first selected event.  (Is this really needed?)
-#  Reconstruct/reconstitute the m_events_clipboard.
```

This process is a bit easier to manage than erase/insert on events because std::multimap has no erase() function that returns the next valid iterator. Also, we use a local clipboard first, to save on copying. We've enhanced the error-checking, too.

Finally, note that m_events_clipboard is a static member of sequence, so:

```
-#  Copying can be done between sequences.
-#  Access to it needs to be protected by a mutex.
```

Threadsafe

10.91.5.164 cut_selected()

```
void seq64::sequence::cut_selected (
            bool copyevents = true )
```

Pushes onto the undo stack, may copy the events, marks the selected events, and removes them. Now also sets the dirty flag so that the caller doesn't have to. Also raises the modify flag on the parent perform object.

Threadsafe

Parameters

copyevents	If true, copy the selected events before marking and removing them.

10.91.5.165 paste_selected()

```
void seq64::sequence::paste_selected (
            midipulse tick,
            int note )
```

Also, we've moved external calls to push_undo() into this function. The caller shouldn't have to do that.

The event_keys used to access/sort the multimap event_list is not updated after changing timestamp/rank of the stored events. Regenerating all key/value pairs before merging them solves this issue, so that the order of events in the sequence will be preserved. This action is not needed for moving or growing events. Nor is it needed if the old std::list implementation of the event container is compiled in. However, it is needed in any operation that modifies the timestamp of an event inside the container:

```
-   copy_selected()
-   paste_selected()
-   quantize_events() TODO TODO TODO!
```

The alternative to reconstructing the map is to erase-and-insert the events modified in the code above, rather than just tweaking their values, which have an effect on sorting for the event-map implementation. However, multimap does not provide an erase() function that returns the next valid iterator, which would complicate this method of operation. So we're inclined to stick with this solution.

There was an issue with copy/pasting a whole sequence. The pasted events did not go to their destination, but overlayed the original events. This bugs also occurred in Seq24 0.9.2. It occurs with the allofarow.mid file when doing Ctrl-A Ctrl-C Ctrl-V Move-Mouse Left-Click. It turns out the original code was checking only the first event to see if it was a Note event. For sequences that started with a Control Change or Program Change (or other non-Note events), the highest note was never modified, and none of the note events were adjusted.

Finally, we only want to transpose note events (i.e. alter m_data[0]), and not other kinds of events. We still need to figure out what to do with aftertouch, though. Currently likely to be covered by the processing of the note that it accompanies.

Threadsafe

Parameters

tick	The time destination for the paste. This represents the "x" coordinate of the upper left corner of the paste-box. It will be converted to an offset, for example pasting every event 48 ticks forward from the original copy.
note	The note/pitch destination for the paste. This represents the "y" coordinate of the upper left corner of the paste-box. It will be converted to an offset, for example pasting every event 7 notes higher than the original copy.

10.91.5.166 get_selected_box()

```
void seq64::sequence::get_selected_box (
            midipulse & tick_s,
            int & note_h,
            midipulse & tick_f,
            int & note_l )
```

Note the common-code betweem this function and get_clipboard_box(). Also note we could return a boolean indicating if the return values were filled in.

Threadsafe

Parameters

out	*tick_s*	Side-effect return reference for the start time.
out	*note↩ _h*	Side-effect return reference for the high note.
out	*tick_f*	Side-effect return reference for the finish time.
out	*note↩ _l*	Side-effect return reference for the low note.

10.91.5.167 get_onsets_selected_box()

```
void seq64::sequence::get_onsets_selected_box (
            midipulse & tick_s,
            int & note_h,
            midipulse & tick_f,
            int & note_l )
```

Compare to get_selected_box().

Threadsafe

Parameters

out	*tick_s*	Side-effect return reference for the start time.
out	*note↩ _h*	Side-effect return reference for the high note.
out	*tick_f*	Side-effect return reference for the finish time.
out	*note↩ _l*	Side-effect return reference for the low note.

10.91.5.168 get_clipboard_box()

```
void seq64::sequence::get_clipboard_box (
            midipulse & tick_s,
            int & note_h,
            midipulse & tick_f,
            int & note_l )
```

Note the common-code betweem this function and get_selected_box(). Also note we could return a boolean indicating if the return values were filled in.

Threadsafe

Parameters

out	*tick_s*	Side-effect return reference for the start time.
out	*note↩ _h*	Side-effect return reference for the high note.
out	*tick_f*	Side-effect return reference for the finish time.
out	*note↩ _l*	Side-effect return reference for the low note.

10.91.5.169 adjust_timestamp()

```
midipulse seq64::sequence::adjust_timestamp (
            midipulse t,
            bool isnoteoff )
```

- If the timestamp plus the delta is greater that m_length, we do round robin magic.
- If the timestamp is greater than m_length, then it is wrapped around to the beginning.
- If the timestamp equals m_length, then it is set to 0, and later, trimmed.
- If the timestamp is less than 0, then it is set to the end.

Taken from similar code in move_selected_notes() and grow_selected(). Be careful using this function.

Parameters

t	Provides the timestamp to be adjusted based on m_length.
isnoteoff	Used for "expanding" the timestamp from 0 to just less than m_length, if necessary. Should be set to true only for Note Off events; it defaults to false, which means to wrap the events around the end of the sequence if necessary, and is used only in movement, not in growth.

Returns

Returns the adjusted timestamp.

10.91.5.170 trim_timestamp()

```
midipulse seq64::sequence::trim_timestamp (
            midipulse t )
```

Similar to adjust_timestamp, but it doesn't have an *isnoteoff* parameter.

Parameters

t	Provides the timestamp to be adjusted based on m_length.

Returns

Returns the adjusted timestamp.

10.91.5.171 clip_timestamp()

```
midipulse seq64::sequence::clip_timestamp (
            midipulse ontime,
            midipulse offtime )
```

If the new (off) timestamp is less than the on-time, it is clipped to the snap value. If it is greater than the length of the sequence, then it is clipped to the sequence length. No wrap-around.

Parameters

ontime	Provides the original time, which limits the amount of negative adjustment that can be done.
offtime	Provides the timestamp to be adjusted and clipped.

Returns

Returns the adjusted timestamp.

10.91.5.172 move_selected_notes()

```
void seq64::sequence::move_selected_notes (
            midipulse delta_tick,
            int delta_note )
```

Also currently moves any other events in the range of the selection.

Also, we've moved external calls to push_undo() into this function. The caller shouldn't have to do that.

Another thing this function does is wrap-around when movement occurs. Any events (except Note Off) that will start just after the END of the pattern will be wrapped around to the beginning of the pattern.

Fixed:

Select all notes in a short pattern that starts at time 0 and has non-note events starting at time 0 (see contrib/midi/allofarow.mid); move them with the right arrow, and move them back with the left arrow; then view in the event editor, and see that the non-Note events have not moved back, and in fact move way too far to the right, actually to near the END marker. We've fixed that in the new adjust_timestamp() function.

This function checks for any marked events in seq24, but now we make sure the event is a Note On or Note Off event before dealing with it. We now handle properly events like Program Change, Control Change, and Pitch Wheel. Remember that Aftertouch is treated like a note, as it has velocity. For non-Notes, event::get_note() returns m_data[0], and we don't want to adjust that.

Note

We leave a small gap where mark_selected() locks and unlocks, then we lock again. This should only be an issue if moving notes while the sequence is playing.

Parameters

delta_tick	Provides the amount of time to move the selected notes. Note that it also applies to events. Note-Off events are expanded to m_length if their timestamp would be 0. All other events will wrap around to 0.
delta_note	Provides the amount of pitch to move the selected notes. This value is applied only to Note (On and Off) events. Also, if this value would bring a note outside the range of 0 to 127, that note is not changed and the event is not moved.

10.91.5.173 stream_event()

```
bool seq64::sequence::stream_event (
             event & ev )
```

The event's timestamp is adjusted, if needed. If recording:

```
-   If the pattern is playing, the event is added.
-   If the pattern is playing and quantized record is in force, the
    note's timestamp is altered.
-   If not playing, but the event is a Note On or Note Off, we add it
    and keep track of it.
```

If MIDI Thru is enabled, the event is put on the buss.

We are adding a feature where events are rejected if their channel doesn't match that of the sequence. This has been a complaint of some people. Could modify the add_event() and add_note() functions, but better to do it here for comprehensive event support. Also have to make sure the event-channel is preserved before this function is called, and also need to make sure that the channel is appended on both playback and in saving of the MIDI file.

We are also adding the usage, at last, of the m_rec_vol member, including the "Free" menu entry in seqedit, which sets the velocity to SEQ64_PRESERVE_VELOCITY (-1).

Todo When we feel like debugging, we will replace the global is-playing call with the parent perform's is-running call.

Threadsafe

Parameters

ev	Provides the event to stream.

Returns

Returns true if the event's channel matched that of this sequence, and the channel-matching feature was set to true. Also returns true if we're not using channel-matching. A return value of true means the event should be saved.

If in overwrite loop-record mode, any events after reset should clear the old items from the previous pass through the loop.

Todo If the last event was a Note Off, we should clear it here, and how?

10.91.5.174 change_event_data_range()

```
bool seq64::sequence::change_event_data_range (
             midipulse tick_s,
             midipulse tick_f,
             midibyte status,
             midibyte 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

```
             df (t - ts) + ds (tf - t)
        d = --------------------------
                    tf  -   ts

If this were an interpolation formula it would be:

                            t -  ts
        d = ds + (df - ds) ---------
                            tf - ts

Something is not quite right; to be investigated.
```

Parameters

tick_s	Provides the starting tick value.
tick_f	Provides the ending tick value.
status	Provides the event status that is to be changed.
cc	Provides the event control value.
data_s	Provides the starting data value.
data_f	Provides the finishing data value.

Returns

Returns true if the data was changed.

10.91.5.175 change_event_data_lfo()

```
void seq64::sequence::change_event_data_lfo (
            double value,
            double range,
            double speed,
            double phase,
            wave_type_t wave,
            midibyte status,
            midibyte cc )
```

Parameters

value	Provides the base value for the event data value. Ranges from 0 to 127 in increments of 0.1. This amount is added to the result of the wave_func() calculation.
range	Provides the range for the event data value. Ranges from 0 to 127 in increments of 0.1.
speed	Provides the inverse periodicity (?) for the modifications. Ranges from 0 to 16 in increments of 0.01. Not sure what units this value is in.
phase	The phase of the event modification. Ranges from 0 to 1 (what units?) in increments of 0.01.
wave	The wave type to apply. Ranges from 1 to 5.
status	The status value for the events to modify.
cc	Provides the control-change value for Control Change events that are to be modified.

10.91.5.176 increment_selected()

```
void seq64::sequence::increment_selected (
            midibyte astat,
            midibyte  )
```

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

Parameters

astat	The desired event.

Parameter "acontrol", the desired control-change, is unused. This might be a bug, or at least a missing feature.

10.91.5.177 decrement_selected()

```
void seq64::sequence::decrement_selected (
            midibyte astat,
            midibyte  )
```

The supported statuses are:

- One-byte messages
  - EVENT_PROGRAM_CHANGE
  - EVENT_CHANNEL_PRESSURE
- Two-byte messages
  - EVENT_NOTE_ON
  - EVENT_NOTE_OFF
  - EVENT_AFTERTOUCH
  - EVENT_CONTROL_CHANGE
  - EVENT_PITCH_WHEEL

Threadsafe

Parameters

astat	The desired event.

Parameter "acontrol", the desired control-change, is unused. This might be a bug, or at least a missing feature.

10.91.5.178 grow_selected()

```
void seq64::sequence::grow_selected (
            midipulse delta )
```

And, though it doesn't move Note Off events, it does reconstruct them.

This function is called when doing a ctrl-left mouse move on the selected notes or when using ctrl-left-arrow or ctrl-right-arrow to shrink or stretch the selected notes. Using the mouse allows pretty much any amount of growth or shrinkage, but use the arrow keys limits the changes to the current snap value.

This function grows/shrinks only Note On events that are marked and linked. If an event is not linked, this function now ignores the event's timestamp, rather than risk a segfault on a null pointer. Compare this function to the stretch_selected() and move_selected_notes() functions.

This function would strip out non-Notes, but now it at least preserves them and moves them, to try to preserve their relative position re the notes.

In any case, we want to mark the original off-event for deletion, otherwise we get duplicate off events, for example in the "Begin/End" pattern in the test.midi file.

This function now tries to prevent pathological growth, such as trying to shrink the notes to zero length or less, or stretch them beyond the length of the sequence. Otherwise we get weird and unexpected results. Also, we've moved external calls to push_undo() into this function. The caller shouldn't have to do that.

A comment on terminology: The user "selects" notes, while the sequencer "marks" notes. The first thing this function does is mark all the selected notes.

Threadsafe

Parameters

delta	An offset for each linked event's timestamp.

10.91.5.179 stretch_selected()

```
void seq64::sequence::stretch_selected (
            midipulse 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. Rather, it moves any event in the selection.

Also, we've moved external calls to push_undo() into this function. The caller shouldn't have to do that.

Threadsafe

Parameters

delta_tick	Provides the amount of time to stretch the selected notes.

10.91.5.180 mark_selected()

```
bool seq64::sequence::mark_selected ( )
```

Threadsafe

Returns

Returns true if there were any events that got marked.

10.91.5.181 remove_selected()

```
void seq64::sequence::remove_selected ( )
```

This is a new convenience function to fold in the push_undo() and mark_selected() calls. It makes the process slightly faster, as well.

Threadsafe Also makes the whole process threadsafe.

10.91.5.182 remove_marked()

```
bool seq64::sequence::remove_marked ( )
```

Note how this function forwards the call to m_event.remove_marked().

Threadsafe

Returns

Returns true if at least one event was removed.

10.91.5.183 unpaint_all()

```
void seq64::sequence::unpaint_all ( )
```

Threadsafe

10.91.5.184 unselect()

```
void seq64::sequence::unselect ( )
```

Threadsafe

10.91.5.185 verify_and_link()

```
void seq64::sequence::verify_and_link ( )
```

Threadsafe

10.91.5.186 link_new()

```
void seq64::sequence::link_new ( )
```

Threadsafe

10.91.5.187 link_tempos()

```
void seq64::sequence::link_tempos ( ) [inline]
```

10.91.5.188 zero_markers()

```
void seq64::sequence::zero_markers ( ) [inline]
```

This function is used when the sequencer stops. This function currently sets m_last_tick = 0, but we would like to avoid that if doing a pause, rather than a stop, of playback.

10.91.5.189 play_note_on()

```
void seq64::sequence::play_note_on (
            int note )
```

It flushes a note to the midibus to preview its sound, used by the virtual piano.

Threadsafe

Parameters

note	The note to play. It is not checked for range validity, for the sake of speed.

10.91.5.190 play_note_off()

```
void seq64::sequence::play_note_off (
            int note )
```

Threadsafe

Parameters

note	The note to turn off. It is not checked for range validity, for the sake of speed.

10.91.5.191 off_playing_notes()

```
void seq64::sequence::off_playing_notes ( )
```

This function does not bother checking if m_master_bus is a null pointer.

Threadsafe

10.91.5.192 stop()

```
void seq64::sequence::stop (
            bool song_mode = false )
```

In Live mode, the user controls playback, while in Song mode, JACK or the performance/song editor controls playback. This function used to be called "reset()".

Parameters

song_mode	True if song mode is on. This can mean that JACK transport is not in control of playback.

10.91.5.193 pause()

```
void seq64::sequence::pause (
            bool song_mode = false )
```

It still includes the note-shutoff capability to prevent notes from lingering. Note that we do not call set_playing(false)... it disarms the sequence, which we do not want upon pausing.

10.91.5.194 inc_draw_marker()

```
void seq64::sequence::inc_draw_marker ( )
```

Warning

This iterator is shared by about four GUI object, and they might interfere with each other!

Threadsafe

10.91.5.195 reset_draw_marker()

```
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.

Warning

This iterator is shared by about four GUI object, and they might interfere with each other!

Threadsafe

10.91.5.196 reset_draw_trigger_marker()

```
void seq64::sequence::reset_draw_trigger_marker ( )
```

Threadsafe

10.91.5.197 reset_ex_iterator()

```
void seq64::sequence::reset_ex_iterator (
            event_list::const_iterator & evi )
```

10.91.5.198 get_next_note_event()

```
draw_type_t seq64::sequence::get_next_note_event (
            midipulse & tick_s,
            midipulse & tick_f,
            int & note,
            bool & selected,
            int & velocity )
```

When it has no more events, returns a false.

Note that, before the first call to draw a sequence, the reset_draw_marker() function must be called, to reset m_↩
iterator_draw.

Parameters

out	*tick_s*	Provides a pointer destination for the start time.
out	*tick_f*	Provides a pointer destination for the finish time.
out	*note*	Provides a pointer destination for the note pitch value Probably should be a midibyte value. If the event is the special case of a tempo event, then this value is the tempo value scaled to 0 to 127 for display purposes.
out	*selected*	Provides a pointer destination for the selection status of the note.
out	*velocity*	Provides a pointer destination for the note velocity. Probably should be a midibyte value.

Returns

Returns a draw_type_t value: DRAW_NORMAL_LINKED, DRAW_NOTE_ON, DRAW_NOTE_OFF, or DR↩ AW_FIN. Note that the new value DRAW_TEMPO could be returned, as well.

10.91.5.199 get_minmax_note_events()

```
bool seq64::sequence::get_minmax_note_events (
            int & lowest,
            int & highest )
```

Todo For efficency, we should calculate this only when the event set changes, and save the results and return them if good.

Threadsafe

Parameters

lowest	A reference parameter to return the note with the lowest value. if there are no notes, then it is set to SEQ64_MAX_DATA_VALUE, and false is returned.
highest	A reference parameter to return the note with the highest value. if there are no notes, then it is set to 0, and false is returned.

Returns

If there are no notes or tempo events in the list, then false is returned, and the results should be disregarded. If true is returned, but there are only tempo events, then the low/high range is 0 to 127.

10.91.5.200 get_next_event()

```
bool seq64::sequence::get_next_event (
            midibyte & status,
            midibyte & cc )
```

Then set the status and control character parameters using that event. This overload is used only in seqedit↩ ::popup_event_menu().

Parameters

status	Provides a pointer to the MIDI status byte to be set, as a way to retrieve the event.
cc	The return pointer for the control value.

Returns

Returns true if the data is useable, and false if there are no more events.

10.91.5.201 get_next_event_ex()

```
bool seq64::sequence::get_next_event_ex (
            midibyte status,
            midibyte cc,
            event_list::const_iterator & evi,
            int evtype = EVENTS_ALL )
```

This version makes the caller responsible for providing and maintaining the iterator, so that there are no conflicting operations on m_draw_iterator from seqdata, seqevent, seqroll, and perfroll.

This rational version of get_next_event() returns the whole event, rather than filling in a bunch of parameters. In addition, it always allows Tempo events to be found. Gets the next event in the event list that matches the given status and control character. Then set the rest of the parameters parameters using that event. If the status is the new value EVENT_ANY, then any event will be obtained.

Note the usage of event::is_desired_cc_or_not_cc(status, cc, ∗d0); Either we have a control change with the right CC or it's a different type of event.

Parameters

	status	The type of event to be obtained. The special value EVENT_ANY can be provided so that no event statuses are filtered.
	cc	The continuous controller value that might be desired.
out	*evi*	An iterator return value for the next event found. The caller might want to check if it is a Tempo event. Do not use this iterator if false is returned!
	evtype	A stazed parameter for picking either all event or unselected events. Defaults to EVENTS_ALL. Not used unless the macro USE_STAZED_SELECTION_EXTENSIONS is defined.

Returns

Returns true if the current event was one of the desired ones, or was a Tempo event. In this case, the caller *must* increment the iterator.

10.91.5.202 get_next_trigger()

```
bool seq64::sequence::get_next_trigger (
            midipulse & tick_on,
            midipulse & tick_off,
            bool & selected,
            midipulse & tick_offset )
```

10.91.5.203 quantize_events()

```
void seq64::sequence::quantize_events (
            midibyte status,
            midibyte cc,
            midipulse snap_tick,
            int divide,
            bool linked = false )
```

One confusing things is why the original versions of the events don't seem to be deleted.

Parameters

status	Indicates the type of event to be quantized.
cc	The desired control-change to count, if the event is a control-change.
snap_tick	Provides the maximum amount to move the events. Actually, events are moved to the previous or next snap_tick value depend on whether they are halfway to the next one or not.
divide	A rough indicator of the amount of quantization. The only values used in the application are either 1 ("quantize") or 2 ("tighten"). The latter value reduces the amount of change slightly.
linked	False by default, this parameter indicates if marked events are to be relinked, as far as we can tell.

10.91.5.204 push_quantize()

```
void seq64::sequence::push_quantize (
            midibyte status,
            midibyte cc,
            midipulse snap_tick,
            int divide,
            bool linked = false )
```

See the sequence::quantize_events() function for more information. This function just does locking and a push-undo before calling that function.

Parameters

status	The kind of event to quantize, such as Note On, or the event type selected in the pattern editor's data pane.
cc	The control-change value to quantize, again as selected in the pattern editor's data pane. For Note Ons, this value should be set to 0.
snap_tick	The number of ticks to use for quantizing the events. Usually, this is the snap value selected in the pattern editor.
divide	Provides a division value, usually either 1 ("quantize") or 2 ("tighten").
linked	Set this value to true for tightening notes. The default value of this parameter is false.

10.91.5.205 transpose_notes()

```
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.

Also, we've moved external calls to push_undo() into this function. The caller shouldn't have to do that.

Note

We noticed (ca 2016-06-10) that MIDI aftertouch events need to be transposed, but are not being transposed here. Assuming they are selectable (another question!), the test for note-on and note-off is not sufficient, and so has been replaced by a call to event::is_note_msg().

Parameters

steps	The number of steps to transpose the notes.
scale	The scale to make the notes adhere to while transposing.

10.91.5.206 shift_notes()

```
void seq64::sequence::shift_notes (
            midipulse ticks )
```

10.91.5.207 multiply_pattern()

```
void seq64::sequence::multiply_pattern (
            double multiplier )
```

10.91.5.208 musical_key() [1/2]

```
midibyte seq64::sequence::musical_key ( ) const  [inline]
```

10.91.5.209 musical_key() [2/2]

```
void seq64::sequence::musical_key (
             int key )  [inline]
```

10.91.5.210 musical_scale() [1/2]

```
midibyte seq64::sequence::musical_scale ( ) const  [inline]
```

10.91.5.211 musical_scale() [2/2]

```
void seq64::sequence::musical_scale (
             int scale )  [inline]
```

10.91.5.212 background_sequence() [1/2]

```
int seq64::sequence::background_sequence ( ) const  [inline]
```

10.91.5.213 background_sequence() [2/2]

```
void seq64::sequence::background_sequence (
             int bs )  [inline]
```

Disabling the sequence number (setting it to SEQ64_SEQUENCE_LIMIT) is valid.

10.91.5.214 show_events()

```
void seq64::sequence::show_events ( ) const
```

10.91.5.215 copy_events()

```
void seq64::sequence::copy_events (
             const event_list & newevents )
```

Compare this function to the remove_all() function. Copying the container is a lot of work, but fairly fast, even with an std::multimap as the container. Also note that we have to recalculate the length of the sequence.

Threadsafe Note that we had to consolidate the replacement of all the events in the container in order to prevent the "Save to Sequence" button in the eventedit object from causing the application to segfault. It would segfault when the mainwnd timer callback would fire, causing updates to the sequence's slot pixmap, which would then try to access deleted events. Part of the issue was that note links were dropped when copying the events, so now we call verify_and_link() to hopefully reconstitute the links.

Parameters

newevents	Provides the container of MIDI events that will completely replace the current container. Normally this container is supplied by the event editor, via the eventslots class.

10.91.5.216 note_off_margin()

```
midipulse seq64::sequence::note_off_margin ( ) const  [inline]
```

10.91.5.217 set_unit_measure()

```
void seq64::sequence::set_unit_measure ( ) const
```

10.91.5.218 get_unit_measure()

```
midipulse seq64::sequence::get_unit_measure ( ) const  [inline]
```

10.91.5.219 channel_match()

```
bool seq64::sequence::channel_match ( ) const  [inline]
```

Compare this function to channels_match().

10.91.5.220 set_overwrite_rec()

```
void seq64::sequence::set_overwrite_rec (
            bool ovwr )
```

Threadsafe

10.91.5.221 get_overwrite_rec()

```
bool seq64::sequence::get_overwrite_rec ( )  [inline]
```

10.91.5.222 set_loop_reset()

```
void seq64::sequence::set_loop_reset (
            bool reset )
```

Threadsafe

10.91.5.223 get_loop_reset()

```
bool seq64::sequence::get_loop_reset ( )  [inline]
```

10.91.5.224 handle_size()

```
midipulse seq64::sequence::handle_size (
            midipulse start,
            midipulse finish )
```

The s_handlesize value is n internal variable for handle size. Note that, with the default PPQN of 192, a sixteenth note (a typical snap value) is 48 pulses (ticks), so that a sixteenth note is broken into equal left, center, and right sides. However, for a PPQN of, say, 960, 16 pulses is 5 times smaller in width. We really need to scale the handle size.

Parameters

start	The starting tick of the note event.
finish	The ending tick of the note event.

Returns

Returns 16 or one-third of the note length. This value is scaled according to PPQN if different from 192.

10.91.5.225 event_in_range()

```
bool seq64::sequence::event_in_range (
            const event & e,
            midibyte status,
            midipulse tick_s,
            midipulse tick_f ) const  [private]
```

Makes if-clauses easier to read.

Parameters

e	Provides the event to be checked.
status	Provides the event type that must be matched. However, Set Tempo events will always be matched.
tick←_s	The lower end of the range of timestamps that the event must fall within.
tick←_f	The upper end of the range of timestamps that the event must fall within.

Returns

Returns true if the event matches all of the restrictions noted.

10.91.5.226 set_parent()

```
void seq64::sequence::set_parent (
            perform * p ) [private]
```

Remember that m_parent is not at all owned by the sequence. We just don't want to do all the work necessary to make it a reference, at this time.

Parameters

p	A pointer to the parent, assigned only if not already assigned.

10.91.5.227 put_event_on_bus()

```
void seq64::sequence::put_event_on_bus (
            event & ev ) [private]
```

This function does not bother checking if m_master_bus is a null pointer.

Parameters

ev	The event to put on the buss.

Threadsafe

10.91.5.228 reset_loop()

```
void seq64::sequence::reset_loop ( ) [private]
```

10.91.5.229 set_trigger_offset()

```
void seq64::sequence::set_trigger_offset (
            midipulse trigger_offset ) [private]
```

If m_length is 0, then m_trigger_offset is simply set to the parameter.

Threadsafe

Parameters

trigger_offset	The full trigger offset to set.

10.91.5.230 adjust_trigger_offsets_to_length()

```
void seq64::sequence::adjust_trigger_offsets_to_length (
            midipulse newlength )  [private]
```

Threadsafe

Might can get rid of this function?

Parameters

newlength	The new length of the adjusted trigger.

10.91.5.231 adjust_offset()

```
midipulse seq64::sequence::adjust_offset (
            midipulse offset )  [private]
```

10.91.5.232 remove() [1/2]

```
void seq64::sequence::remove (
            event_list::iterator i )  [private]
```

We no longer bother checking the pointer. If it is bad, all hope is lost. If the event is a note off, and that note is currently playing, then send a note off.

Not threadsafe

Parameters

i	Provides the iterator to the event to remove from the event list.

10.91.5.233 remove() [2/2]

```
void seq64::sequence::remove (
            event & e )  [private]
```

Finds the given event in m_events, and removes the first iterator matching that. If there are events that would match after that, they remain in the container. This matches seq24 behavior.

Not threadsafe

Parameters

e	Provides a reference to the event to be removed.

10.91.5.234 remove_all()

```
void seq64::sequence::remove_all ( )  [private]
```

Unsets the modified flag. (Why?) Also see the new copy_events() function.

10.91.5.235 channels_match()

```
bool seq64::sequence::channels_match (
            const event & e ) const  [inline], [private]
```

Parameters

e	The event whose channel nybble is to be checked.

Returns

Returns true if the channel-matching feature is enabled and the channel matches, or true if the channel-matching feature is turned off, in which case the sequence accepts events on any channel.

10.91.5.236 one_shot() [2/2]

```
void seq64::sequence::one_shot (
            bool f )  [inline], [private]
```

10.91.5.237 off_from_snap() [2/2]

```
void seq64::sequence::off_from_snap (
            bool f )  [inline], [private]
```

10.91.5.238 song_playback_block() [2/2]

```
void seq64::sequence::song_playback_block (
            bool f )  [inline], [private]
```

10.91.5.239 song_recording() [2/2]

```
void seq64::sequence::song_recording (
            bool f )  [inline], [private]
```

10.91.5.240 song_recording_snap() [2/2]

```
void seq64::sequence::song_recording_snap (
            bool f )  [inline], [private]
```

10.91.5.241 song_record_tick() [2/2]

```
void seq64::sequence::song_record_tick (
            midipulse t )  [inline], [private]
```

10.91.6 Friends And Related Function Documentation

10.91.6.1 perform

```
friend class perform  [friend]
```

10.91.6.2 triggers

```
friend class triggers  [friend]
```

10.91.7 Field Documentation

10.91.7.1 m_events_clipboard

```
event_list seq64::sequence::m_events_clipboard [static], [private]
```

Being static allows for copy/paste between patterns.

10.91.7.2 m_parent

```
perform* seq64::sequence::m_parent [private]
```

We can use the rc_settings flag(s), but JACK could be disconnected. We could use a reference here, but, to avoid modifying the midifile class as well, we use a pointer. It is set in perform::add_sequence(). This member would also be using for passing modification status to the parent, so that the GUI code doesn't have to do it.

10.91.7.3 m_events

```
event_list seq64::sequence::m_events [private]
```

It used to be called m_list_events, but a map implementation is now available, and is the default.

10.91.7.4 m_triggers

```
triggers seq64::sequence::m_triggers [private]
```

10.91.7.5 m_events_undo_hold

```
event_list seq64::sequence::m_events_undo_hold [private]
```

Changed, of course, from std::list<event> to the sequence::Events typedef.

```
Events m_events_undo_hold;
```

10.91.7.6 m_have_undo

```
bool seq64::sequence::m_have_undo [private]
```

10.91.7.7 m_have_redo

```
bool seq64::sequence::m_have_redo [private]
```

Previously, unlike the perfedit, the seqedit did not provide a redo facility.

10.91.7.8 m_events_undo

```
EventStack seq64::sequence::m_events_undo  [private]
```

10.91.7.9 m_events_redo

```
EventStack seq64::sequence::m_events_redo  [private]
```

10.91.7.10 m_iterator_draw

```
event_list::iterator seq64::sequence::m_iterator_draw  [private]
```

10.91.7.11 m_channel_match

```
bool seq64::sequence::m_channel_match  [private]
```

If true (not yet the default), then the seqedit window will record only MIDI events that match its channel. The old behavior is preserved if this variable is set to false.

10.91.7.12 m_midi_channel

```
midibyte seq64::sequence::m_midi_channel  [private]
```

However, if this value is EVENT_NULL_CHANNEL (0xFF), then this sequence is an SMF 0 track, and has no single channel. Please note that this is the output channel.

10.91.7.13 m_bus

```
midibyte seq64::sequence::m_bus  [private]
```

10.91.7.14 m_song_mute

```
bool seq64::sequence::m_song_mute  [private]
```

10.91.7.15 m_transposable

```
bool seq64::sequence::m_transposable  [private]
```

A potential feature from stazed's seq32 project. Now it is an actual, configurable feature.

10.91.7.16 m_notes_on

```
short seq64::sequence::m_notes_on  [private]
```

We will never come close to the short limit of 32767.

10.91.7.17 m_master_bus

```
mastermidibus* seq64::sequence::m_master_bus  [private]
```

10.91.7.18 m_playing_notes

```
short seq64::sequence::m_playing_notes[SEQ64_MIDI_NOTES_MAX]  [private]
```

It is used when muting, to shut off the notes that are playing. The number of notes playing will never come close to the short limit of 32767.

10.91.7.19 m_was_playing

```
bool seq64::sequence::m_was_playing  [private]
```

10.91.7.20 m_playing

```
bool seq64::sequence::m_playing  [private]
```

10.91.7.21 m_recording

```
bool seq64::sequence::m_recording  [private]
```

10.91.7.22 m_quantized_rec

```
bool seq64::sequence::m_quantized_rec  [private]
```

10.91.7.23 m_thru

```
bool seq64::sequence::m_thru  [private]
```

10.91.7.24 m_queued

```
bool seq64::sequence::m_queued  [private]
```

10.91.7.25 m_one_shot

```
bool seq64::sequence::m_one_shot  [private]
```

Set to false whenever playing-state changes. Used in sequence :: play_queue() to maybe play from the one-shot tick, then toggle play and toggle queuing before playing normally.

One-shot mode is entered when the MIDI control c_status_oneshot event is received. Kepler34 reserves the period '.' to initiate this event.

10.91.7.26 m_one_shot_tick

```
midipulse seq64::sequence::m_one_shot_tick  [private]
```

. Compare this member to m_queued_tick.

10.91.7.27 m_off_from_snap

```
bool seq64::sequence::m_off_from_snap  [private]
```

10.91.7.28 m_song_playback_block

```
bool seq64::sequence::m_song_playback_block  [private]
```

Set to false if at a trigger transition in trigger playback. Otherwise, triggers are allow to be processed. Turned off when song-recording stops.

10.91.7.29 m_song_recording

```
bool seq64::sequence::m_song_recording  [private]
```

Allows recording a live performance, by storing the sequence triggers. Adapted from Kepler34.

10.91.7.30 m_song_recording_snap

```
bool seq64::sequence::m_song_recording_snap  [private]
```

10.91.7.31 m_song_record_tick

```
midipulse seq64::sequence::m_song_record_tick  [private]
```

10.91.7.32 m_overwrite_recording

```
bool seq64::sequence::m_overwrite_recording  [private]
```

10.91.7.33 m_loop_reset

```
bool seq64::sequence::m_loop_reset  [private]
```

10.91.7.34 m_unit_measure

```
midipulse seq64::sequence::m_unit_measure  [mutable], [private]
```

Need to clarifiy this one. It is calculated when needed (lazy evaluation).

10.91.7.35 m_dirty_main

```
bool seq64::sequence::m_dirty_main  [private]
```

Provides the main dirtiness flag.

10.91.7.36 m_dirty_edit

```
bool seq64::sequence::m_dirty_edit  [private]
```

10.91.7.37 m_dirty_perf

```
bool seq64::sequence::m_dirty_perf [private]
```

10.91.7.38 m_dirty_names

```
bool seq64::sequence::m_dirty_names [private]
```

10.91.7.39 m_editing

```
bool seq64::sequence::m_editing [private]
```

10.91.7.40 m_raise

```
bool seq64::sequence::m_raise [private]
```

It allows a sequence editor window to pop up if not already raised, in seqedit::timeout().

10.91.7.41 m_name

```
std::string seq64::sequence::m_name [private]
```

10.91.7.42 sm_default_name

```
const std::string seq64::sequence::sm_default_name [static], [private]
```

10.91.7.43 m_last_tick

```
midipulse seq64::sequence::m_last_tick [private]
```

Provides the last tick played.

10.91.7.44 m_queued_tick

```
midipulse seq64::sequence::m_queued_tick [private]
```

10.91.7.45 m_trigger_offset

```
midipulse seq64::sequence::m_trigger_offset [private]
```

10.91.7.46 m_maxbeats

```
const int seq64::sequence::m_maxbeats [private]
```

Hardwired to c_maxbeats at present.

10.91.7.47 m_ppqn

```
unsigned short seq64::sequence::m_ppqn [private]
```

10.91.7.48 m_seq_number

```
short seq64::sequence::m_seq_number [private]
```

This number is set in the perform::install_sequence() function.

10.91.7.49 m_seq_color

```
colorbyte seq64::sequence::m_seq_color [private]
```

It will be an index into a palette. The colorbyte type is defined in the midibyte.hpp file.

10.91.7.50 m_seq_edit_mode

```
edit_mode_t seq64::sequence::m_seq_edit_mode [private]
```

10.91.7.51 m_length

```
midipulse seq64::sequence::m_length [private]
```

This value should be a power of two when used as a bar unit. This value depends on the settings of beats/minute, pulses/quarter-note, the beat width, and the number of measures.

10.91.7.52 m_snap_tick

```
midipulse seq64::sequence::m_snap_tick [private]
```

It starts out as the value m_ppqn / 4.

10.91.7.53 m_time_beats_per_measure

```
unsigned short seq64::sequence::m_time_beats_per_measure [private]
```

Defaults to 4. Used by the sequence editor to mark things in correct time on the user-interface.

10.91.7.54 m_time_beat_width

```
unsigned short seq64::sequence::m_time_beat_width [private]
```

Defaults to 4, which means the beat is a quarter note. A value of 8 would mean it is an eighth note. Used by the sequence editor to mark things in correct time on the user-interface.

10.91.7.55 m_clocks_per_metronome

```
int seq64::sequence::m_clocks_per_metronome [private]
```

This value provides the number of MIDI clocks between metronome clicks. The default value of this item is 24. It can also be read from some SMF 1 files, such as our hymne.mid example.

10.91.7.56 m_32nds_per_quarter

```
int seq64::sequence::m_32nds_per_quarter [private]
```

This value provides the number of notated 32nd notes in a MIDI quarter note (24 MIDI clocks). The usual (and default) value of this parameter is 8; some sequencers allow this to be changed.

10.91.7.57 m_us_per_quarter_note

```
long seq64::sequence::m_us_per_quarter_note [private]
```

This value can be extracted from the beats-per-minute value (mastermidibus::m_beats_per_minute), but here we set it to 0 by default, indicating that we don't want to write it. Otherwise, it can be read from a MIDI file, and saved here to be restored later.

10.91.7.58 m_rec_vol

```
short seq64::sequence::m_rec_vol [private]
```

It can range from 0 to 127, or be set to SEQ64_PRESERVE_VELOCITY (-1).

10.91.7.59 m_note_on_velocity

```
short seq64::sequence::m_note_on_velocity  [private]
```

Currently set to SEQ64_DEFAULT_NOTE_ON_VELOCITY. If the recording velocity (m_rec_vol) is non-zero, this value will be set to the desired recording velocity. A "stazed" feature.

10.91.7.60 m_note_off_velocity

```
short seq64::sequence::m_note_off_velocity  [private]
```

Currently set to SEQ64_DEFAULT_NOTE_OFF_VELOCITY, and currently unmodifiable. A "stazed" feature.

10.91.7.61 m_musical_key

```
midibyte seq64::sequence::m_musical_key  [private]
```

If the value is SEQ64_KEY_OF_C, then there is no musical key to be set.

10.91.7.62 m_musical_scale

```
midibyte seq64::sequence::m_musical_scale  [private]
```

If the value is the enumeration value c_scale_off, then there is no musical scale to be set.

10.91.7.63 m_background_sequence

```
short seq64::sequence::m_background_sequence  [private]
```

If the value is greater than max_sequence(), then there is no background sequence to be set.

10.91.7.64 m_mutex

```
mutex seq64::sequence::m_mutex  [mutable], [private]
```

Made mutable for use in certain locked getter functions.

10.91.7.65 m_note_off_margin

```
const midipulse seq64::sequence::m_note_off_margin  [private]
```

Also used when the user attempts to shrink a note to zero (or less than zero) length.

10.92 seq64::trigger Class Reference

This class hold a single trigger for a sequence object.

Public Member Functions

- trigger ()

  Initializes the trigger structure.
- bool operator< (const trigger &rhs)

  This operator compares only the m_tick_start members.
- midipulse length () const

  'Getter' function for member m_tick_end and m_tick_start.
- midipulse tick_start () const

  'Getter' function for member m_tick_start
- void tick_start (midipulse s)

  'Setter' function for member m_tick_start
- void increment_tick_start (midipulse s)

  'Setter' function for member m_tick_start
- void decrement_tick_start (midipulse s)

  'Setter' function for member m_tick_start
- bool at_trigger_transition (midipulse s, midipulse e)

  Test if the input parameters indicate we are touching a trigger transtion.
- midipulse tick_end () const

  'Getter' function for member m_tick_end
- void tick_end (midipulse e)

  'Setter' function for member m_tick_end
- void increment_tick_end (midipulse s)

  'Setter' function for member m_tick_end
- void decrement_tick_end (midipulse s)

  'Setter' function for member m_tick_end
- midipulse offset () const

  'Getter' function for member m_offset
- void offset (midipulse o)

  'Setter' function for member m_offset
- void increment_offset (midipulse s)

  'Setter' function for member m_offset
- void decrement_offset (midipulse s)

  'Setter' function for member m_offset
- bool selected () const

  'Getter' function for member m_selected
- void selected (bool s)

  'Setter' function for member m_selected

Private Attributes

- midipulse m_tick_start

  Provides the starting tick for this trigger.
- midipulse m_tick_end

  Provides the ending tick for this trigger.
- midipulse m_offset

  Provides the offset for this trigger.
- bool m_selected

  Indicates that the trigger is part of a selection.

10.92.1 Detailed Description

This class is used in playback, and is contained in the triggers class.

10.92.2 Constructor & Destructor Documentation

10.92.2.1 trigger()

```
seq64::trigger::trigger ( )  [inline]
```

10.92.3 Member Function Documentation

10.92.3.1 operator<()

```
bool seq64::trigger::operator< (
             const trigger & rhs )  [inline]
```

Parameters

rhs	The "right-hand side" of the less-than operation.

Returns

Returns true if m_tick_start is less than rhs's.

10.92.3.2 length()

```
midipulse seq64::trigger::length ( ) const  [inline]
```

We've seen that some of the calculations of trigger length are wrong, being 1 tick less than the true length of the trigger in pulses. This function calculates trigger length the correct way.

10.92.3.3 tick_start() [1/2]

```
midipulse seq64::trigger::tick_start ( ) const  [inline]
```

10.92.3.4 tick_start() [2/2]

```
void seq64::trigger::tick_start (
            midipulse s )  [inline]
```

10.92.3.5 increment_tick_start()

```
void seq64::trigger::increment_tick_start (
            midipulse s )  [inline]
```

10.92.3.6 decrement_tick_start()

```
void seq64::trigger::decrement_tick_start (
            midipulse s )  [inline]
```

10.92.3.7 at_trigger_transition()

```
bool seq64::trigger::at_trigger_transition (
            midipulse s,
            midipulse e )  [inline]
```

Parameters

s	The starting tick.
e	The ending tick.

10.92.3.8 tick_end() [1/2]

```
midipulse seq64::trigger::tick_end ( ) const  [inline]
```

10.92.3.9 tick_end() [2/2]

```
void seq64::trigger::tick_end (
            midipulse e )  [inline]
```

10.92.3.10 increment_tick_end()

```
void seq64::trigger::increment_tick_end (
            midipulse s )  [inline]
```

10.92.3.11 decrement_tick_end()

```
void seq64::trigger::decrement_tick_end (
            midipulse s )  [inline]
```

10.92.3.12 offset() [1/2]

```
midipulse seq64::trigger::offset ( ) const  [inline]
```

10.92.3.13 offset() [2/2]

```
void seq64::trigger::offset (
            midipulse o )  [inline]
```

10.92.3.14 increment_offset()

```
void seq64::trigger::increment_offset (
            midipulse s )  [inline]
```

10.92.3.15 decrement_offset()

```
void seq64::trigger::decrement_offset (
            midipulse s )  [inline]
```

10.92.3.16 selected() [1/2]

```
bool seq64::trigger::selected ( ) const  [inline]
```

10.92.3.17 selected() [2/2]

```
void seq64::trigger::selected (
            bool s )  [inline]
```

10.92.4 Field Documentation

10.92.4.1 m_tick_start

```
midipulse seq64::trigger::m_tick_start  [private]
```

10.92.4.2 m_tick_end

```
midipulse seq64::trigger::m_tick_end  [private]
```

10.92.4.3 m_offset

```
midipulse seq64::trigger::m_offset  [private]
```

10.92.4.4 m_selected

```
bool seq64::trigger::m_selected  [private]
```

10.93 seq64::triggers Class Reference

The triggers class is a receptable the triggers that can be used with a sequence object.

Public Types

- enum grow_edit_t {
  GROW_START,
  GROW_END,
  GROW_MOVE }

  Provides a typedef introduced by Stazed to make the trigger grow/move code easier to understand.

Public Member Functions

- triggers (sequence &parent)

  Principal constructor.
- ∼triggers ()

  A rote destructor.
- triggers & operator= (const triggers &rhs)

  Principal assignment operator.
- void set_ppqn (int ppqn)

  'Setter' function for member m_ppqn We have to set this value after construction for best safety.
- void set_length (int len)

  'Setter' function for member m_length We have to set this value after construction for best safety.
- const List & triggerlist () const

  'Getter' function for member m_triggers This is the const version
- List & triggerlist ()

  'Getter' function for member m_triggers
- int count () const

  'Getter' function for member m_triggers.size()
- int number_selected () const

  'Getter' function for member m_number_selected
- void push_undo ()

  Pushes the list-trigger into the trigger undo-list, then flags each item in the undo-list as unselected.
- void pop_undo ()

  If the trigger undo-list has any items, the list-trigger is pushed into the redo list, the top of the undo-list is coped into the list-trigger, and then pops from the undo-list.
- void pop_redo ()

  If the trigger redo-list has any items, the list-trigger is pushed into the undo list, the top of the redo-list is coped into the list-trigger, and then pops from the redo-list.
- void print (const std::string &seqname) const

  Prints a list of the currently-held triggers.
- bool play (midipulse &starttick, midipulse &endtick, bool resume=false)

  If playback-mode (song mode) is in force, that is, if using in-triggers and on/off triggers, this function handles that kind of playback.
- void add (midipulse tick, midipulse len, midipulse offset=0, bool adjustoffset=true)

  Adds a trigger.
- void adjust_offsets_to_length (midipulse newlen)

  Adjusts trigger offsets to the length specified for all triggers, and undo triggers.
- void split (midipulse tick)

  Splits the first trigger that brackets the splittick parameter.
- void half_split (midipulse tick)

  If the tick is between the start and end of this trigger...
- void exact_split (midipulse tick)

  If the tick is between the start and end of this trigger...
- void grow (midipulse tickfrom, midipulse tickto, midipulse length)

  Grows a trigger.
- void remove (midipulse tick)

  Deletes the first trigger that brackets the given tick from the trigger-list.
- bool get_state (midipulse tick) const

  Checks the list of triggers against the given tick.
- bool select (midipulse tick)

  Selects the desired trigger.
- bool unselect (midipulse tick)

Unselects the desired trigger.
- bool unselect ()

  Unselects all triggers for the sequence.
- bool intersect (midipulse position, midipulse &start, midipulse &end)

  This function examines each trigger in the trigger list.
- bool intersect (midipulse position)
- void remove_selected ()

  Deletes the first selected trigger that is found.
- void copy_selected ()

  Copies the first selected trigger that is found.
- void paste (midipulse paste_tick=SEQ64_NO_PASTE_TRIGGER)

  If there is a copied trigger, then this function grabs it from the trigger clipboard and adds it.
- bool move_selected (midipulse tick, bool adjustoffset, grow_edit_t which=GROW_MOVE)

  Moves selected triggers as per the given parameters.
- midipulse get_selected_start ()

  Gets the selected trigger's start tick.
- midipulse get_selected_end ()

  Gets the selected trigger's end tick.
- midipulse get_maximum () const

  Get the ending value of the last trigger in the trigger-list.
- void move (midipulse starttick, midipulse distance, bool direction)

  Moves triggers in the trigger-list.
- void copy (midipulse starttick, midipulse distance)

  Not sure what these diagrams are for yet.
- void clear ()

  Clears the whole list of triggers, and zeroes the number selected.
- bool next (midipulse &tick_on, midipulse &tick_off, bool &selected, midipulse &tick_offset)

  Get the next trigger in the trigger list, and set the parameters based on that trigger.
- trigger next_trigger ()

  Get the next trigger in the trigger list.
- void reset_draw_trigger_marker ()

  Sets the draw-trigger iterator to the beginning of the trigger list.
- void set_trigger_paste_tick (midipulse tick)
- midipulse get_trigger_paste_tick () const

Private Types

- typedef std::list< trigger > List

  Exposes the triggers type, currently needed for midi_container only.
- typedef std::stack< List > Stack

  Provides a stack for use with the undo/redo features of the trigger support.

Private Member Functions

- midipulse adjust_offset (midipulse offset)

  Adjusts the given offset by mod'ing it with m_length and adding m_length if needed, and returning the result.
- void split (trigger &t, midipulse splittick)

  Splits the trigger given by the parameter into two triggers.
- void select (trigger &t, bool count=true)

  Selects the given trigger and increments the count of selected triggers if appropriate.
- void unselect (trigger &t, bool count=true)

  Unselects the given trigger and decrements the count of selected triggers if appropriate.

Private Attributes

- sequence & m_parent

    Holds a reference to the parent sequence object that owns this trigger object.
- List m_triggers

    This list holds the current pattern/triggers events.
- int m_number_selected

    Holds a count of the selected triggers, for better control over selections.
- trigger m_clipboard

    This item holds a single copied trigger, to be pasted later.
- Stack m_undo_stack

    Handles the undo list for a series of operations on triggers.
- Stack m_redo_stack

    Handles the redo list for a series of operations on triggers.
- List::iterator m_iterator_play_trigger

    An iterator for cycling through the triggers during playback.
- List::iterator m_iterator_draw_trigger

    An iterator for cycling through the triggers during drawing.
- bool m_trigger_copied

    Set to true if there is an active trigger in the trigger clipboard.
- midipulse m_paste_tick

    The tick point for pasting.
- int m_ppqn

    Holds the value of the PPQN from the parent sequence, for easy access.
- int m_length

    Holds the value of the length from the parent sequence, for easy access.

Friends

- class midi_container
- class midifile
- class sequence
- class Seq24PerfInput
- class FruityPerfInput

10.93.1 Member Typedef Documentation

10.93.1.1 List

```
typedef std::list<trigger> seq64::triggers::List  [private]
```

10.93.1.2 Stack

```
typedef std::stack<List> seq64::triggers::Stack  [private]
```

10.93.2 Member Enumeration Documentation

10.93.2.1 grow_edit_t

```
enum seq64::triggers::grow_edit_t
```

Enumerator

GROW_START	Grow the start of the trigger.
GROW_END	Grow the end of the trigger.
GROW_MOVE	Move the entire trigger block.

10.93.3 Constructor & Destructor Documentation

10.93.3.1 triggers()

```
seq64::triggers::triggers (
            sequence & parent )
```

Parameters

parent	The triggers object often needs to tell its parent sequence object what to do (such as stop playing).

10.93.3.2 ∼triggers()

```
seq64::triggers::∼triggers ( )
```

10.93.4 Member Function Documentation

10.93.4.1 operator=()

```
triggers & seq64::triggers::operator= (
            const triggers & rhs )
```

Follows the stock rules for such an operator, but does a little more then just assign member values.

FIXED, BEWARE: Currently, it does not assign them all, so we should create a partial_copy() function to do this work, and use it where it is needed.

Parameters

rhs	Provides the "right-hand side" of the assignment operation.

Returns

Returns a reference to self, for use in concatenated assignment operations.

10.93.4.2 set_ppqn()

```
void seq64::triggers::set_ppqn (
             int ppqn )  [inline]
```

10.93.4.3 set_length()

```
void seq64::triggers::set_length (
             int len )  [inline]
```

Also, there a chance that the length of the parent might change from time to time. Currently, only the sequence constructor and midifile call this function.

10.93.4.4 triggerlist() [1/2]

```
const List& seq64::triggers::triggerlist ( ) const  [inline]
```

10.93.4.5 triggerlist() [2/2]

```
List& seq64::triggers::triggerlist ( )  [inline]
```

10.93.4.6 count()

```
int seq64::triggers::count ( ) const  [inline]
```

10.93.4.7 number_selected()

```
int seq64::triggers::number_selected ( ) const  [inline]
```

10.93.4.8 push_undo()

```
void seq64::triggers::push_undo ( )
```

10.93.4.9 pop_undo()

```
void seq64::triggers::pop_undo ( )
```

10.93.4.10 pop_redo()

```
void seq64::triggers::pop_redo ( )
```

10.93.4.11 print()

```
void seq64::triggers::print (
             const std::string & seqname ) const
```

Parameters

seqname	A tag name to accompany the print-out, for the human to read.

10.93.4.12 play()

```
bool seq64::triggers::play (
             midipulse & start_tick,
             midipulse & end_tick,
             bool resume_note_ons = false )
```

This is a new function for sequence::play() to call.

The for-loop goes through all the triggers, determining if there is are trigger start/end values before the *end_tick*. If so, then the trigger state is set to true (start only within the tick range) or false (end is within the tick range), and the trigger tick is set to start or end. The first start or end trigger that is past the end tick cause the search to end.

tick_start | | tick_end

start_tick || start_tick || end_tick || end_tick

Song recording:

```
If we've reached a new chunk of drawn sequences in the song data, and
we're not recording, unset the block on this sequence's events.
```

If the trigger state has changed, then the start/end ticks are passed back to the sequence, and the trigger offset is adjusted.

Parameters

start_tick	Provides the starting tick value, and returns the modified value as a side-effect.
end_tick	Provides the ending tick value, and returns the modified value as a side-effect.
resume_note_ons	Indicates what to do with notes when song-recording.

Returns

Returns true if we're through playing the frame (trigger turning off), and the caller should stop the playback.

10.93.4.13 add()

```
void seq64::triggers::add (
            midipulse tick,
            midipulse len,
            midipulse offset = 0,
            bool fixoffset = true )
```

What is this?

```
is    ie
<      ><        ><        >
es             ee
<               >
XX
es ee
<   >
<>
es    ee
<      >
<    >
es     ee
<       >
<    >
```

Parameters

tick	Provides the tick (pulse) time at which the trigger goes on.
len	Provides the length of the trigger. This value is actually calculated from the "on" value minus the "off" value read from the MIDI file.
offset	This value specifies the offset of the trigger. It is a feature of the c_triggers_new that c_triggers doesn't have. It is the third value in the trigger specification of the Sequencer64 MIDI file.
fixoffset	If true, the offset parameter is modified by adjust_offset() first. We think that basically makes sure it is positive.

10.93.4.14 adjust_offsets_to_length()

```
void seq64::triggers::adjust_offsets_to_length (
            midipulse newlength )
```

Parameters

newlength	Provides the length to which to adjust the offsets.

COMMON CODE?

10.93.4.15 split() [1/2]

```
void seq64::triggers::split (
            midipulse splittick )
```

This is the first trigger where splittick is greater than L and less than R.

Parameters

splittick	Provides the tick that must be bracketed for the split to be made.

10.93.4.16 half_split()

```
void seq64::triggers::half_split (
            midipulse tick )
```

10.93.4.17 exact_split()

```
void seq64::triggers::exact_split (
            midipulse tick )
```

10.93.4.18 grow()

```
void seq64::triggers::grow (
            midipulse tickfrom,
            midipulse tickto,
            midipulse len )
```

This function looks for the first trigger where the tickfrom parameter is between the trigger's tick-start and tick-end values. If found then the trigger's start is moved back to tickto, if necessary, or the trigger's end is moved to tickto plus the length parameter, if necessary.

Then this new trigger is added, and the function breaks from the search loop.

Parameters

tickfrom	The desired from-value back which to expand the trigger, if necessary.
tickto	The desired to-value towards which to expand the trigger, if necessary.
len	The additional length to append to tickto for the check.

10.93.4.19 remove()

```
void seq64::triggers::remove (
            midipulse tick )
```

Parameters

tick	Provides the tick to be examined.

10.93.4.20 get_state()

```
bool seq64::triggers::get_state (
            midipulse tick ) const
```

If any trigger is found to bracket that tick, then true is returned.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.93.4.21 select() [1/2]

```
bool seq64::triggers::select (
            midipulse tick )
```

Checks the list of triggers against the given tick. If any trigger is found to bracket that tick, then true is returned, and the trigger is marked as selected.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.93.4.22 unselect() [1/3]

```
bool seq64::triggers::unselect (
            midipulse tick )
```

Checks the list of triggers against the given tick. If any trigger is found to bracket that tick, then true is returned, and the trigger is marked as unselected.

Parameters

tick	Provides the tick of interest.

Returns

Returns true if a trigger is found that brackets the given tick.

10.93.4.23 unselect() [2/3]

```
bool seq64::triggers::unselect ( )
```

Returns

Always returns false.

10.93.4.24 intersect() [1/2]

```
bool seq64::triggers::intersect (
            midipulse position,
            midipulse & start,
            midipulse & ender )
```

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.

Parameters

position	The position to examine.
start	The destination for the starting tick (m_tick_start) of the matching trigger.
ender	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.

10.93.4.25 intersect() [2/2]

```
bool seq64::triggers::intersect (
            midipulse position )
```

10.93.4.26 remove_selected()

```
void seq64::triggers::remove_selected ( )
```

10.93.4.27 copy_selected()

```
void seq64::triggers::copy_selected ( )
```

10.93.4.28 paste()

```
void seq64::triggers::paste (
            midipulse paste_tick = SEQ64_NO_PASTE_TRIGGER )
```

It pastes at the copy end. or at the paste-tick, if supplied.

Parameters

paste_tick	Provides the optional tick at which to paste the trigger. If not set to SEQ64_NO_PASTE_TRIGGER, this value is used to adjust the paste offset.

10.93.4.29 move_selected()

```
bool seq64::triggers::move_selected (
            midipulse tick,
            bool fixoffset,
            grow_edit_t which = GROW_MOVE )
```

```
          mintick][0                1][maxtick
                            2


The \a which parameter has three possible values:

-#  If we are moving 0 (GROW_START), use first as offset.
-#  If we are moving the 1 (GROW_END), use the last as the offset.
-#  If we are moving both, 2 (GROW_MOVE), use first as offset.
```

Parameters

tick	The tick at which the trigger starts.
fixoffset	Set to true if the offset is to be adjusted.
which	Selects which movement will be done, as discussed above. See the values of the trigger::grow_edit_t type.

Returns

Returns true if there was room to move. Otherwise, false is returned. We need this feature to support keystoke movement of a selected trigger in the perfroll window, and keep it from continually incrementing when there can be no more movement. This causes moving the other direction to be delayed while the accumulating movement counter is used up. However, right now we can't rely on this result, and ignore it. There may be no way around this minor issue.

10.93.4.30 get_selected_start()

`midipulse seq64::triggers::get_selected_start ( )`

We guess this ends up selecting only one trigger, otherwise only the last selected one would effectively set the result.

Returns

Returns the tick_start() value of the last-selected trigger. If no triggers are selected, then midipulse(-1) is returned.

10.93.4.31 get_selected_end()

`midipulse seq64::triggers::get_selected_end ( )`

Returns

Returns the tick_end() value of the last-selected trigger. If no triggers are selected, then midipulse(-1) is returned.

10.93.4.32 get_maximum()

```
midipulse seq64::triggers::get_maximum ( ) const
```

Returns

Returns the tick-end for the last trigger, if available. Otherwise, 0 is returned.

10.93.4.33 move()

```
void seq64::triggers::move (
             midipulse starttick,
             midipulse distance,
             bool direction )
```

There's no way to optimize this by saving tick values, as they are potentially modified at each step.

Parameters

starttick	The current location of the triggers.
distance	The distance away from the current location to which to move the triggers.
direction	If true, the triggers are moved forward. If false, the triggers are moved backward.

10.93.4.34 copy()

```
void seq64::triggers::copy (
             midipulse starttick,
             midipulse distance )
```

```
... a
[      ][      ]
...
... a
...

5   7    play
3        offset
8   10   play

X...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
        [     ]        [             ]


|...|...|...|...|...|...|...

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
```

Copies triggers to a point distant from a given tick.

Parameters

starttick	The current location of the triggers.
distance	The distance away from the current location to which to copy the triggers.

10.93.4.35 clear()

```
void seq64::triggers::clear ( )  [inline]
```

10.93.4.36 next()

```
bool seq64::triggers::next (
             midipulse & tick_on,
             midipulse & tick_off,
             bool & selected,
             midipulse & offset )
```

Todo It would be a bit simpler to simply return a trigger object, wouldn't it?

Parameters

tick_on	Return value for the retrieval of the starting tick for the trigger.
tick_off	Return value for the retrieval of the ending tick for the trigger.
selected	Return value for the retrieval of the is-selected flag for the trigger.
offset	Return value for the retrieval of the offset for the trigger.

Returns

Returns true if a trigger was found. If false, the caller cannot rely on the values returned through the return parameters.

Side-effect(s) The value of the m_iterator_draw_trigger member will be altered by this call, unless pointing to the end of the triggerlist, or if there are no triggers.

10.93.4.37 next_trigger()

```
trigger seq64::triggers::next_trigger ( )
```

Returns

Returns the next trigger. If there is none, a default trigger object is returned.

10.93.4.38 reset_draw_trigger_marker()

```
void seq64::triggers::reset_draw_trigger_marker ( )  [inline]
```

10.93.4.39 set_trigger_paste_tick()

```
void seq64::triggers::set_trigger_paste_tick (
            midipulse tick )  [inline]
```

10.93.4.40 get_trigger_paste_tick()

```
midipulse seq64::triggers::get_trigger_paste_tick ( ) const  [inline]
```

10.93.4.41 adjust_offset()

```
midipulse seq64::triggers::adjust_offset (
            midipulse offset )  [private]
```

Parameters

offset	Provides the offset, mod'ed against m_length, used to adjust the offset.

Returns

Returns the new offset. However, if m_length is 0, no change is made, and the original offset is returned.

10.93.4.42 split() [2/2]

```
void seq64::triggers::split (
            trigger & trig,
            midipulse splittick )  [private]
```

The original trigger ends 1 tick before the splittick parameter, and the new trigger starts at splittick and ends where the original trigger ended.

Parameters

trig	Provides the original trigger, and also holds the changes made to that trigger as it is shortened, as a side-effect.
splittick	The position just after where the original trigger will be truncated, and the new trigger begins.

10.93.4.43 select() [2/2]

```
void seq64::triggers::select (
            trigger & t,
            bool count = true )  [private]
```

Don't confuse this function with select(midipulse).

Parameters

t	Provides a reference to the desired trigger.
count	If true, count the selection. This can only be done in normal triggers, not triggers in the undo container.

10.93.4.44 unselect() [3/3]

```
void seq64::triggers::unselect (
            trigger & t,
            bool count = true )  [private]
```

Don't confuse this function with unselect(midipulse).

Parameters

t	Provides a reference to the desired trigger.
count	If true, uncount the selection. This can only be done in normal triggers, not triggers in the undo container.

10.93.5 Friends And Related Function Documentation

10.93.5.1 midi_container

```
friend class midi_container  [friend]
```

10.93.5.2 midifile

```
friend class midifile  [friend]
```

10.93.5.3 sequence

```
friend class sequence  [friend]
```

10.93.5.4 Seq24PerfInput

```
friend class Seq24PerfInput  [friend]
```

10.93.5.5 FruityPerfInput

```
friend class FruityPerfInput  [friend]
```

10.93.6 Field Documentation

10.93.6.1 m_parent

```
sequence& seq64::triggers::m_parent  [private]
```

10.93.6.2 m_triggers

```
List seq64::triggers::m_triggers  [private]
```

10.93.6.3 m_number_selected

```
int seq64::triggers::m_number_selected  [private]
```

10.93.6.4 m_clipboard

```
trigger seq64::triggers::m_clipboard  [private]
```

10.93.6.5 m_undo_stack

```
Stack seq64::triggers::m_undo_stack  [private]
```

10.93.6.6 m_redo_stack

```
Stack seq64::triggers::m_redo_stack  [private]
```

10.93.6.7 m_iterator_play_trigger

```
List::iterator seq64::triggers::m_iterator_play_trigger  [private]
```

10.93.6.8 m_iterator_draw_trigger

```
List::iterator seq64::triggers::m_iterator_draw_trigger  [private]
```

10.93.6.9 m_trigger_copied

```
bool seq64::triggers::m_trigger_copied  [private]
```

10.93.6.10 m_paste_tick

```
midipulse seq64::triggers::m_paste_tick  [private]
```

Set to -1 if not in force. This is a new feature from stazed's Seq32 project.

10.93.6.11 m_ppqn

```
int seq64::triggers::m_ppqn  [private]
```

This should not change, but we have to set it after construction, and so we provide a setter for it, set_ppqn(), called by the sequence constructor.

10.93.6.12 m_length

```
int seq64::triggers::m_length  [private]
```

This might change, we're not yet sure.

10.94 seq64::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.
- 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 If the name parameter is not empty, the validity flag is set to true, otherwise it is set to false.
- 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.

10.94.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

10.94.2 Constructor & Destructor Documentation

10.94.2.1 user_instrument() [1/2]

```
seq64::user_instrument::user_instrument (
            const std::string & name = "" )
```

Fills in the defaults for the instrument definition, sets its name, and provides some light validation.

Parameters

name	The name of the instrument, valid only if it is not empty.

10.94.2.2 user_instrument() [2/2]

```
seq64::user_instrument::user_instrument (
            const user_instrument & rhs )
```

Parameters

rhs	The sources of the data for the copy.

10.94.3 Member Function Documentation

10.94.3.1 operator=()

```
user_instrument & seq64::user_instrument::operator= (
            const user_instrument & rhs )
```

Parameters

rhs	The sources of the data for the assignment.

Returns

Returns a reference to this object.

10.94.3.2 is_valid()

```
bool seq64::user_instrument::is_valid ( ) const  [inline]
```

10.94.3.3 set_defaults()

```
void seq64::user_instrument::set_defaults ( )
```

Also invalidates the object.

10.94.3.4 name()

```
const std::string& seq64::user_instrument::name ( ) const  [inline]
```

10.94.3.5 controller_count()

```
int seq64::user_instrument::controller_count ( ) const  [inline]
```

10.94.3.6 controller_max()

```
int seq64::user_instrument::controller_max ( ) const  [inline]
```

Remember that the controller numbers for each MIDI instrument range from 0 to 127 (MIDI_CONTROLLER_MAX-1).

10.94.3.7 controller_name()

```
const std::string & seq64::user_instrument::controller_name (
            int c ) const
```

Parameters

c	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.

10.94.3.8 controller_active()

```
bool seq64::user_instrument::controller_active (
            int c ) const
```

Parameters

c	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.

10.94.3.9 set_controller()

```
void seq64::user_instrument::set_controller (
            int c,
            const std::string & cname,
            bool isactive )
```

Parameters

c	The index of the desired controller.
cname	The name of the controller to be set as the controller name.
isactive	A flag that indicates if the desired controller is active.

10.94.3.10 set_name()

```
void seq64::user_instrument::set_name (
            const std::string & instname )  [private]
```

Too tricky?

Parameters

instname	The name of the instrument, valid only if it is not empty.

10.94.3.11 copy_definitions()

```
void seq64::user_instrument::copy_definitions (
             const user_instrument & rhs )  [private]
```

Does not include the validity flag.

Parameters

rhs	The sources of the data for the partial copy.

10.94.4 Field Documentation

10.94.4.1 m_is_valid

```
bool seq64::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.

10.94.4.2 m_controller_count

```
int seq64::user_instrument::m_controller_count  [private]
```

Often, the "user" configuration file has only a few out of the 128 assigned explicitly.

10.94.4.3 m_instrument_def

```
user_instrument_t seq64::user_instrument::m_instrument_def  [private]
```

10.95 seq64::user_instrument_t Struct Reference

This structure corresponds to `[user-instrument-N]` definitions in the `~/.seq24usr` or `~/.config/sequencer64/s`
`usr` file.

Data Fields

- std::string instrument

  Provides the name of the "instrument" being supported.
- std::string controllers [SEQ64_MIDI_CONTROLLER_MAX]

  Provides a list of up to 128 controllers (e.g.
- bool controllers_active [SEQ64_MIDI_CONTROLLER_MAX]

  Provides a flag that indicates if each of up to 128 controller is active and supported.

10.95.1 Field Documentation

10.95.1.1 instrument

```
std::string seq64::user_instrument_t::instrument
```

Do not confuse "instrument" with "program" here. An "instrument" is most likely a hardware MIDI sound-box (though it could be a software synthesizer as well.

10.95.1.2 controllers

```
std::string seq64::user_instrument_t::controllers[SEQ64_MIDI_CONTROLLER_MAX]
```

"Modulation"). If a controller isn't present, or if General MIDI is in force, this name might be empty.

10.95.1.3 controllers_active

```
bool seq64::user_instrument_t::controllers_active[SEQ64_MIDI_CONTROLLER_MAX]
```

If false, it might be an unsupported controller or a General MIDI device.

10.96 seq64::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.
- 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
- void channel_count (int count)

  'Setter' function for member m_channel_count
- int channel_max () const

  'Getter' function for member SEQ64_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.

10.96.1 Detailed Description

Will later make the size adjustable, if it makes sense to do so.

10.96.2 Constructor & Destructor Documentation

10.96.2.1 user_midi_bus() [1/2]

```
seq64::user_midi_bus::user_midi_bus (
            const std::string & name = "" )
```

Parameters

name	The name of the buss, valid only if it is not empty.

10.96.2.2 user_midi_bus() [2/2]

```
seq64::user_midi_bus::user_midi_bus (
             const user_midi_bus & rhs )
```

Parameters

rhs	The sources of the data for the copy.

10.96.3 Member Function Documentation

10.96.3.1 operator=()

```
user_midi_bus & seq64::user_midi_bus::operator= (
             const user_midi_bus & rhs )
```

Parameters

rhs	The sources of the data for the assignment.

Returns

Returns a reference to this object.

10.96.3.2 is_valid()

```
bool seq64::user_midi_bus::is_valid ( ) const  [inline]
```

10.96.3.3 set_defaults()

```
void seq64::user_midi_bus::set_defaults ( )
```

Also invalidates the object. All 16 of the channels are set to SEQ64_GM_INSTRUMENT_FLAG (-1).

10.96.3.4 name()

```
const std::string& seq64::user_midi_bus::name ( ) const  [inline]
```

10.96.3.5 channel_count() [1/2]

```
int seq64::user_midi_bus::channel_count ( ) const  [inline]
```

Returns

This function returns the actual number of channels. This is different from before, when the maximum number was always returned.

10.96.3.6 channel_count() [2/2]

```
void seq64::user_midi_bus::channel_count (
             int count )  [inline]
```

10.96.3.7 channel_max()

```
int seq64::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).

10.96.3.8 instrument()

```
int seq64::user_midi_bus::instrument (
             int channel ) const
```

Parameters

channel	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 SEQ64_GM_INSTRUMENT_FLAG (-1) is returned.

10.96.3.9 set_instrument()

```
void seq64::user_midi_bus::set_instrument (
             int channel,
             int instrum )
```

Does not alter the validity flag, just checks it.

Parameters

channel	Provides the desired buss channel number.
instrum	Provides the instrument number to set that channel to.

10.96.3.10 set_name()

```
void seq64::user_midi_bus::set_name (
             const std::string & name )  [inline], [private]
```

10.96.3.11 copy_definitions()

```
void seq64::user_midi_bus::copy_definitions (
             const user_midi_bus & rhs )  [private]
```

Does not include the validity flag.

10.96.4 Field Documentation

10.96.4.1 m_is_valid

```
bool seq64::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.

10.96.4.2 m_channel_count

```
int seq64::user_midi_bus::m_channel_count  [private]
```

Often, the "user" configuration file has only a few out of the 16 assigned explicitly.

10.96.4.3 m_midi_bus_def

```
user_midi_bus_t seq64::user_midi_bus::m_midi_bus_def  [private]
```

10.97 seq64::user_midi_bus_t Struct Reference

This structure corresponds to `[user-midi-bus-0]` definitions in the `~/.seq24usr` ("user") file (`~/.config/sequencer64/sequencer64.usr` in the latest version of the application).

Data Fields

- std::string alias

  Provides the user's desired name for the MIDI bus.
- int instrument [SEQ64_MIDI_BUS_CHANNEL_MAX]

  Provides an implicit list of MIDI channels from 0 to 15 (1 to 16) and the "instrument" number assigned to each channel.

10.97.1 Field Documentation

10.97.1.1 alias

```
std::string seq64::user_midi_bus_t::alias
```

For example, "2x2 A" for some kind of MIDI card or USB MIDI cable. If manual-alsa-ports is enabled, this could be something like "[0] seq24 0", and that is what should be shown in that case.

10.97.1.2 instrument

```
int seq64::user_midi_bus_t::instrument[SEQ64_MIDI_BUS_CHANNEL_MAX]
```

Note that the "instrument" is not a MIDI program number. Instead, it is the number associated with a [user-instrument-definitions] section in the "user" configuration file.

10.98 seq64::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.
- bool add_bus (const std::string &alias)

  Adds a user buss 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)
- const std::string & instrument_name (int buss, int channel)

  Gets the correct instrument number from the buss and channel, and then looks up the name of the instrument.
- bool instrument_controller_active (int instrum, int cc)

  'Getter' function for member m_instruments[instrument].controllers_active[controller]
- bool controller_active (int buss, int channel, int cc)

  A convenience function so that the caller doesn't have to get the instrument number from the bus_instrument() member function.
- const std::string & instrument_controller_name (int instrum, int cc)

  'Getter' function for member m_instruments[instrument].controllers_active[controller]
- const std::string & controller_name (int buss, int channel, int cc)

  'Getter' function for member m_instruments[instrument].controllers_active[controller] A convenience function so that the caller doesn't have to get the instrument number from the bus_instrument() member function.
- const std::string & comments_block () const

  'Getter' function for member m_comments_block
- void clear_comments ()

  'Setter' function for member m_comments_block
- void append_comment_line (const std::string &line)

'Setter' function for member m_comments_block

- float window_scale () const

  'Getter' function for member m_window_scale
- bool window_scaled_down () const

  Returns true if we're reducing the size of the main window.
- int scale_size (int value) const

  'Getter' function for member m_window_scale
- int grid_style () const

  'Getter' function for member m_grid_style Checks for normal style.
- bool grid_is_normal () const

  'Getter' function for member m_grid_style Checks for normal style.
- bool grid_is_white () const

  'Getter' function for member m_grid_style Checks for the white style.
- bool grid_is_black () const

  'Getter' function for member m_grid_style Checks for the black style.
- int grid_brackets () const

  'Getter' function for member m_grid_brackets
- int mainwnd_rows () const

  'Getter' function for member m_mainwnd_rows
- int mainwnd_cols () const

  'Getter' function for member m_mainwnd_cols
- bool is_variset () const

  'Getter' function for member m_mainwnd_rows and m_mainwnd_cols Returns true if either value is not the default.
- bool is_default_mainwid_size () const

  'Getter' function for member m_mainwnd_rows and m_mainwnd_cols Returns true if both values are the default.
- int seqs_in_set () const

  'Getter' function for member m_seqs_in_set, dependent member
- int gmute_tracks () const

  'Getter' function for member m_gmute_tracks, dependent member
- int max_sets () const

  'Getter' function for member m_max_sets
- int max_sequence () const

  'Getter' function for member m_max_sequence, dependent member
- int text_x () const

  'Getter' function for member m_text_x, not user modifiable, not saved
- int text_y () const

  'Getter' function for member m_text_y, not user modifiable, not saved
- int seqchars_x () const

  'Getter' function for member m_seqchars_x, not user modifiable, not saved
- int seqchars_y () const

  'Getter' function for member m_seqchars_y, not user modifiable, not saved
- int seqarea_x () const

  'Getter' function for member m_seqarea_x, not user modifiable, not saved
- int seqarea_y () const

  'Getter' function for member m_seqarea_y, not user modifiable, not saved
- int seqarea_seq_x () const

  'Getter' function for member m_seqarea_seq_x, not user modifiable, not saved
- int seqarea_seq_y () const

  'Getter' function for member m_seqarea_seq_y, not user modifiable, not saved
- int mainwid_border () const

  'Getter' function for member m_mainwid_border

- int mainwid_spacing () const

  'Getter' function for member m_mainwid_spacing
- int mainwid_x () const

  'Getter' function for member m_mainwid_x, dependent member
- int mainwid_y () const

  'Getter' function for member m_mainwid_y, dependent member
- int mainwnd_x () const

  'Getter' function for member m_mainwnd_x
- int mainwnd_y () const

  'Getter' function for member m_mainwnd_y Scaled only if window scaling is less than 1.0.
- int mainwid_border_x () const

  Returns the mainwid border thickness plus a fudge constant.
- int mainwid_border_y () const

  Returns the mainwid border thickness plus a fudge constant.
- int control_height () const

  'Getter' function for member m_control_height
- int zoom () const

  'Getter' function for member m_current_zoom
- void zoom (int value)

  'Setter' function for member m_current_zoom This value is not modified unless the value parameter is between 1 and 512, inclusive.
- bool global_seq_feature () const

  'Getter' function for member m_global_seq_feature_save
- void global_seq_feature (bool flag)

  'Setter' function for member m_global_seq_feature_save
- int seqedit_scale () const

  'Getter' function for member m_seqedit_scale
- void seqedit_scale (int scale)

  'Setter' function for member m_seqedit_scale
- int seqedit_key () const

  'Getter' function for member m_seqedit_key
- void seqedit_key (int key)

  'Setter' function for member m_seqedit_key
- int seqedit_bgsequence () const

  'Getter' function for member m_seqedit_bgsequence
- void seqedit_bgsequence (int seqnum)

  'Setter' function for member m_seqedit_bgsequence Note that SEQ64_IS_LEGAL_SEQUENCE() allows the SE↩ Q64_SEQUENCE_LIMIT (0x800 = 2048) value, to turn off the use of a background sequence.
- bool use_new_font () const

  'Getter' function for member m_use_new_font
- bool allow_two_perfedits () const

  'Getter' function for member m_allow_two_perfedits
- int perf_h_page_increment () const

  'Getter' function for member m_h_perf_page_increment
- int perf_v_page_increment () const

  'Getter' function for member m_v_perf_page_increment
- int progress_bar_colored () const

  'Getter' function for member m_progress_bar_colored
- bool progress_bar_thick () const

  'Getter' function for member m_progress_bar_thick
- bool inverse_colors () const

Accessor m_inverse_colors

- int window_redraw_rate () const

  'Getter' function for member m_window_redraw_rate_ms
- bool use_more_icons () const

  'Getter' function for member m_use_more_icons
- int block_rows () const

  'Getter' function for member m_mainwid_block_rows
- int block_columns () const

  'Getter' function for member m_mainwid_block_cols
- int block_independent () const

  'Getter' function for member m_mainwid_block_independent
- bool save_user_config () const

  'Getter' function for member m_save_user_config
- void save_user_config (bool flag)

  'Setter' function for member m_save_user_config
- int midi_ppqn () const

  'Getter' function for member m_midi_ppqn
- int midi_beats_per_bar () const

  'Getter' function for member m_midi_beats_per_measure
- midibpm midi_bpm_minimum () const

  'Getter' function for member m_midi_bpm_minimum
- midibpm midi_beats_per_minute () const

  'Getter' function for member m_midi_beats_per_minute
- midibpm midi_bpm_maximum () const

  'Getter' function for member m_midi_bpm_maximum
- int midi_beat_width () const

  'Getter' function for member m_midi_beat_width
- char midi_buss_override () const

  'Getter' function for member m_midi_buss_override
- int velocity_override () const

  'Getter' function for member m_velocity_override
- int bpm_precision () const

  'Getter' function for member m_bpm_precision
- midibpm bpm_step_increment () const

  'Getter' function for member m_bpm_step_increment
- midibpm bpm_page_increment () const

  'Getter' function for member m_bpm_page_increment
- int min_zoom () const

  'Getter' function for member mc_min_zoom
- int max_zoom () const

  'Getter' function for member mc_max_zoom
- int baseline_ppqn () const

  'Getter' function for member mc_baseline_ppqn
- bool option_daemonize () const

  'Getter' function for member m_user_option_daemonize
- bool option_use_logfile () const

  'Getter' function for member m_user_use_logfile
- std::string option_logfile () const

  'Getter' function for member m_user_option_logfile
- bool work_around_play_image () const

  'Getter' function for member m_work_around_play_image

- bool work_around_transpose_image () const

  'Getter' function for member m_work_around_transpose_image
- int key_height () const

  'Getter' function for member m_user_ui_key_height
- void use_new_font (bool flag)

  'Setter' function for member m_use_new_font
- void allow_two_perfedits (bool flag)

  Sets the value of allowing two perfedits to be created and shown to the user.
- void perf_h_page_increment (int inc)

  Sets the horizontal page increment size for the horizontal scrollbar of a perfedit window.
- void perf_v_page_increment (int inc)

  Sets the vertical page increment size for the vertical scrollbar of a perfedit window.
- void progress_bar_colored (int palcode)

  'Setter' function for member m_progress_bar_colored
- void progress_bar_thick (bool flag)

  'Setter' function for member m_progress_bar_thick
- void inverse_colors (bool flag)

  'Setter' function for member m_inverse_colors
- void window_redraw_rate (int ms)

  'Setter' function for member m_window_redraw_rate_ms
- void use_more_icons (bool flag)

  'Setter' function for member m_use_more_icons
- void block_rows (int count)

  'Setter' function for member m_mainwid_block_rows
- void block_columns (int count)

  'Setter' function for member m_mainwid_block_cols
- void block_independent (bool flag)

  'Setter' function for member m_mainwid_block_independent
- void option_daemonize (bool flag)

  'Setter' function for member m_user_option_daemonize
- void option_use_logfile (bool flag)

  'Setter' function for member m_user_use_logfile
- void option_logfile (const std::string &logfile)

  'Setter' function for member m_user_option_logfile
- void work_around_play_image (bool flag)

  'Setter' function for member m_work_around_play_image
- void work_around_transpose_image (bool flag)

  'Setter' function for member m_work_around_transpose_image
- void key_height (int h)

  'Setter' function for member m_user_ui_key_height Do we want to add scaling to this at this time? m_window_scale
- void midi_ppqn (int ppqn)

  'Setter' function for member m_midi_ppqn This value can be set from 96 to 19200 (this upper limit will be determined by what Sequencer64 can actually handle).
- void midi_buss_override (char buss)

  'Setter' function for member m_midi_buss_override This value can be set from 0 to 31.
- void velocity_override (int vel)

  'Setter' function for member m_velocity_override
- void bpm_precision (int precision)

  'Setter' function for member m_bpm_precision
- void bpm_step_increment (midibpm increment)

  'Setter' function for member m_bpm_step_increment

- void bpm_page_increment (midibpm increment)

  'Setter' function for member m_bpm_page_increment
- int mainwid_width () const

  Replaces the hard-wired calculation in the mainwid module.
- int mainwid_height () const

  Replaces the hard-wired calculation in the mainwid module.
- int mainwid_width_fudge () const

  'Getter' function for member MAINWID_WIDTH_FUDGE / 2
- int mainwid_height_fudge () const

  'Getter' function for member MAINWID_HEIGTH_FUDGE / 2

Protected Member Functions

- void grid_brackets (int thickness)

  'Getter' function for member m_grid_brackets
- void window_scale (float winscale)

  'Setter' function for member m_window_scale
- void grid_style (int gridstyle)

  'Setter' function for member m_grid_style
- 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 8, inclusive.
- void max_sets (int value)

  'Setter' function for member m_max_sets This value is not modified unless the value parameter is between 16 and 32.
- void text_x (int value)

  'Setter' function for member m_text_x This value is not modified unless the value parameter is between 6 and 6, inclusive.
- 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 ()

  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.

- void midi_beats_per_bar (int beatsperbar)

  'Setter' function for member m_midi_beats_per_measure This value can be set from 1 to 16.

- void midi_bpm_minimum (midibpm beatsperminute)

  'Setter' function for member m_midi_bpm_minimum This value can be set from 20 to 500.

- void midi_beats_per_minute (midibpm beatsperminute)

  'Setter' function for member m_midi_beats_minute This value can be set from 20 to 500.

- void midi_bpm_maximum (midibpm beatsperminute)

  'Setter' function for member m_midi_bpm_maximum This value can be set from 20 to 500.

- void midi_beat_width (int beatwidth)

  'Setter' function for member m_midi_beatwidth This value can be set to any power of 2 in the range from 1 to 16.

Private Types

- enum mainwid_grid_style_t {
  grid_style_normal,
  grid_style_white,
  grid_style_black,
  grid_style_max }
- typedef std::vector< user_midi_bus > Busses

  [user-midi-bus-definitions]

- typedef std::vector< user_midi_bus >::iterator BussIterator
- typedef std::vector< user_midi_bus >::const_iterator BussConstIterator
- typedef std::vector< user_instrument > Instruments

  [user-instrument-definitions]

- typedef std::vector< user_instrument >::iterator InstrumentIterator
- typedef std::vector< user_instrument >::const_iterator InstrumentConstIterator

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.
- std::string m_comments_block

  [comments]
- mainwid_grid_style_t m_grid_style

  [user-interface-settings]
- int m_grid_brackets

  Specify drawing brackets (like the old Seq24) or a solid box.
- int m_mainwnd_rows

  Number of rows in the Patterns Panel.
- int m_mainwnd_cols

  Number of columns in the Patterns Panel.
- int m_max_sets

  Maximum number of screen sets that can be supported.
- float m_window_scale

  Provide a scale factor to increase the size of the main window and its internals.
- int m_mainwid_border

  These control sizes.
- int m_mainwid_spacing
- 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_current_zoom

  Provides the initial zoom value, in units of ticks per pixel.
- bool m_global_seq_feature_save

  If true, this value provide a bit of backward-compatibility with the global key/scale/background-sequence persistence feature.
- int m_seqedit_scale

  Replaces seqedit::m_initial_scale as the repository for the scale to apply when a sequence is loaded into the sequence editor.
- int m_seqedit_key

  Replaces seqedit::m_initial_key as the repository for the key to apply when a sequence is loaded into the sequence editor.
- int m_seqedit_bgsequence

  Replaces seqedit::m_initial_sequence as the repository for the background sequence to apply when a sequence is loaded into the sequence editor.
- bool m_use_new_font

  Sets the usage of the font.
- bool m_allow_two_perfedits

  Enables the usage of two perfedit windows, for added convenience in editing multi-set songs.
- int m_h_perf_page_increment

  Allows a changed to the page size for the horizontal scroll bar.
- int m_v_perf_page_increment

  Allows a changed to the page size for the vertical scroll bar.
- int m_progress_bar_colored

  If set, makes progress bars have the "progress_color()", instead of black.
- bool m_progress_bar_thick

  If set, makes progress bars thicker than 1 pixel...

- bool m_inverse_colors

  If set, use an alternate, neo-inverse color palette.
- int m_window_redraw_rate_ms

  Provides the global setting for redraw rate of windows.
- bool m_use_more_icons

  Another [user-interface-settings] item.
- int m_mainwid_block_rows

  New section [user-main-window].
- int m_mainwid_block_cols

  This value specifies the number of columns of main windows.
- bool m_mainwid_block_independent

  If true, this value will enable individual set-controls for the multiple mainwid objects shown in the main window.
- int m_text_x

  Constants for the mainwid class.
- int m_text_y
- int m_seqchars_x

  Constants for the mainwid class.
- int m_seqchars_y
- int m_midi_ppqn

  Provides the universal PPQN setting for the duration of this setting.
- int m_midi_beats_per_measure

  Provides the universal and unambiguous MIDI value for beats per measure, also called "beats per bar" (BPB).
- midibpm m_midi_bpm_minimum

  Provides the minimum beats per minute, purely for providing the scale for drawing the tempo.
- midibpm m_midi_beats_per_minute

  Provides the universal and unambiguous MIDI value for beats per minute (BPM).
- midibpm m_midi_bpm_maximum

  Provides the maximum beats per minute, purely for providing the scale for drawing the tempo.
- int m_midi_beat_width

  Provides the universal MIDI value for beats width (BW).
- char m_midi_buss_override

  Provides a universal override of the buss number for all sequences, for the purpose of convenience of of testing.
- int m_velocity_override

  Sets the default velocity for note adding.
- int m_bpm_precision

  Sets the precision of the BPM (beats-per-minute) setting.
- midibpm m_bpm_step_increment

  The step increment value for BPM, regardless of the decimal precision.
- midibpm m_bpm_page_increment

  This is the larger increment for paging the BPM.
- int m_total_seqs

  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_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/sequences/patterns that can be supported, which is m_seqs_in_set squared, or 1024.
- 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_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_y
- int m_seqarea_seq_x

  These values delineate the smaller rectangle inside of a mainwid cell, wherein the sequence events are drawn.
- int m_seqarea_seq_y
- int m_mainwid_x

  The width of the main pattern/sequence grid, in pixels.
- int m_mainwid_y

  The height of the main pattern/sequence grid, in pixels.
- int m_mainwnd_x

  The hardwired base width of the whole main window.
- int m_mainwnd_y

  The hardwired base height of the whole main window.
- bool m_save_user_config

  Provides a temporary variable that can be set from the command line to cause the "user" state to be saved into the "user" configuration file.
- const int mc_min_zoom

  Provides the minimum zoom value, currently a constant.
- const int mc_max_zoom

  Provides the maximum zoom value, currently a constant.
- const int mc_baseline_ppqn

  Permanent storage for the baseline, default PPQN used by Seq24.
- bool m_user_option_daemonize

  Indicates if the application should be daemonized.
- bool m_user_use_logfile

  If true, this value means that "-o log=..." (where the "..." is an optional filename) was specified on the command line.
- std::string m_user_option_logfile

  If not empty, this file will be set up as the destination for all logging done by the errprint(), infoprint(), warnprint(), and printf() functions.
- bool m_work_around_play_image

  We have an issue on some user's machines where toggling the image on the play button from the "play" image to the "pause" images causes segfaults.
- bool m_work_around_transpose_image

  Another similar issue occurs in setting the tranposable image in seqedit, even though there should be no thread conflicts! Weird.
- int m_user_ui_key_height

  Defines the key height in the Kepler34 sequence editor.

Friends

- class midifile
- class userfile
- bool parse_o_options (int, char ∗[ ])

  Checks the putative command-line arguments for any of the new "options" options.

10.98.1 Detailed Description

These settings will eventually be made part of the "user" settings file.

10.98.2 Member Typedef Documentation

10.98.2.1 Busses

```
typedef std::vector<user_midi_bus> seq64::user_settings::Busses [private]
```

Internal types for the container of user_midi_bus objects. Sorry about the "confusion" about "bus" versus "buss". See Google for arguments about it.

10.98.2.2 BussIterator

```
typedef std::vector<user_midi_bus>::iterator seq64::user_settings::BussIterator [private]
```

10.98.2.3 BussConstIterator

```
typedef std::vector<user_midi_bus>::const_iterator seq64::user_settings::BussConstIterator
[private]
```

10.98.2.4 Instruments

```
typedef std::vector<user_instrument> seq64::user_settings::Instruments [private]
```

Internal type for the container of user_instrument objects.

10.98.2.5 InstrumentIterator

```
typedef std::vector<user_instrument>::iterator seq64::user_settings::InstrumentIterator [private]
```

10.98.2.6 InstrumentConstIterator

```
typedef std::vector<user_instrument>::const_iterator seq64::user_settings::InstrumentConst←
Iterator [private]
```

10.98.3 Member Enumeration Documentation

10.98.3.1 mainwid_grid_style_t

```
enum seq64::user_settings::mainwid_grid_style_t [private]
```

Enumerator

grid_style_normal The grid background color is white. This style better fits displaying the white-on-black sequence numbers. The box is drawn with brackets on either side.	
grid_style_black	The grid background color is black.
grid_style_max	Marks the end of the list, and is an illegal

10.98.4 Constructor & Destructor Documentation

10.98.4.1 user_settings() [1/2]

```
seq64::user_settings::user_settings ( )
```

10.98.4.2 user_settings() [2/2]

```
seq64::user_settings::user_settings (
             const user_settings & rhs )
```

10.98.5 Member Function Documentation

10.98.5.1 operator=()

```
user_settings & seq64::user_settings::operator= (
             const user_settings & rhs )
```

10.98.5.2 set_defaults()

```
void seq64::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!

10.98.5.3 normalize()

```
void seq64::user_settings::normalize ( )
```

Should we normalize the BPM increment values here, in case they are irregular?

gmute_tracks() is viable with variable set sizes only if we stick with the 32 sets by 32 patterns, at this time. It's semantic meaning is... TODO!!

m_max_sequence is now actually a constant (1024), so we enforce that here now.

10.98.5.4 add_bus()

```
bool seq64::user_settings::add_bus (
             const std::string & alias )
```

10.98.5.5 add_instrument()

```
bool seq64::user_settings::add_instrument (
             const std::string & instname )
```

10.98.5.6 bus()

```
const user_midi_bus& seq64::user_settings::bus (
             int index ) [inline]
```

Cannot append the const specifier.

10.98.5.7 instrument()

```
const user_instrument& seq64::user_settings::instrument (
             int index ) [inline]
```

Cannot append the const specifier.

10.98.5.8 bus_count()

```
int seq64::user_settings::bus_count ( ) const [inline]
```

10.98.5.9 set_bus_instrument()

```
void seq64::user_settings::set_bus_instrument (
            int index,
            int channel,
            int instrum )
```

10.98.5.10 bus_instrument()

```
int seq64::user_settings::bus_instrument (
            int buss,
            int channel )  [inline]
```

10.98.5.11 bus_name()

```
const std::string& seq64::user_settings::bus_name (
            int buss )  [inline]
```

10.98.5.12 instrument_count()

```
int seq64::user_settings::instrument_count ( ) const  [inline]
```

10.98.5.13 set_instrument_controllers()

```
void seq64::user_settings::set_instrument_controllers (
            int index,
            int cc,
            const std::string & ccname,
            bool isactive )
```

10.98.5.14 instrument_name() [1/2]

```
const std::string& seq64::user_settings::instrument_name (
            int instrum )  [inline]
```

10.98.5.15 instrument_name() [2/2]

```
const std::string& seq64::user_settings::instrument_name (
             int buss,
             int channel )  [inline]
```

10.98.5.16 instrument_controller_active()

```
bool seq64::user_settings::instrument_controller_active (
             int instrum,
             int cc )  [inline]
```

10.98.5.17 controller_active()

```
bool seq64::user_settings::controller_active (
             int buss,
             int channel,
             int cc )  [inline]
```

It also has a shorter name.

10.98.5.18 instrument_controller_name()

```
const std::string& seq64::user_settings::instrument_controller_name (
             int instrum,
             int cc )  [inline]
```

10.98.5.19 controller_name()

```
const std::string& seq64::user_settings::controller_name (
             int buss,
             int channel,
             int cc )  [inline]
```

It also has a shorter name.

10.98.5.20 comments_block()

```
const std::string& seq64::user_settings::comments_block ( ) const  [inline]
```

10.98.5.21 clear_comments()

```
void seq64::user_settings::clear_comments ( )  [inline]
```

10.98.5.22 append_comment_line()

```
void seq64::user_settings::append_comment_line (
             const std::string & line )  [inline]
```

10.98.5.23 window_scale() [1/2]

```
float seq64::user_settings::window_scale ( ) const  [inline]
```

10.98.5.24 window_scaled_down()

```
bool seq64::user_settings::window_scaled_down ( ) const  [inline]
```

10.98.5.25 scale_size()

```
int seq64::user_settings::scale_size (
             int value ) const  [inline]
```

10.98.5.26 grid_style() [1/2]

```
int seq64::user_settings::grid_style ( ) const  [inline]
```

10.98.5.27 grid_is_normal()

```
bool seq64::user_settings::grid_is_normal ( ) const  [inline]
```

10.98.5.28 grid_is_white()

```
bool seq64::user_settings::grid_is_white ( ) const  [inline]
```

10.98.5.29 grid_is_black()

```
bool seq64::user_settings::grid_is_black ( ) const  [inline]
```

10.98.5.30 grid_brackets() [1/2]

```
int seq64::user_settings::grid_brackets ( ) const  [inline]
```

10.98.5.31 mainwnd_rows() [1/2]

```
int seq64::user_settings::mainwnd_rows ( ) const  [inline]
```

10.98.5.32 mainwnd_cols() [1/2]

```
int seq64::user_settings::mainwnd_cols ( ) const  [inline]
```

10.98.5.33 is_variset()

```
bool seq64::user_settings::is_variset ( ) const  [inline]
```

This function is the inverse of is_default_m.inwid_size().

10.98.5.34 is_default_mainwid_size()

```
bool seq64::user_settings::is_default_mainwid_size ( ) const  [inline]
```

This function is the inverse of is_variset().

10.98.5.35 seqs_in_set()

```
int seq64::user_settings::seqs_in_set ( ) const  [inline]
```

10.98.5.36 gmute_tracks()

```
int seq64::user_settings::gmute_tracks ( ) const  [inline]
```

10.98.5.37 max_sets() [1/2]

```
int seq64::user_settings::max_sets ( ) const  [inline]
```

10.98.5.38 max_sequence()

```
int seq64::user_settings::max_sequence ( ) const  [inline]
```

10.98.5.39 text_x() [1/2]

```
int seq64::user_settings::text_x ( ) const  [inline]
```

10.98.5.40 text_y() [1/2]

```
int seq64::user_settings::text_y ( ) const  [inline]
```

10.98.5.41 seqchars_x() [1/2]

```
int seq64::user_settings::seqchars_x ( ) const  [inline]
```

10.98.5.42 seqchars_y() [1/2]

```
int seq64::user_settings::seqchars_y ( ) const  [inline]
```

10.98.5.43 seqarea_x() [1/2]

```
int seq64::user_settings::seqarea_x ( ) const  [inline]
```

10.98.5.44 seqarea_y() [1/2]

```
int seq64::user_settings::seqarea_y ( ) const  [inline]
```

10.98.5.45 seqarea_seq_x() [1/2]

```
int seq64::user_settings::seqarea_seq_x ( ) const  [inline]
```

10.98.5.46 seqarea_seq_y() [1/2]

```
int seq64::user_settings::seqarea_seq_y ( ) const  [inline]
```

10.98.5.47 mainwid_border() [1/2]

```
int seq64::user_settings::mainwid_border ( ) const  [inline]
```

10.98.5.48 mainwid_spacing() [1/2]

```
int seq64::user_settings::mainwid_spacing ( ) const  [inline]
```

10.98.5.49 mainwid_x()

```
int seq64::user_settings::mainwid_x ( ) const  [inline]
```

10.98.5.50 mainwid_y()

```
int seq64::user_settings::mainwid_y ( ) const  [inline]
```

10.98.5.51 mainwnd_x()

```
int seq64::user_settings::mainwnd_x ( ) const
```

10.98.5.52 mainwnd_y()

```
int seq64::user_settings::mainwnd_y ( ) const
```

10.98.5.53 mainwid_border_x()

```
int seq64::user_settings::mainwid_border_x ( ) const  [inline]
```

10.98.5.54 mainwid_border_y()

```
int seq64::user_settings::mainwid_border_y ( ) const  [inline]
```

10.98.5.55 control_height() [1/2]

```
int seq64::user_settings::control_height ( ) const  [inline]
```

10.98.5.56 zoom() [1/2]

```
int seq64::user_settings::zoom ( ) const  [inline]
```

10.98.5.57 zoom() [2/2]

```
void seq64::user_settings::zoom (
             int value )
```

The default value is 2. Note that 0 is allowed as a special case, which allows the default zoom to be adjusted when the PPQN value is different from the default.

10.98.5.58 global_seq_feature() [1/2]

```
bool seq64::user_settings::global_seq_feature ( ) const  [inline]
```

10.98.5.59 global_seq_feature() [2/2]

```
void seq64::user_settings::global_seq_feature (
             bool flag )  [inline]
```

10.98.5.60 seqedit_scale() [1/2]

```
int seq64::user_settings::seqedit_scale ( ) const  [inline]
```

10.98.5.61 seqedit_scale() [2/2]

```
void seq64::user_settings::seqedit_scale (
             int scale )  [inline]
```

10.98.5.62 seqedit_key() [1/2]

```
int seq64::user_settings::seqedit_key ( ) const  [inline]
```

10.98.5.63 seqedit_key() [2/2]

```
void seq64::user_settings::seqedit_key (
             int key )  [inline]
```

10.98.5.64 seqedit_bgsequence() [1/2]

```
int seq64::user_settings::seqedit_bgsequence ( ) const  [inline]
```

10.98.5.65 seqedit_bgsequence() [2/2]

```
void seq64::user_settings::seqedit_bgsequence (
             int seqnum )  [inline]
```

10.98.5.66 use_new_font() [1/2]

```
bool seq64::user_settings::use_new_font ( ) const  [inline]
```

10.98.5.67 allow_two_perfedits() [1/2]

```
bool seq64::user_settings::allow_two_perfedits ( ) const  [inline]
```

10.98.5.68 perf_h_page_increment() [1/2]

```
int seq64::user_settings::perf_h_page_increment ( ) const  [inline]
```

10.98.5.69 perf_v_page_increment() [1/2]

```
int seq64::user_settings::perf_v_page_increment ( ) const  [inline]
```

10.98.5.70 progress_bar_colored() [1/2]

```
int seq64::user_settings::progress_bar_colored ( ) const  [inline]
```

10.98.5.71 progress_bar_thick() [1/2]

```
bool seq64::user_settings::progress_bar_thick ( ) const  [inline]
```

10.98.5.72 inverse_colors() [1/2]

```
bool seq64::user_settings::inverse_colors ( ) const  [inline]
```

10.98.5.73 window_redraw_rate() [1/2]

```
int seq64::user_settings::window_redraw_rate ( ) const  [inline]
```

10.98.5.74 use_more_icons() [1/2]

```
bool seq64::user_settings::use_more_icons ( ) const  [inline]
```

10.98.5.75 block_rows() [1/2]

```
int seq64::user_settings::block_rows ( ) const  [inline]
```

10.98.5.76 block_columns() [1/2]

```
int seq64::user_settings::block_columns ( ) const  [inline]
```

10.98.5.77 block_independent() [1/2]

```
int seq64::user_settings::block_independent ( ) const  [inline]
```

10.98.5.78 save_user_config() [1/2]

```
bool seq64::user_settings::save_user_config ( ) const  [inline]
```

10.98.5.79 save_user_config() [2/2]

```
void seq64::user_settings::save_user_config (
             bool flag )  [inline]
```

10.98.5.80 grid_brackets() [2/2]

```
void seq64::user_settings::grid_brackets (
             int thickness )  [inline], [protected]
```

10.98.5.81 window_scale() [2/2]

```
void seq64::user_settings::window_scale (
             float winscale )  [protected]
```

10.98.5.82 grid_style() [2/2]

```
void seq64::user_settings::grid_style (
             int gridstyle )  [protected]
```

10.98.5.83 mainwnd_rows() [2/2]

```
void seq64::user_settings::mainwnd_rows (
             int value )  [protected]
```

The default value is 4. Dependent values are recalculated after the assignment.

10.98.5.84 mainwnd_cols() [2/2]

```
void seq64::user_settings::mainwnd_cols (
             int value )  [protected]
```

The default value is 8. Dependent values are recalculated after the assignment.

10.98.5.85 max_sets() [2/2]

```
void seq64::user_settings::max_sets (
             int value )  [protected]
```

The default value is 32. Dependent values are recalculated after the assignment.

Parameters

value	Provides the desired setting. It might be modified by the call to normalize(). Not sure we really need this function.

10.98.5.86 text_x() [2/2]

```
void seq64::user_settings::text_x (
             int value )  [protected]
```

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.

10.98.5.87 text_y() [2/2]

```
void seq64::user_settings::text_y (
            int value )  [protected]
```

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.

10.98.5.88 seqchars_x() [2/2]

```
void seq64::user_settings::seqchars_x (
            int value )  [protected]
```

10.98.5.89 seqchars_y() [2/2]

```
void seq64::user_settings::seqchars_y (
            int value )  [protected]
```

10.98.5.90 seqarea_x() [2/2]

```
void seq64::user_settings::seqarea_x (
            int value )  [protected]
```

10.98.5.91 seqarea_y() [2/2]

```
void seq64::user_settings::seqarea_y (
            int value )  [protected]
```

10.98.5.92 seqarea_seq_x() [2/2]

```
void seq64::user_settings::seqarea_seq_x (
            int value )  [protected]
```

10.98.5.93 seqarea_seq_y() [2/2]

```
void seq64::user_settings::seqarea_seq_y (
            int value )  [protected]
```

10.98.5.94 mainwid_border() [2/2]

```
void seq64::user_settings::mainwid_border (
            int value )  [protected]
```

The default value is 0. Dependent values are recalculated after the assignment.

10.98.5.95 mainwid_spacing() [2/2]

```
void seq64::user_settings::mainwid_spacing (
            int value )  [protected]
```

The default value is 2. Dependent values are recalculated after the assignment.

10.98.5.96 control_height() [2/2]

```
void seq64::user_settings::control_height (
            int value )  [protected]
```

The default value is 0. Dependent values are recalculated after the assignment.

10.98.5.97 dump_summary()

```
void seq64::user_settings::dump_summary ( )  [protected]
```

Does its work only if PLATFORM_DEBUG and SEQ64_USE_DEBUG_OUTPUT are defined. Only enabled in emergencies :-D.

10.98.5.98 midi_ppqn() [1/2]

```
int seq64::user_settings::midi_ppqn ( ) const  [inline]
```

10.98.5.99 midi_beats_per_bar() [1/2]

```
int seq64::user_settings::midi_beats_per_bar ( ) const  [inline]
```

10.98.5.100 midi_bpm_minimum() [1/2]

```
midibpm seq64::user_settings::midi_bpm_minimum ( ) const  [inline]
```

10.98.5.101 midi_beats_per_minute() [1/2]

```
midibpm seq64::user_settings::midi_beats_per_minute ( ) const  [inline]
```

10.98.5.102 midi_bpm_maximum() [1/2]

```
midibpm seq64::user_settings::midi_bpm_maximum ( ) const  [inline]
```

10.98.5.103 midi_beat_width() [1/2]

```
int seq64::user_settings::midi_beat_width ( ) const  [inline]
```

10.98.5.104 midi_buss_override() [1/2]

```
char seq64::user_settings::midi_buss_override ( ) const  [inline]
```

10.98.5.105 velocity_override() [1/2]

```
int seq64::user_settings::velocity_override ( ) const  [inline]
```

10.98.5.106 bpm_precision() [1/2]

```
int seq64::user_settings::bpm_precision ( ) const  [inline]
```

10.98.5.107 bpm_step_increment() [1/2]

```
midibpm seq64::user_settings::bpm_step_increment ( ) const  [inline]
```

10.98.5.108 bpm_page_increment() [1/2]

```
midibpm seq64::user_settings::bpm_page_increment ( ) const  [inline]
```

10.98.5.109 min_zoom()

```
int seq64::user_settings::min_zoom ( ) const  [inline]
```

10.98.5.110 max_zoom()

```
int seq64::user_settings::max_zoom ( ) const  [inline]
```

10.98.5.111 baseline_ppqn()

```
int seq64::user_settings::baseline_ppqn ( ) const  [inline]
```

10.98.5.112 option_daemonize() [1/2]

```
bool seq64::user_settings::option_daemonize ( ) const  [inline]
```

10.98.5.113 option_use_logfile() [1/2]

```
bool seq64::user_settings::option_use_logfile ( ) const  [inline]
```

10.98.5.114 option_logfile() [1/2]

```
std::string seq64::user_settings::option_logfile ( ) const
```

Returns

This function returns rc().config_directory() + m_user_option_logfile if the latter does not contain a path marker ("/"). Otherwise, it returns m_user_option_logfile, which must be a full path specification to the desired log-file.

10.98.5.115 work_around_play_image() [1/2]

```
bool seq64::user_settings::work_around_play_image ( ) const  [inline]
```

10.98.5.116 work_around_transpose_image() [1/2]

```
bool seq64::user_settings::work_around_transpose_image ( ) const  [inline]
```

10.98.5.117 key_height() [1/2]

```
int seq64::user_settings::key_height ( ) const  [inline]
```

10.98.5.118 use_new_font() [2/2]

```
void seq64::user_settings::use_new_font (
             bool flag )  [inline]
```

10.98.5.119 allow_two_perfedits() [2/2]

```
void seq64::user_settings::allow_two_perfedits (
             bool flag )  [inline]
```

10.98.5.120 perf_h_page_increment() [2/2]

```
void seq64::user_settings::perf_h_page_increment (
             int inc )
```

This value ranges from 1 (the original value, really too small for a "page" operation) to 6 (which is 24 measures, the same as the typical width of the perfroll)

10.98.5.121 perf_v_page_increment() [2/2]

```
void seq64::user_settings::perf_v_page_increment (
             int inc )
```

This value ranges from 1 (the original value, really too small for a "page" operation) to 18 (which is 18 tracks, slightly more than the typical height of the perfroll)

10.98.5.122 progress_bar_colored() [2/2]

```
void seq64::user_settings::progress_bar_colored (
             int palcode )  [inline]
```

10.98.5.123 progress_bar_thick() [2/2]

```
void seq64::user_settings::progress_bar_thick (
            bool flag )  [inline]
```

10.98.5.124 inverse_colors() [2/2]

```
void seq64::user_settings::inverse_colors (
            bool flag )  [inline]
```

10.98.5.125 window_redraw_rate() [2/2]

```
void seq64::user_settings::window_redraw_rate (
            int ms )  [inline]
```

10.98.5.126 use_more_icons() [2/2]

```
void seq64::user_settings::use_more_icons (
            bool flag )  [inline]
```

10.98.5.127 block_rows() [2/2]

```
void seq64::user_settings::block_rows (
            int count )
```

10.98.5.128 block_columns() [2/2]

```
void seq64::user_settings::block_columns (
            int count )
```

10.98.5.129 block_independent() [2/2]

```
void seq64::user_settings::block_independent (
            bool flag )  [inline]
```

10.98.5.130 option_daemonize() [2/2]

```
void seq64::user_settings::option_daemonize (
             bool flag )  [inline]
```

10.98.5.131 option_use_logfile() [2/2]

```
void seq64::user_settings::option_use_logfile (
             bool flag )  [inline]
```

10.98.5.132 option_logfile() [2/2]

```
void seq64::user_settings::option_logfile (
             const std::string & logfile )  [inline]
```

10.98.5.133 work_around_play_image() [2/2]

```
void seq64::user_settings::work_around_play_image (
             bool flag )  [inline]
```

10.98.5.134 work_around_transpose_image() [2/2]

```
void seq64::user_settings::work_around_transpose_image (
             bool flag )  [inline]
```

10.98.5.135 key_height() [2/2]

```
void seq64::user_settings::key_height (
             int h )  [inline]
```

10.98.5.136 midi_ppqn() [2/2]

```
void seq64::user_settings::midi_ppqn (
             int value )
```

The default value is 192.

10.98.5.137 midi_buss_override() [2/2]

```
void seq64::user_settings::midi_buss_override (
            char buss )
```

The default value is -1, which means that there is no buss override. It provides a way to override the buss number for smallish MIDI files. It replaces the buss-number read from the file. This option is turned on by the –bus option, and is merely a convenience feature for the quick previewing of a tune. (It's called "developer laziness".)

10.98.5.138 velocity_override() [2/2]

```
void seq64::user_settings::velocity_override (
            int vel )
```

10.98.5.139 bpm_precision() [2/2]

```
void seq64::user_settings::bpm_precision (
            int precision )
```

10.98.5.140 bpm_step_increment() [2/2]

```
void seq64::user_settings::bpm_step_increment (
            midibpm increment )
```

10.98.5.141 bpm_page_increment() [2/2]

```
void seq64::user_settings::bpm_page_increment (
            midibpm increment )
```

10.98.5.142 mainwid_width()

```
int seq64::user_settings::mainwid_width ( ) const
```

Affected by the c_mainwid_border and c_mainwid_spacing values.

Returns

Returns the width, in pixels, of a mainwid grid.

10.98.5.143 mainwid_height()

```
int seq64::user_settings::mainwid_height ( ) const
```

Affected by the c_mainwid_border and c_control_height values.

Change Note ca 2017-08-13 Issue #104. Add 8 to the height calculation until we can figure out how to adjust for button height increases due to adding the main-window time-stamp field.

Returns

Returns the height, in pixels, of a mainwid grid.

10.98.5.144 mainwid_width_fudge()

```
int seq64::user_settings::mainwid_width_fudge ( ) const  [inline]
```

10.98.5.145 mainwid_height_fudge()

```
int seq64::user_settings::mainwid_height_fudge ( ) const  [inline]
```

10.98.5.146 midi_beats_per_bar() [2/2]

```
void seq64::user_settings::midi_beats_per_bar (
             int value )  [protected]
```

The default value is 4.

10.98.5.147 midi_bpm_minimum() [2/2]

```
void seq64::user_settings::midi_bpm_minimum (
             midibpm value )  [protected]
```

The default value is 120.

10.98.5.148 midi_beats_per_minute() [2/2]

```
void seq64::user_settings::midi_beats_per_minute (
             midibpm value )  [protected]
```

The default value is 120.

10.98.5.149 midi_bpm_maximum() [2/2]

```
void seq64::user_settings::midi_bpm_maximum (
             midibpm value )  [protected]
```

The default value is 120.

10.98.5.150 midi_beat_width() [2/2]

```
void seq64::user_settings::midi_beat_width (
             int bw )  [protected]
```

The default value is 4.

10.98.5.151 private_bus()

```
user_midi_bus & seq64::user_settings::private_bus (
             int index )  [private]
```

This invalid object has an empty alias, and all the instrument numbers are -1.

10.98.5.152 private_instrument()

```
user_instrument & seq64::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.

10.98.6 Friends And Related Function Documentation

10.98.6.1 midifile

```
friend class midifile  [friend]
```

10.98.6.2 userfile

```
friend class userfile  [friend]
```

10.98.6.3 parse_o_options

```
bool parse_o_options (
             int argc,
             char * argv[] )  [friend]
```

These are flagged by "-o" or "--option". These options are then passed to the user_settings module. Multiple options can be supplied; the whole command-line is processed.

Parameters

argc	The number of command-line parameters, including the name of the application as parameter 0.
argv	The array of pointers to the command-line parameters.

Returns

Returns true if any "options" option was found, and false otherwise. If the options flags ("-o" or "--option") were found, but were not valid options, then we break out of processing and return false.

10.98.7 Field Documentation

10.98.7.1 m_midi_buses

`Busses seq64::user_settings::m_midi_buses [private]`

Since this object is a vector, its size is adjustable.

10.98.7.2 m_instruments

`Instruments seq64::user_settings::m_instruments [private]`

The size is adjustable, and grows as objects are added.

10.98.7.3 m_comments_block

`std::string seq64::user_settings::m_comments_block [private]`

Provides a way to embed comments in the "usr" file and not lose them when the "usr" file is auto-saved.

10.98.7.4 m_grid_style

`mainwid_grid_style_t seq64::user_settings::m_grid_style [private]`

These are not labelled, but are present in the "user" configuration file in the following order:

```
-#  grid-style
-#  grid-brackets
-#  mainwnd-rows
-#  mainwnd-cols
-#  max-set
-#  mainwid-border
-#  control-height
-#  zoom
-#  global-seq-feature
-#  use-new-font
-#  allow-two-perfedits
-#  perf-h-page-increment
-#  perf-v-page-increment
-#  progress-bar-colored (new)
-#  progress-bar-thick (new)
-#  window-redraw-rate-ms (new)
```

Specifies the current grid style.

10.98.7.5 m_grid_brackets

```
int seq64::user_settings::m_grid_brackets  [private]
```

0 = no brackets, 1 and above is the thickness of the brakcets. 1 is the normal thickness of the brackets, 2 is a two-pixel thickness, and so on.

10.98.7.6 m_mainwnd_rows

```
int seq64::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". We would like to be able to change this value from 4 to 8, and maybe allow the values of 5, 6, and 7 as well. But if we could just get 8 working, then well would Sequencer64 deserve the 64 in its name.

10.98.7.7 m_mainwnd_cols

```
int seq64::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".

10.98.7.8 m_max_sets

```
int seq64::user_settings::m_max_sets  [private]
```

Basically, that the number of times the Patterns Panel can be filled. 32 sets can be created. Although this value is part of the "user" configuration file, it is likely that it will never change. Rather, the number of sequences per set would change. We'll see.

10.98.7.9 m_window_scale

```
float seq64::user_settings::m_window_scale  [private]
```

Should be limited from 1.0 to 3.0, probably. Right now we allow 0.5 to 3.0.

10.98.7.10 m_mainwid_border

```
int seq64::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.

10.98.7.11 m_mainwid_spacing

```
int seq64::user_settings::m_mainwid_spacing  [private]
```

10.98.7.12 m_control_height

```
int seq64::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.

10.98.7.13 m_current_zoom

```
int seq64::user_settings::m_current_zoom  [private]
```

The original default value was 32 ticks per pixel, but larger PPQN values need higher values, and we will have to adapt the default zoom to the PPQN value. Also, the zoom can never be zero, as it can appear as the divisor in scaling equations.

10.98.7.14 m_global_seq_feature_save

```
bool seq64::user_settings::m_global_seq_feature_save  [private]
```

In this feature, applying one of these three changes to a sequence causes them to also be applied to sequences that are subsequently opened for editing. However, we improve on this feature by allowing the changes to be saved in the global, proprietary part of the saved MIDI file.

If false, the user can still save the key/scale/background-sequence values with each individual sequence, so they can be different.

This value will be true by default, unless changed in the "user" configuration file.

10.98.7.15 m_seqedit_scale

```
int seq64::user_settings::m_seqedit_scale  [private]
```

Its default value is c_scale_off. Although this value is now stored in the user_settings class, it always comes from the currently loaded MIDI file, if present. If m_global_seq_feature_save is true, this variable is stored in the "proprietary" track at the end of the file, under the control tag c_musicscale, and will be applied to any sequence that is edited. If m_global_seq_feature_save is false, this variable is stored, if used, in the meta-data for the sequence to which it applies, and, again, is tagged with the control tag c_musicscale.

10.98.7.16 m_seqedit_key

```
int seq64::user_settings::m_seqedit_key  [private]
```

Its default value is SEQ64_KEY_OF_C. Although this value is now stored in the user_settings class, it always comes from the currently loaded MIDI file, if present. If m_global_seq_feature_save is true, this variable is stored in the "proprietary" track at the end of the file, under the control tag c_musickey, and will be applied to any sequence that is edited. If m_global_seq_feature_save is false, this variable is stored, if used, in the meta-data for the sequence to which it applies, and, again, is tagged with the control tag c_musickey.

10.98.7.17 m_seqedit_bgsequence

```
int seq64::user_settings::m_seqedit_bgsequence  [private]
```

Its default value is SEQ64_SEQUENCE_LIMIT. Although this value is now stored in the user_settings class, it always comes from the currently loaded MIDI file, if present. If m_global_seq_feature_save is true, this variable is stored, if it has a valid (but not "legal") value, in the "proprietary" track at the end of the file, under the control tag c_backsequence, and will be applied to any sequence that is edited. If m_global_seq_feature_save is false, this variable is stored, if used, in the meta-data for the sequence to which it applies, and, again, is tagged with the control tag c_backsequence.

10.98.7.18 m_use_new_font

```
bool seq64::user_settings::m_use_new_font  [private]
```

By default, in normal mode, the new font is used. In legacy mode, the old font is used.

10.98.7.19 m_allow_two_perfedits

```
bool seq64::user_settings::m_allow_two_perfedits  [private]
```

Defaults to true.

10.98.7.20 m_h_perf_page_increment

```
int seq64::user_settings::m_h_perf_page_increment  [private]
```

The value used to be hardwired to 1 (in four-measure units), now it defaults to 4 (16 measures at a time). The value of 1 is already covered by the scrollbar arrows.

10.98.7.21 m_v_perf_page_increment

```
int seq64::user_settings::m_v_perf_page_increment  [private]
```

The value used to be hardwired to 1 (in single-track units), now it defaults to 8. The value of 1 is already covered by the scrollbar arrows.

10.98.7.22 m_progress_bar_colored

```
int seq64::user_settings::m_progress_bar_colored  [private]
```

This value is no longer hardwired in the gui_palette_gtk2 module to be red. Now we want to let the color select from a slightly large palette. We chande this from a boolean to an integer to allow the selection of more colors.

10.98.7.23 m_progress_bar_thick

```
bool seq64::user_settings::m_progress_bar_thick  [private]
```

2 pixels. It isn't useful to support anything thicker.

10.98.7.24 m_inverse_colors

```
bool seq64::user_settings::m_inverse_colors [private]
```

Not all colors are reversed, though.

10.98.7.25 m_window_redraw_rate_ms

```
int seq64::user_settings::m_window_redraw_rate_ms [private]
```

Not all windows use this yet. The default is 40 ms (c_redraw_ms, which is 20 ms in Windows builds)), but some windows originally used 25 ms, so beware of side-effects.

10.98.7.26 m_use_more_icons

```
bool seq64::user_settings::m_use_more_icons [private]
```

If set to 1, icons will be used for more buttons. This setting affects only a few buttons so far, such as the buttons at the top of the main window.

10.98.7.27 m_mainwid_block_rows

```
int seq64::user_settings::m_mainwid_block_rows [private]
```

This section adds to the [user-interface-settings] configuration section. That section is big enough, and the new section is for newer features.

Currently these value are not saved; we want to test the viability of the concept, first. This value specifies the number of rows of main windows. The default is the legacy value, 1, to support the original paradigm of one set shown in the user interface. For now, we will restrict this value to range from 1 to 3, which will fit onto a 1920 x 1080 screen.

10.98.7.28 m_mainwid_block_cols

```
int seq64::user_settings::m_mainwid_block_cols [private]
```

The default is the legacy value, 1, to support the original paradigm of one set shown in the user interface. For now, we will restrict this value to range from 1 to 2, which will fit onto a 1920 x 1080 screen.

10.98.7.29 m_mainwid_block_independent

```
bool seq64::user_settings::m_mainwid_block_independent [private]
```

If false, then the main set spinner is the only one shown, and it makes all sets track the main set, which is always shown in the upper-right mainwid slot. If there is only a single window, this value is set to true, but it really doesn't matter what behavior is enabled for a single mainwid.

10.98.7.30 m_text_x

```
int seq64::user_settings::m_text_x [private]
```

These items are not read from the "usr", and are not currently part of any configuration section.

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).

We have added black-on-yellow and yellow-on-black versions of the fonts, to support the highlighting of pattern boxes if they are empty of actual MIDI events.

We have also added a set of four new font files that are roughly the same size, and are treated as the same size, but look smooth and less like a DOS-era font.

The font module does not use these values directly, but does define some similar variables that differ slightly between the two styles of font. There are a lot of tricks and hard-wired places to fix before further work can be done with fonts in Sequencer64.

10.98.7.31 m_text_y

```
int seq64::user_settings::m_text_y [private]
```

10.98.7.32 m_seqchars_x

```
int seq64::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.

10.98.7.33 m_seqchars_y

```
int seq64::user_settings::m_seqchars_y [private]
```

10.98.7.34 m_midi_ppqn

```
int seq64::user_settings::m_midi_ppqn [private]
```

This variable replaces the global ppqn. The default value of this setting is 192 parts-per-quarter-note (PPQN). There is still a lot of work to get a different PPQN to work properly in speed of playback, scaling of the user interface, and other issues. Note that this value can be changed by the still-experimental –ppqn option. There is one remaining trace of the global, though: DEFAULT_PPQN.

10.98.7.35 m_midi_beats_per_measure

```
int seq64::user_settings::m_midi_beats_per_measure  [private]
```

This variable will replace the global beats per measure. The default value of this variable is SEQ64_DEFAULT_↩
BEATS_PER_MEASURE (4). For external access, we will call this value "beats per bar", abbreviate it "BPB", and use "bpb" in any accessor function names. Now, although it applies to the whole session, we should be able to continue seq24's tradition of allowing each sequence to have its own time signature. Also, there are a number of places where the number 4 appears and looks like it might be a hardwired BPB value, either for MIDI purposes or for drawing the piano-roll grids. So we might need a couple different versions of this variable.

10.98.7.36 m_midi_bpm_minimum

```
midibpm seq64::user_settings::m_midi_bpm_minimum  [private]
```

Defaults to 0.

10.98.7.37 m_midi_beats_per_minute

```
midibpm seq64::user_settings::m_midi_beats_per_minute  [private]
```

This variable will replace the global beats per minute. The default value of this variable is DEFAULT_BPM (120). This variable should apply to the whole session; there's probably no way to support a diffent tempo for each sequence. But we shall see. For external access, we will call this value "beats per minute", abbreviate it "BPM", and use "bpm" in any accessor function names.

10.98.7.38 m_midi_bpm_maximum

```
midibpm seq64::user_settings::m_midi_bpm_maximum  [private]
```

Defaults to 127.

10.98.7.39 m_midi_beat_width

```
int seq64::user_settings::m_midi_beat_width  [private]
```

This variable will replace the global beat_width. The default value of this variable is DEFAULT_BEAT_WIDTH (4). Now, although it applies to the whole session, we should be able to continue seq24's tradition of allowing each sequence to have its own time signature. Also, there are a number of places where the number 4 appears and looks like it might be a hardwired BW value, either for MIDI purposes or for drawing the user-interface. So we might need a couple different versions of this variable. For external access, we will call this value "beat width", abbreviate it "BW", and use "bw" in any accessor function names.

10.98.7.40 m_midi_buss_override

```
char seq64::user_settings::m_midi_buss_override  [private]
```

This variable replaces the global buss-override variable, and is set via the command-line option –bus.

10.98.7.41 m_velocity_override

```
int seq64::user_settings::m_velocity_override  [private]
```

The value SEQ64_PRESERVE_VELOCITY (-1) preserves the velocity of incoming notes, so that nuances in live playing can be preserved. The popup-menu for the "Vol" button in the seqedit window shows this value as the "Free" menu entry. The rest of the values in the menu show a few select velocities, but any velocity from 0 to 127 can be entered here. Of course, 0 is not recommended.

10.98.7.42 m_bpm_precision

```
int seq64::user_settings::m_bpm_precision  [private]
```

The original value was effectively 0, but we need to be able to support the following values:

```
-   0.  The legacy default.
-   1.  One decimal place in the BPM spinner.
-   2.  Two decimal places in the BPM spinner.
```

10.98.7.43 m_bpm_step_increment

```
midibpm seq64::user_settings::m_bpm_step_increment  [private]
```

The default value is the legacy value, 1, for a BPM precision value of 0. The default value is 0.1 if one decimal place of precision is in force, and 0.01 if two decimal places of precision is in force. This is the increment that is performed in the BPM field of the main window when the arrow-buttons are clicked, the up/down arrow keys are pressed, or the BPM MIDI controls are processed.

10.98.7.44 m_bpm_page_increment

```
midibpm seq64::user_settings::m_bpm_page_increment  [private]
```

Currently, the only way to use this increment is to click in the BPM field of the main window and then use the Page-Up and Page-Down keys.

10.98.7.45 m_total_seqs

```
int seq64::user_settings::m_total_seqs  [private]
```

It is basically the same value as m_max_sequence by default. It is a derived value, and not stored in the "usr" file. We might make it equal to the maximum number of sequences the currently-loaded MIDI file.

```
m_total_seqs = m_seqs_in_set * m_max_sets;
```

10.98.7.46 m_seqs_in_set

```
int seq64::user_settings::m_seqs_in_set  [private]
```

This value is 4 x 8 = 32 by default.

Warning

Currently implicit/explicit in a number of the "rc" file and rc_settings. Would probably want the left 32 or the first 32 items in the main window only to be subject to keystroke control. This value is calculated by the normalize() function, and is *not* part of the "user" configuration file.

10.98.7.47 m_gmute_tracks

```
int seq64::user_settings::m_gmute_tracks  [private]
```

This value is *not* part of the "user" configuration file; it is calculated by the normalize() function.

10.98.7.48 m_max_sequence

```
int seq64::user_settings::m_max_sequence  [private]
```

It is a derived value, and not stored in the "user" file.

```
m_max_sequence = m_seqs_in_set * m_max_sets;
```

10.98.7.49 m_seqarea_x

```
int seq64::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.

10.98.7.50 m_seqarea_y

```
int seq64::user_settings::m_seqarea_y  [private]
```

10.98.7.51 m_seqarea_seq_x

```
int seq64::user_settings::m_seqarea_seq_x  [private]
```

Doesn't look at all like it is based on the size of characters. These values are used only in the mainwid module.

10.98.7.52 m_seqarea_seq_y

```
int seq64::user_settings::m_seqarea_seq_y  [private]
```

10.98.7.53 m_mainwid_x

```
int seq64::user_settings::m_mainwid_x  [private]
```

Affected by the m_mainwid_border and m_mainwid_spacing values, as well a m_window_scale. Replaces c_↩
mainwid_x.

10.98.7.54 m_mainwid_y

```
int seq64::user_settings::m_mainwid_y  [private]
```

Affected by the m_mainwid_border and m_control_height values, as well a m_window_scale. Replaces c_↩
mainwid_y.

10.98.7.55 m_mainwnd_x

```
int seq64::user_settings::m_mainwnd_x  [private]
```

If m_window_scale is significantly different from 1.0, then the accessor will scale this value.

10.98.7.56 m_mainwnd_y

```
int seq64::user_settings::m_mainwnd_y  [private]
```

Llike m_mainwnd_x, this value is scaled by the accessor, however, only if less than 1.0; otherwise, the top buttons expand way too much.

10.98.7.57 m_save_user_config

```
bool seq64::user_settings::m_save_user_config  [private]
```

Normally, this state is not saved. It is not saved because there is currently no user-interface for editing it, and because it can pick up some command-line options, and it is not right to have them written to the "user" configuration file.

(The "rc" configuration file is a different case, having historically always been saved, and having a number of command-line options, such as JACK settings that should generally be permanent on a given system.)

Anyway, this flag can be set by the –user-save option. This setting is never saved. But note that, if no "user" configuration file is found, it is then saved anyway.

10.98.7.58 mc_min_zoom

```
const int seq64::user_settings::mc_min_zoom  [private]
```

It's value is 1.

10.98.7.59 mc_max_zoom

```
const int seq64::user_settings::mc_max_zoom  [private]
```

It's value was 32, but is now 512, to allow for better presentation of high PPQN valued sequences.

10.98.7.60 mc_baseline_ppqn

```
const int seq64::user_settings::mc_baseline_ppqn  [private]
```

This value is necessary in order to keep user-interface elements stable when different PPQNs are used. It is set to DEFAULT_PPQN.

10.98.7.61 m_user_option_daemonize

```
bool seq64::user_settings::m_user_option_daemonize  [private]
```

All options that begin with "option_" are options specific to a particular version of Sequencer64. We don't anticipate having a lot of such options, so there's no need for a separate class to handle them. These options are flagged on the command-line by the strings "-o" or "--option".

10.98.7.62 m_user_use_logfile

```
bool seq64::user_settings::m_user_use_logfile  [private]
```

10.98.7.63 m_user_option_logfile

```
std::string seq64::user_settings::m_user_option_logfile  [private]
```

In other words, stdout and stderr will go to a log file instead. Unless a full path is provided, this filename will be a base filename, with the path given by rc().config_directory() prepended to it. That path is normally ∼/.config/sequencer64, but can be modified on the command line via the -H (–home) option.

This file can also be specified by the "-o log=filename" option.

10.98.7.64 m_work_around_play_image

```
bool seq64::user_settings::m_work_around_play_image  [private]
```

We can't duplicate on the developer's machines, so while we try to figure how to avoid the issue, this flag is provided to simply leave the play-button image alone.

10.98.7.65 m_work_around_transpose_image

```
bool seq64::user_settings::m_work_around_transpose_image  [private]
```

10.98.7.66 m_user_ui_key_height

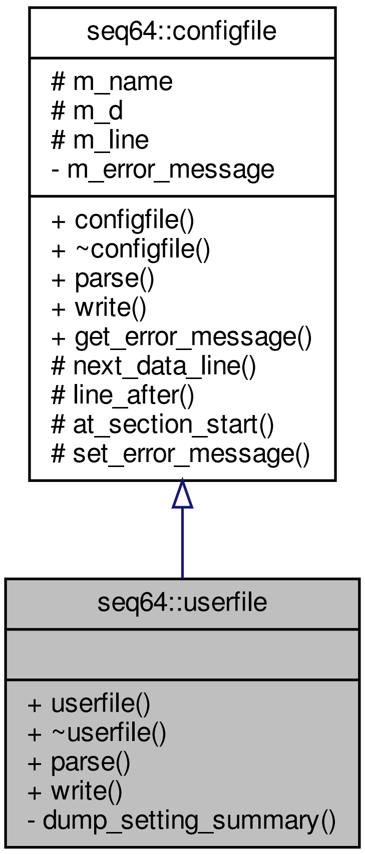
```
int seq64::user_settings::m_user_ui_key_height  [private]
```

Defaults to 12 pixels (8 is actually a bit nicer IMHO). Will eventually affect the Gtkmm-2.4 user-interface as well.

10.99 seq64::userfile Class Reference

Supports the user's `~/.config/sequencer64/sequencer64.usr` and `~/.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.

Private Member Functions

- void dump_setting_summary ()

  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.

Additional Inherited Members

10.99.1 Constructor & Destructor Documentation

10.99.1.1 userfile()

```
seq64::userfile::userfile (
            const std::string & name )
```

Parameters

name	Provides the full file path specification to the configuration file.

10.99.1.2 ∼userfile()

```
seq64::userfile::∼userfile ( )
```

10.99.2 Member Function Documentation

10.99.2.1 parse()

```
bool seq64::userfile::parse (
            perform & a_perf )   [virtual]
```

This function opens the file as a text file (line-oriented).

Parameters

a_perf	The performance object, currently unused.

Returns

Returns true if the parsing succeeded.

Implements seq64::configfile.

10.99.2.2 write()

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

Parameters

a_perf	The performance object, currently unused.

Returns

Returns true if the writing succeeded.

Implements seq64::configfile.

10.99.2.3 dump_setting_summary()

```
void seq64::userfile::dump_setting_summary ( )  [private]
```

Does work only if PLATFORM_DEBUG is defined; see the user_settings class.

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