
MultitrackStudio

Bremmers Audio Design

Manual

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<https://www.multitrackstudio.com>

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1 Introduction

1.1 Overview

MultitrackStudio is a virtual multitrack studio. You can record and play audio and MIDI tracks, edit them, and mixdown to stereo.

The straightforward and uncluttered user-interface has been designed with tape-based recording in mind. Mixer sections are oriented horizontally (as opposed to the more familiar vertical layout), allowing them to include an editor as well. The editing tools are aimed at correcting mistakes. MIDI tracks have been made to look like audio tracks as much as possible.

The large number of high quality effects and the built-in General MIDI compatible MultitrackStudio Instruments make it possible to do software-only mixing and mastering. All track, mixer and effect settings can be stored in a song file and recalled any time.

Using a songlist you can play a sequence of songs. This way you can preview your CD project without having to mix the individual songs down to stereo files first.

Tip: MultitrackStudio features a context-sensitive help system: pressing the F1 key (Windows) / Shift-Command-? (Mac) will show help on the item the mouse points to.

The main window



MultitrackStudio main window

1. Menu buttons
2. Recording options
3. Editing options
4. Transport controls
5. Overview bar
6. MIDI track
7. MIDI Instrument slot
8. Editor Preview pane
9. Audio track with its editor opened
10. Effect Return section
11. Effect slots
12. Master section
13. Garbage Bin

Tracks (6,9) contain audio or MIDI files. Tracks can be switched to playback or record mode using their Play and Rec buttons. Clicking the transport's Start/Stop button (4) will start recording / playing back all tracks simultaneously.

Effects can be loaded in effect slots (11) by clicking the slot's down arrow. MIDI Instruments can be loaded in MIDI Instrument slots (7) in the same way. Tracks and effects etc. can be removed by dragging and dropping them onto the Garbage Bin (13).

Clicking an Editor Preview pane (8) opens a track's editor.

The complete setup can be saved as a song using the Song menu (1). The Mix Down menu's 'Mix down to audio file' option can be used to mix the song down to a single audio file.

1.2 Quick Start: Recording a Song

Note: after installing the program you can go to the Studio menu's Devices option to select the audio and MIDI devices you want to use.

Follow these steps to record a song and make a CD:

Step 1: Make new Song

Make a new (empty) Song using the Song->New menu option. A new (empty) folder is created automatically.

Step 2: Add Click Track (optional)

If you're recording a song from scratch you'll probably want to add a click track (metronome). Use the Add Track menu's Click Track option to do this. Note that you can tap the tempo on the space bar.

Step 3: Add audio or MIDI track

Add a Track with an empty audio or MIDI file using the Add Track menu. Use a mono audio file if you're recording a mono source like a microphone.

Step 4: Record the track

Click the track's Rec button. If you're recording audio a Recording Level Fader now appears at the top of the window (provided your sound device supports this). Alternatively you can click the Input button to get access to recording level controls.

Note: depending on the sound device there may be a dedicated software control panel or hardware knobs to set the recording level. Please refer to the sound device's manual.

Now you can start recording by starting the Transport. You will hear the Click Track, which was created in step 2, while recording. Stop the transport when you're done.

Step 5: Record more tracks

Add more tracks (using the Add Track menu) and record them (repeat step 3 and 4). You will hear the previously recorded tracks while recording a new one. At this stage it is quite common to add Reverb to vocal tracks using an Effect Return section.

Step 6: Mix down to master file

Now you can fine-tune the individual track's volume levels and add any effects. If your song sounds fine you can mix it down to a single .wav file using the Mix Down menu's Mix down to audio file option. This new file can be used for burning a CDR.

Note (Pro edition only): make sure it's a 16 bit stereo file if you want to burn it to CDR. CD burning software typically can't read 24 bit (or higher) files.

Step 7: Play back master file (optional)

Use the Mix Down menu's Playback mixed down file option to play back and verify the master file.

Step 8: Burn CDR

Now you can burn the file recorded in step 6 to a CDR using the software that came with your CD-writer.

2 Songs

2.1 Songs

MultitrackStudio project files are called "songs". A song file (.hdr file extension) contains all information that is required to reproduce the mix you made. This includes:

- The number of tracks and other mixer sections.
- The position of all their knobs, effects, names of audio/MIDI files etc.
- Sample Rate used
- Song Comments
- Chords and Lyrics
- Markers

A song file does *not* include any audio or MIDI data, it contains only references to the audio/MIDI files used by the tracks (ie. these audio/MIDI files are needed in order to play back the song). All filenames that are stored in the song file have a relative path whenever possible. This way projects can easily be moved to other drives or folders.

Note: The devices used for playing audio and MIDI are NOT part of the song file. This way songs can be used on any computer.

Mac note: Finder will show the song files as Radiance files. If you want to be able to open songs by double-clicking you can Ctrl-click a song, choose Get Info and change the "Open with" field to MultitrackStudio.

The currently opened song is shown in the main window's title bar.

The Song menu

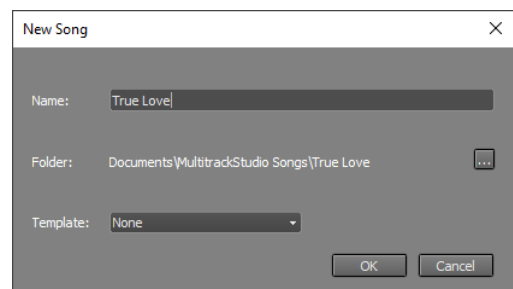
The Song menu contains the following options (note that some options are described in other chapters):

- **New:** In the New Song window you can type the name of the new song. It will be placed in a folder having the same name automatically unless you browse for a folder yourself.

The **Template** box (*Pro edition only*) lets you apply a template. The Template box also allows for creating new templates: the **Save current as template...** option creates a template based on the current song. Templates include almost everything related to the song, except for the audio and MIDI data in the tracks. New songs will have empty audio/MIDI files.

There's a special "**Identical to current**" template which creates a new song identical to the current one. This can be convenient for live multitrack recording.

- **Open:** Open a song file.
- **Save:** Save the song file and all MIDI files and edited audio files (.aem files) opened in tracks.
- **Rename:** Rename the song.
- **Close:** Close the song.
- **Comments:** Read or write text which is stored in the song file. You can use this to document the project.
- **Import Song:** Import a zipped song (ie. a song exported using the Export Song option).



New Song window (Pro edition)

The Song menu offers several export options:

Note: the most important export function has its own button in the main window: Mix Down.

Export MIDI Tracks

This tool merges any combination of the currently loaded MIDI tracks in a single MIDI file. You can use it to move your MIDI tracks to third party notation software etc. The current versions of the tracks are used (ie. the MIDI files are not read from disk), so you can temporarily edit MIDI channels, or quantize tracks if necessary.

The resulting file is a format 1 MIDI file by default. You can use the "Format 0" option if you need a format 0 file (certain hardware can import format 0 only, for example).

If a MIDI channel is used by multiple tracks a message will appear. You can choose 'Export as-is' or 'Merge Tracks'. The first option is best if the file is to be imported in a notation program etc. The latter option can be used if the file is meant to be played back by a (General MIDI) media player. Note that you'll have to make sure there's just one track playing notes to a particular MIDI channel at any time.

Lyrics, Chords and Markers appear in the list if available, and they're checked by default. Lyrics can optionally be stored using UTF8 encoding, this is typically used for Asian languages.

Note: Chords are stored in Yamaha XF style. The file isn't a full blown XF file.

Export Audio Stems

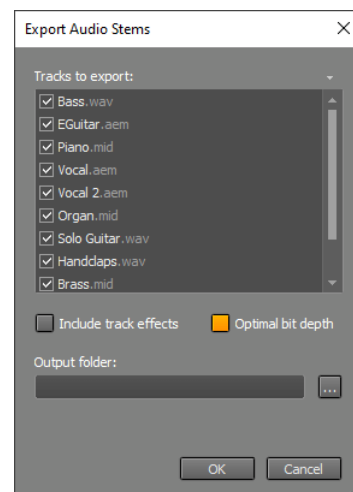
Note: this feature is available in the Pro edition only.

This tool can export MIDI tracks using a software instrument, audio tracks and groups. An audio file will be created for each track or group. You can use this if you're going to have your tracks mixed by someone who doesn't use MultitrackStudio.

If "Include track effects" is on any audio effects in the track effect slots will be included. Exported groups include track en group effects regardless of this option.

"Optimal bit depth" (on by default) makes each file use the lowest bit depth that won't cause any loss of quality for that track. A 16 bit file will be used 16 bit track if "Include track effects" is off, for example. 32 bit float files will be used otherwise.

Note: groups are rendered using the tracks that are routed to the group being rendered. Solo buttons may affect the result. Fancy sidechaining (using other tracks) may not work as expected.



"Export Audio Stems" window

Note: if a MIDI track has multiple streams only the first stream will be exported. You can click the track's file name box and choose Split Streams to split it into multiple single-stream tracks.

Export Song

"Export Song" saves the song in a .zip file. This makes it easy to move the song to another computer or to iPad. The zip file only contains files that are required to playback the song, ie. the files found by the Clean up Song Folder tool aren't included.

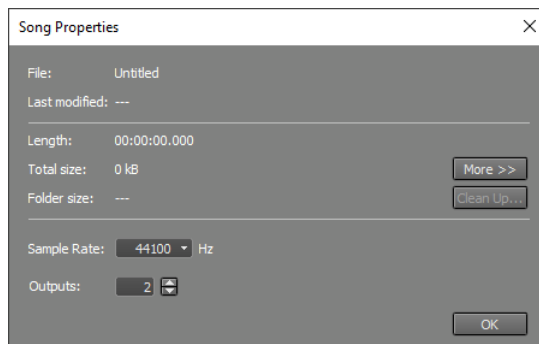
See Transferring Songs for more info.

2.2 Song Properties

In the Song Properties window, reached via the Song menu's Properties option, you can change mixer and sample rate settings. It also shows file related information.

The **Sample Rate** box specifies the sample rate to be used for audio recording/playback. Usually the default value (44.1 kHz) will be used, as this is the value used on CDs. The bottom entry of the drop down list lets you make the current value the one to be used for new songs.

Outputs (Pro edition only) determines the number of audio outputs. This is always an even number, the minimum value is two (stereo), the maximum value is 140. If the value is greater than 2 all Tracks, Group and Effect Return sections will have an Output Selector. Note that the Outputs value can exceed the number of outputs the audio device actually has. Any mixer sections using these non-existing outputs will not be heard.



Song Properties window

The window also shows some non-editable properties. These include:

- The total playing time of the song
- The total occupied disk space
- The file name, playing length and occupied disk space of each track's file (via the More button)

Clean up Song Folder

The Clean up Song Folder tool analyzes the folder that contains the current song, and lists all MultitrackStudio related files which are not required to play back a song file. You can delete these files in order to preserve disk space.

Note: Any alternate or partial takes appearing in a track's file options menu appear in the list, and can be deleted. Once deleted the take will no longer be available.

Note: song version files (.hdrversion) and any tracks used by the versions appear in the list as well. If you delete audio files used by a version this version will no longer play back correctly.

2.3 Song Versions

Versions of the song can be created, and reverted to, later. These versions include the song file and the MIDI and .aem files opened in the tracks.

Typical applications of versions include:

- Create a version before making major changes to the song, so you can revert to the old version if it's not such a good idea after all.
- Try different mixes and store as versions. Note that you can not only change mixer settings, but edit audio and MIDI tracks as well.
- Create a version of any mixes you send to someone, just in case they later feel the old one was better.

Create Version

The Song menu's Create Version option pops up the Create Version dialog which lets you type a name for the version to be created. If there are modifications in the song which haven't been saved yet you can choose whether you want to include the modifications in the version or not. This can come in handy if you open a song and start tweaking the mix: if you think you're onto something good you can still create a version of the song as it was when you opened it, just in case the new mix appears to be not so good after all.

Revert to Version

The Song menu's Revert to Version item lists all available versions. Tooltips show information about the versions, like the date it was created. You can revert to a version by clicking it. If there's no version that equals the song in its current state a version equaling the current state will be created. These automatically created versions are named "Autosave Version 1" etc.

Autosave

Some versions are created automatically:

- **Autosave (safety backup):** This version is created every 15 minutes. If the computer crashes you can open the song again and revert to this version in order to minimize the amount of work lost. The version is created when the transport is stopped.
- **Autosave (discarded version):** This version is created if you choose to discard the changes when the song is closed. If you regret this you can open the song again and revert to this version.

Note 1: Autosave versions aren't created until the song has been saved for the first time.

Note 2: Audio files themselves are not stored in the version files, so if you edit an audio file using a third party editor all versions using that file will be affected. You can make a copy of a file and edit the copy to avoid this.

Note 3: The versions mechanism assumes there's only one song in a folder (ie. it assumes every versions it finds in the song's folder is a version of the current song). This is likely the case with MultitrackStudio 5 or newer, but you might want to make sure this is the case with songs you created with older versions before reverting to a version.

Note 4: Some third-party demo version VST / AU plugins pop up a 'demo limitation' message window when the plugin settings are written to file. These messages will appear whenever a version is created.

Under the hood

A version file (.hdrversion file extension) is a song file which also contains the .mid and .aem track data.

2.4 Transferring Songs

Both MultitrackStudio (Windows/Mac) and MultitrackStudio for iPad can export songs as .zip files, and import them.

While MultitrackStudio is largely the same on all platforms, there are some things to consider:

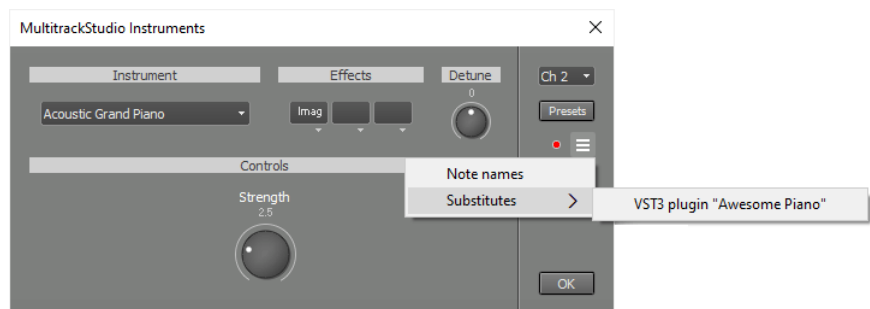
- 3rd party plugins may not be available (see MIDI Instrument and MIDI Effect substitutes).
- The SoundFont Player is available on Mac and iPad only.
- MultitrackStudio for iPad lacks some features (see Exporting to MultitrackStudio for iPad).

MIDI Instrument and MIDI Effect substitutes

Exported songs may use plugins that aren't available on a different device. There can be several reasons for this:

- The plugin isn't available for this platform. Windows doesn't support AU plugins, iPad doesn't support CLAP or VST plugins.
- The plugin isn't installed and you can't or don't want to install it.
- The plugins aren't compatible between platforms. This can happen with AU plugins for Mac and iPad, for example. Plugin developers can choose to make their Mac and iPad versions compatible with each other, but this isn't always the case.

If a plugin is missing a Missing Audio Effect / Missing Instrument / Missing MIDI Effect placeholder appears instead. This placeholder serves to remember the plugin settings, so you can save the song without losing them. The plugin will appear again if you move the song back to the device it came from.



MultitrackStudio Instruments used as substitute for the Awesome Piano VST3 plugin

Missing instruments are a major problem because you can't hear the track at all. MultitrackStudio lets you use a substitute on the current device while keeping the settings from the other device too:

1. Click the slot's down arrow to pop up the selector menu, and select an effect.
2. The instrument's Options menu now has a 'Substitutes' section. The original (missing) instrument appears there.
3. When you move the song back to the original device you'll initially see the instrument you picked on the second device. You can use the Options menus of the affected instruments to load the substitute.
4. The actual instrument and the substitute have now changed place. So if you move the song to the second device again you can pick the substitute you choose before.

Substitutes are available for instruments and MIDI effects (not for audio effects). They don't work with External MIDI Instruments, Virtual MIDI apps (iPad) or IAA apps (iPad).

Exporting to MultitrackStudio for iPad

Zipped MultitrackStudio songs can be imported in MultitrackStudio for iPad, provided you take care of a couple of things:

- MIDI files containing multiple streams (instruments) are not supported. Click the track's file name box and choose 'Split streams' first.
- Song sample rate can't be higher than 48 kHz.
- There can't be more than 16 tracks (64 if the Pro Extension Pack is present).

MultitrackStudio for iPad doesn't support the following features (but the song will be usable nonetheless):

- Total number of effect slots and Effect Return section is limited, depending on iPad size. In addition, using Groups or multichannel audio output takes one of the spaces for slots/Effect Return sections.
- No CLAP / VST plugins, no macOS AU plugins.
- No Multi Instrument, Sampler or Wheel Organ instruments.
- No Doubler, Exciter, Mid/Side Effect, Multi Effect, Parallel Effect or Stereo Effect audio effects.
- No MIDI Multi Effect.
- Sidechain effects don't have a slot that processes the sidechain input signal.

Note: some features require the Pro Extension to be present.

The zip file can be moved to iPad using iTunes File Sharing or DropBox etc.

Using Mac / iPad Universal Clipboard

If you've set up your Mac and iPad to use the Universal Clipboard (*) you can copy/paste data between MultitrackStudio on the Mac and MultitrackStudio for iPad.

- **Songs:** The Mac 'Export Song' / 'Import Song' options will copy / paste if you press the Option key while clicking. The corresponding iPad dialogs have Copy or Paste options.
- **Audio/MIDI:** You can use the track editor COPY and PASTE buttons. Alternatively you can paste in the 'Import Audio/MIDI File' dialog, so a new track is created.
- **Audio/MIDI files** can be copied in Finder and pasted in a track in MultitrackStudio for iPad. Alternatively you can paste them in the 'Import Audio/MIDI File' dialog, so a new track is created for the file.
- **SoundFont files** can be copied in Finder and pasted in MultitrackStudio for iPad's SoundFont Player.
- **Patchmap files** can be copied in Finder and pasted in MultitrackStudio for iPad's External MIDI Instrument.
- **Presets** can be copy-and-pasted between iPad and Mac just like songs using the Import/Export buttons in the Preferences window.

() In short: enable WIFI, Bluetooth and Handoff. Both devices must use the same iCloud account.*

2.5 Songlists

Using a songlist you can play a sequence of songs. You can use this to preview your CD project without having to mix the individual songs down to stereo files first.

Note that using songlists is not required.

A songlist file (.lml file extension) contains references to song files. When a playing song is finished, the next song can automatically be opened and played. When the last song is finished the transport will be stopped.

Creating or opening a songlist

The Songlist menu is not visible if no songlist is opened. The Song menu's Songlist item contains New and Open options. After using one of these the Songlist bar will appear.



Songlist Bar (3 songs)

The Songlist Bar will be placed at the top of the window. A button with the song's file name is shown for each song in the songlist, the yellow one being the song currently opened. Clicking a button will open the corresponding song. The songs can be reordered by dragging and dropping the buttons. Opening or reordering songs is not possible while the transport is running.

Songs can be added and removed using the Song menu: New or Open will add a song to the Songlist, Close will remove the current song from the songlist and Rename will update the name of the current song.

The **Play All** button determines whether all songs will be played back consecutively. It's on by default. You can turn it off if you're going to do some work on a song, in order to avoid going the next song inadvertently.

The Songlist menu

The Songlist bar contains the Songlist menu, which offers the following options:

- **New, Open, Save, Save As, Rename, Close**
- **Comments:** Read or write text which is stored in the songlist file. You can use this to document the project.
- **Songlist Properties:** Show the songlist's properties. This includes:
 - The song file name, playing length and occupied disk space of each song
 - The total playing time of the songlist
 - The total occupied disk space

Collecting the songlist properties might take a few seconds as all songs have to be analyzed.

3 Transport

3.1 Transport

The transport controls are similar to a tape recorder's transport controls. There's a position indicator and rewind, fast forward, home (to start of song) and start/stop buttons.



The transport controls

When the transport is started all tracks that are in playback mode will play back, and all tracks that are in record mode will record. If there are no tracks that are in either playback or record mode the transport will not start.

Tip: you can hit the space bar instead of clicking the start/stop button.

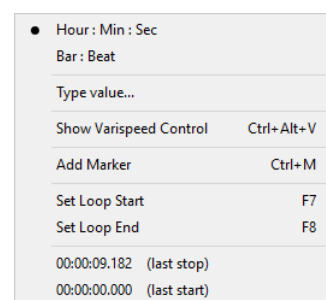
Position Indicator

The position indicator shows the current transport position. It can show either hours:minutes:seconds or bar:beat. On clicking the position indicator a menu appears which allows for choosing hours:minutes:seconds or bar:beat. The bar:beat option is available only if at least one track contains a MIDI file. That's because tempo information is stored in MIDI files.

After clicking the position indicator menu's **Type Value** option a new position can be typed. Hours:minutes:seconds values (separated by colons) are interpreted right to left, so you don't have to enter hours or minutes if the time you enter is less than 60 seconds. But if you want to enter minutes you should enter seconds as well. Zero values can be omitted (you can enter 12: instead of 12:00). Bar:beat values are interpreted left to right, so you can enter plain bar numbers easily (12 instead of 12:1).

The seconds and beat values can be real numbers (like 1.462). Press Enter to accept the new value, or Esc to cancel the operation.

The position indicator's maximum value is 10 hours at 44.1 kHz sample rate (4 hours and 30 minutes at 96 kHz).



Transport menu

Loop mode

If the **Loop** button is engaged the transport will loop the looping region (assuming you've set a valid region). You can click the position indicator and use the Set Loop Start/Set Loop End options to set the looping region. These options can also be reached by rightclicking the overview bar. The Loop button appears dimmed if it's engaged but there's no valid looping region.

The Overview Bar shows the looping region.



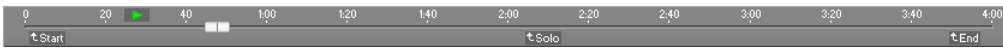
Overview Bar showing looping region

You can select a looping region and start the transport in one go by drawing it on the Overview Bar while pressing the Alt key (Windows) / Option key (Mac). In this case the Loop button will be engaged automatically, and it will be disengaged automatically when transport stops.

3.2 Overview Bar and Markers

Overview Bar

The Overview Bar is closely related to the transport. It is a large slider indicating the current transport position. The slider thumb can be moved using the mouse. Double clicking anywhere starts the transport from that position, clicking the thumb stops it. The overview bar also shows the markers.



Overview Bar with three markers, green triangle is most recent start position

The most recent transport start position appears in the upper half as a green triangle. If you click it the transport moves back to that position, double clicking it starts the transport at that position.

The current editor view area is indicated by a thin line. It's only visible while the editors are scrolling horizontally.

Markers

Markers are used to name certain parts of a song (for instance Intro, Verse 1, Verse 2, Solo, Verse 3). Navigating through a song becomes significantly easier using markers. The position indicator menu features an **Add Marker** option which adds a marker at the current transport position. If there's a marker at the current position a **Delete Marker** option is presented instead.

Alternatively markers can be added by rightclicking the overview bar. Most editors allow for adding markers by right-clicking the time grid-area (where the needle handle lives). An easy way to add markers "on-the-fly" is to press Ctrl+M (Windows) / Option-M (Mac) at the appropriate times while the song is playing. This takes the grid snap setting into account, so accurately adding markers on-the fly is easy when using a grid spacing of one bar while the "Snap" button is engaged.

The markers appearing on the overview bar can be left-clicked to jump to the corresponding transport position. They can be right-clicked to delete, rename, quantize to the grid, move it to the current transport position, or type a new position. Renaming can also be done by double clicking the marker. Markers can be dragged to a new position.

3.3 VariSpeed

Note: this feature is available in the Pro edition only.

VariSpeed acts like a tape recorder's speed control. An important application is recording instruments which aren't in tune with existing tracks. Speed Only mode can be used to slow the music down to make transcription or practicing easier. The VariSpeed controls are hidden by default, they can be made visible by clicking the position indicator and choosing "Show VariSpeed Control".



VariSpeed control

The box offers a choice of several VariSpeed modes:

- **Off:** No VariSpeed
- **Tape style - 1 semitone (T1):** Change pitch up to 1 semitone, speed changes accordingly.
- **Tape style - 2 semitones (T2):** Change pitch up to 2 semitones, speed changes accordingly.
- **Tape style - half speed (TH):** Run at half speed (+/- 1 semitone). Audio tracks and software instruments sound one octave lower at half speed, External MIDI Instruments don't.
- **Speed Only (SO):** Change speed (50%..150%) without changing pitch. Recording isn't possible using Speed Only mode, VariSpeed will be turned off automatically if you try to do so.

The rotary knob controls speed / pitch. It can be turned while the transport is running, but not while recording.

The tape-style modes work exactly like a tape recorder's speed control: if speed increases pitch goes up, if speed decreases pitch goes down. If you want to record an instrument and its pitch is different from your song's pitch you can use VariSpeed to change the song's pitch. After recording the track you can switch off VariSpeed and the recorded track's pitch will be equal to the song's pitch.

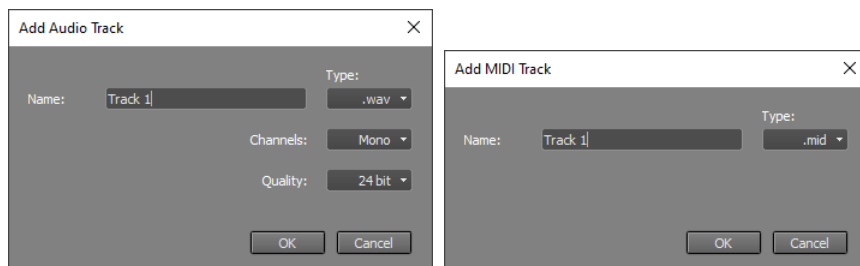
VariSpeed also works with MIDI tracks. Tracks using an External MIDI Instrument are detuned using Pitch Bend messages (the pitch bend range is assumed to be 2 semitones).

Note that VariSpeed consumes CPU power, so it should be switched off when it's not needed.

4 Recording

4.1 Recording

The first thing to do when starting to record a track is to add a track with an audio or MIDI file that will contain the recording. You can do this using the Add Track menu.



Add Audio Track window (Pro edition)

Add MIDI Track window

If the track contains an audio file (like the default .wav format), the track will record audio (using a microphone or a line input), if it contains a MIDI file (.mid) the track will record MIDI (usually a keyboard). See the Audio files and MIDI files paragraphs for more information on supported file types.

To record a track you should click its Rec button (it turns red) and start the transport.

If you want to wait a certain amount of time until recording starts (to give you time to walk to the mic for instance) you can use the Delay Before Recording option.

Recording options

Four buttons at the top of the main window provide access to the most frequently used recording options:

- **Input:** Show the Windows audio recording settings (Windows) / System Preferences audio settings (Mac). If your audio device comes with a control panel application you can click down arrow menu's "Browse for device control panel..." option and open the control panel. Now you can access the control panel via the down arrow menu's "Device control panel" option. If "Button shows device control panel" is checked it will pop up on clicking the Input button itself.
- **Mon:** Soft Monitoring
- **Punch:** Punch In/Out
- **SoS:** Sound on Sound recording

A **Recording Level fader** appears next to the Input button while an audio track's Rec button is engaged. This fader sets the level of all input channels. Use the Input button if you need to set per-channel levels. The Recording Level fader only appears if the sound device supports this.

The **Rec** button pops up the Recording Options menu which offers more options. The buttons move to the menu automatically if the main window is too small to show them all. The menu's options are described in the following paragraphs.



Recording options, with Recording Level fader

4.2 Audio Recording

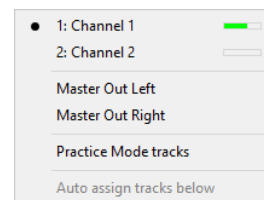
If you want to record using a microphone you should connect it to your sound device's Mic input. Keyboards, mic preamps or mixer outputs should be connected to the Line input.

Input assignment

A small down pointing triangle appears on the right hand side of an audio track's Rec button. Clicking this triangle pops up the input channel selector. The input channel is displayed on the Rec button itself. The input channel selector features small level meters if at least one audio track Rec button is engaged.

Recording Levels

The Level Meter starts working upon clicking the track's **Rec** button (it turns red). You can now set the recording level. The way this can be done depends on your sound device. A Recording Level Fader appears next to the Input button if the sound device supports this. The **Input** button itself may take you to per-channel level settings if the device supports this. If the sound device comes with its own control panel you can use that. If you have a mic preamp or a hardware mixer it's more convenient to use this to set the recording level (set the sound device's level to its maximum value).



Input channel selector

The recording level is OK if the meter reaches the yellow section during signal peaks.

Note: driving the recording level meters into the red section is definitely a bad thing in digital audio.

Under the hood

The level meters read 0.1% above the actual recording level while recording in order to make it possible for the first red segment to light when reaching the clipping level. Otherwise no red segment would ever light as the Audio In Device cannot output data above its clipping level.

Live Multitrack Recording

Note: these features are available in the Pro edition only.

The Pro edition offers two features that make live multitrack recording easier:

1. The Add Audio Track window has a '#' box which holds the number of tracks to create, so you can add multiple tracks in one go. The box appears automatically if the audio device has at least 4 input channels. You can press Ctrl+N to make it appear anyway (this also works in the Add MIDI Track window).
2. The Song menu's New window has a Template box. The "Identical to current" template creates an empty copy of the current song. A new folder will be created, with new audio/MIDI files and a new song file. This feature can be used to record another take of a performance.

Tip: you can toggle all Rec buttons in one go by clicking one while the Ctrl key (Windows) / Command key (Mac) is pressed.

Record Master Out

Note: you can use the Mix Down menu's 'Mix down to audio file' option instead.

An audio track will record the output of the Master section (or simply the output if the Master section has been removed) if the **Master Out** option is selected in the Input channel selector. This feature can be used to mix the song to down stereo (see mastering).

This feature can also be used to 'bounce' tracks in order to reduce the number of tracks used by the song. For example: a five track backing vocal group can be bounced to a single track by recording the five tracks to a new track (temporarily turn off all other tracks, and bypass any effects in the Master section). Having done this, the five original tracks can be turned off (using their Play buttons) and the new track can be used instead.

In a similar way this option can be used to 'freeze' a track that uses effects that require a lot of processing power. The new (audio) track will include the effects, thereby freeing up the processing power used by them.

Recording Practice Mode tracks

The input channel selector features a 'Practice Mode tracks' option. Using this option you can record a track which is in 'manual practice mode' to an audio track. You can use this if you want to play an instrument plugin and record the performance as audio rather than MIDI, for example.

You can set it up like this:

- Doubleclick a track's Play button to switch it to manual practice mode.
- If it's an audio track: engage the Mon button to switch on Soft Monitoring.

- Add an audio track, set its input to 'Practice Mode tracks' and engage its Rec button.
- Now you can hear it's working and you can start the transport.

The audio track that's recording isn't 'soft monitored' (you'd hear the practice mode track twice if it did).

Note: this doesn't work with VariSpeed.

4.3 MIDI Recording

MIDI tracks always record the MIDI In Device(s) and/or the Onscreen MIDI Keyboard, regardless of the type of MIDI instrument being used. If the Autodetect Keyboard Channel option is enabled (default) your keyboard's MIDI channel will be detected automatically. If necessary you can set the channel used in the instrument's user interface.

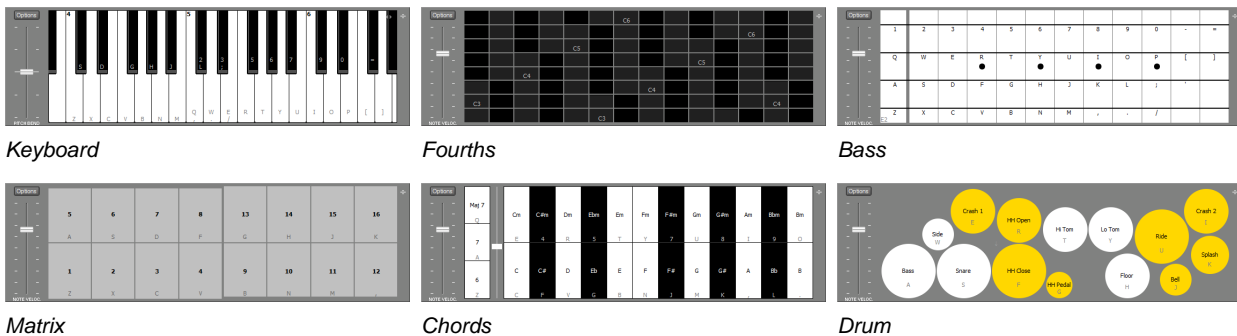
The Pro edition features a built-in MIDI merger that merges all data that's being received on any of the MIDI In Devices (up to four of them can be used, see devices). Make sure your keyboards are using different channels in order to avoid problems.

You can undo MIDI-recording using the track editor's Undo button.

Note: If the MIDI file contains multiple streams ('tracks' in MIDI terms) all streams will be recording. Using multiple streams is not recommended.

Onscreen MIDI Keyboard

The onscreen keyboard can be used to play MIDI instruments, it works just like a MIDI In Device. Not only does it offer a keyboard layout, but drum, chords, matrix, fourths and various string layouts as well. It can be made visible using the button in the bottom-right corner of the main window.



The onscreen keyboard provides suitable shortcut keys for various international keyboard layouts automatically. The number of keys which can be played simultaneously solely depends on the keyboard hardware, three keys typically isn't a problem. The mouse works too, but it isn't really suited to playing music.

Note: The Fourths layout can't be used with the keyboard. It can be used with mouse or pen.

The slider on the left can be assigned to any MIDI controller (including note velocity and pitch bend) using the Options button. The slider can be turned into a button, this may be more convenient for the sustain controller for example.

String instruments can be capoed using the Options button.

The Matrix layout can be used with the Matrix Sampler. The pad mapping conforms to the Matrix Sampler's matrix mapping. The 8 pads on the left correspond to the lower 8 cells of the Matrix Sampler, the 8 pads on the right correspond to the upper 8 cells.

The Chords layout allows for playing chords with a single finger. It offers 12 keys for major chords and 12 keys for minor chords. You can use the 6/7/Maj7 buttons on the left to add a note to the chord. The vertical slider sets "the position of the keyboard player's hand on the keyboard".

The drum layout uses GM instrument mapping.

There's an option to create/recall presets.

Note: the onscreen keyboard's timing may not be as accurate as you'd expect from a real MIDI keyboard.

Note for users of macOS 10.13 and older: the keyboard shortcuts don't appear until the corresponding key on the computer keyboard has been pressed while MultitrackStudio is running. You typically need to press 1..9, A..Z and a couple of keys on the right hand side.

Using the MIDI keyboard with touchscreens

Note: touchscreen support is available for Windows only.

The onscreen keyboard can be used with a touchscreen. A multi-touch screen lets you play multiple notes simultaneously, and also makes monophonic parts easier to play. The number of fingers which can be used simultaneously solely depends on the touchscreen and its driver.

The Options button provides access to various options:

- **Glide:** the Fourths and string instruments support smoothly gliding from one note to the other.
- **String Bend:** the string instruments support string bending.
- **Finger Vibrato:** guitar/cello style vibrato movements.
- **Aftertouch:** polyphonic aftertouch messages are sent if you move a finger upwards.
- **Velocity:** the higher your finger touches the screen, the higher the velocity.
- **Use per-note pitch bend:** Glide, String Bend and Finger Vibrato generate MIDI pitch bend events. This option makes them use MIDI 2.0 per-note pitch bend messages. Without this only monophonic parts can be played while Glide or String Bend is enabled, and Finger Vibrato only works while just a single note is playing.

The drum layout allows for performing hihat pedal movements: put a finger on the HH Open pad to 'hit it with a stick'. Then move the finger to the HH Close pad to close it with the pedal.

The slider on the left can be moved while playing the keyboard.

The keyboard shortcuts are not visible in touchscreen mode.

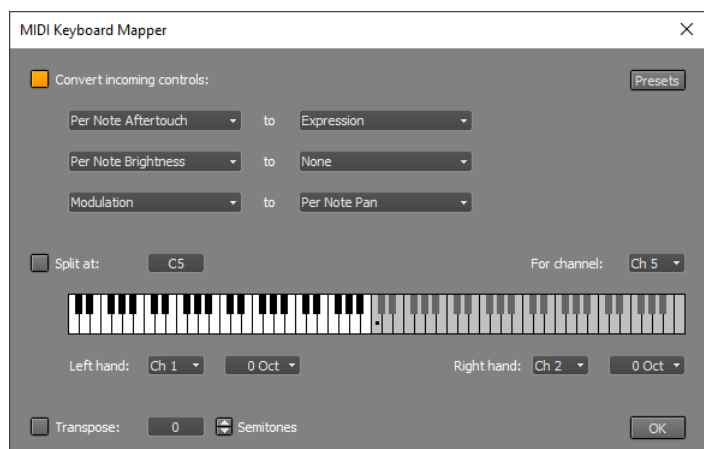
Note for Windows 11 users: you should go to Settings and switch off 'Three- and four-finger touch gestures', located under 'Bluetooth & Devices'. These gestures interfere with keyboard playing.

Tip: you may find your multi-touch screen responds slowly to a single finger, and any fingers you add are detected much faster. In this case you can keep one finger on the screen while playing the keyboard, and use other fingers to actually play notes.

Keyboard Mapper

The MIDI Keyboard Mapper can do 3 things:

- **Convert Controls:** convert up to 3 incoming controls to a different one. You can use this to map an MPE dimension to a MIDI 2.0 per note control like Modulation, for example. This feature can also use this to remove events by converting a control to 'None'. You can remove a dimension from an MPE keyboard for example, the 3 MPE dimensions appear as Per Note Pitch Bend, Per Note Brightness and Per Note Aftertouch.
- **Split:** split a MIDI keyboard in a left and right hand part. You can use this if you want to play two instruments using a single keyboard. MIDI messages on one channel are intercepted and separated. All notes below the split note are routed to the left hand channel. All other notes and all controller events are routed to the right hand channel. Each output channel can be transposed up to three octaves up or down.



Keyboard Mapper window

- **Transpose:** transpose the input by a number of semitones. You can use this so you can play in a more convenient key.

The 3 possible actions are processed in this order.

Autodetect Keyboard Channel

If the Recording options menu's Autodetect Keyboard Channel option is active (this is the default setting) recording MIDI tracks will respond to messages on all channels. This means that you won't have to worry about the actual MIDI channel being used, it just works.

The Autodetect Keyboard Channel feature will disable itself automatically if there are multiple recording MIDI tracks and they're not all recording the same channel. This means that you won't have to turn it off in order to be able to record two tracks using two keyboards.

You can turn off Autodetect Keyboard Channel if data is coming in on multiple MIDI channels and you want to record just one of them.

4.4 Multiple Takes

It typically requires more than one take to get a track right. MultitrackStudio offers two ways to record multiple takes:

- **Alternate Takes:** a new file is created, the existing file is closed and the new one opened.
- **Partial Takes:** the recording is recorded to a new file. When the transport is stopped the part is pasted in the existing track. It appears as a tweakable edit, so you can move or resize the new part.

There are basically two approaches to multiple take recordings:

- **Use alternate takes and decide which parts to use afterwards ("track comping"):**
Record some takes until you think all parts are played OK at least once. Then use the track's file options menu to load the takes one by one to determine which is the best. Other takes can be loaded in new tracks via rightclicking them in the file options menu. Then the part you want to copy can be dragged from the track's editor to the track containing the best take. Note that track comping using partial takes is possible as well. Clicking one in the file options menu opens it in a new track.
- **Use partial or punch in takes and make all decisions immediately:**
Record a full take, and then record partial takes over the weak parts. You can select the part first and then record it (punch in recording), or you can record the part and then tweak the selected part in the editor to only contain the part you want (partial take). If the new take is not successful you can use the track editor's Undo button and try again.

4.5 Alternate Take

Using the **Alternate Take** option from the Recording Options menu, you can quickly create a new file and set up the track for recording a new take of the last recorded track. This is what happens:

1. The last record Track's File Options Menu's Alternate Take option is executed.
2. The transport's position rewinds to the position the last recording started.

If you keep down the Ctrl key (Windows) / Command key (Mac) while clicking the Alternate Take menu item a new track will be created. This is what happens:

1. The last recorded track's Play and Rec buttons are deactivated.
2. A new track is added and switched to Record mode.
3. A file is created having the same name as the last recorded file, but with a number added. If the name ended with a number, that number is incremented.
4. The transport's position rewinds to the position the last recording started.

You can keep down the Shift key while clicking to keep the transport from rewinding.

Invoking Alternate Take automatically clears the Punch button.

4.6 Partial Takes

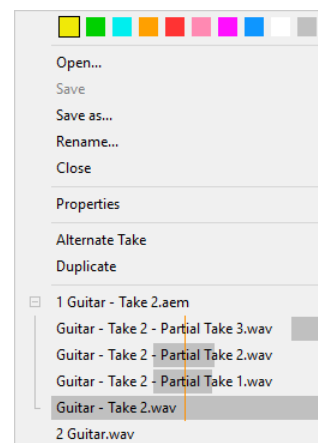
If you record to a track which already contains data the new part becomes a partial take.

The recorded part appears as a tweakable edit in the track's editor, so you can move and resize it to make it fit if necessary. The track editor can also be used to undo the recording. After undoing the file containing the partial take is still available from the track's File Options menu.

If it's an audio track an .aem file will be created if the track isn't using one already.

Partial takes appear on the track's file options menu if the take they're recorded in is expanded (see picture). Clicking one will open it in a new track.

The menu shows which part of the song is covered by a partial take in gray. The vertical orange line represents the current transport position.



A track's File Options Menu

Under the hood

Partial audio take files are BWF (Broadcast Wave File) files. This is a .wav file with additional information on where the starting point is. MultitrackStudio discards the *bext* chunk unless the words "MultitrackStudio Partial Take" are in the Description field.

Partial MIDI take files are just plain MIDI files.

4.7 Punch In/Out

Punch in/out recordings are a special kind of partial takes. You can select the part to record beforehand, and you'll hear the existing track before and after this selected part. The track's editor is used to define the part being recorded (see selecting a part). This should be done before recording starts. The new recording becomes a tweakable edit, so you can modify the punch in/out points afterwards.

If a MIDI track has multiple streams (not recommended) all streams will use the punch in/out points defined by the track's main editor.

Punch in/out recording can be activated using the **Punch** button at the top of the main window.

When the transport is started MultitrackStudio will make sure the transport position is at least one bar before the start of the punch region. The transport position will be moved if necessary. If the editor grid is not in bars transport position will be moved to at least 2 seconds before the start of the punch region.

The existing track, before and after the punch-in region, is audible during punch in/out recording. Invisible copies of software instruments and/or effects are used for this, hence it won't work with demo versions of plugins which are limited to a single instance or can't save their settings.

The software instrument, or the recorded audio signal if Soft Monitoring is active, is audible in the punch-in region only by default. Turning on the Recording Options menu's **Full Punch In/Out Monitoring** option makes your performance audible all the time. It will also pan the existing track to the other side, so if you pan the track to one side before starting punch-in recording you'll hear the existing track on one side, and the performance you're recording on the other side. This can be a convenient way of working if you're using headphones.

Punch-In Recording step-by-step

- Open the editor of the track you want to record.
- Select the part you want to record in the editor.
- Make sure the Punch button at the top of the screen is red.
- Make sure the track's Rec button is red.
- Start the transport.
- Record the part and stop the transport when done.
- Now you can resize the selected part in the editor if necessary. You can also use the EDIT button and change the punched-in part's volume etc.

4.8 Sound on Sound recording

Sound on Sound recording lets you record without erasing the existing part (ie. the recording is added to the existing part). This can be used to add some notes to an existing MIDI part. It also works with audio. The existing part is audible, except when using an External MIDI Instrument.

Sound on Sound recording can be turned on/off using the **SoS** button at the top of the window.

After stopping the transport the recording appears in the track's editor as a tweakable edit, so you can resize the selected part, undo the recording or use the editor's Edit button to change the recording's volume etc. Note that only the newly recorded part is affected by these actions, the original part remains untouched.

4.9 Loop Recording

Using loop recording you can record multiple takes automatically. It also works with punch-in recording.

Loop Recording step-by-step

- Move the transport position to the point where you want to start recording.
- Make sure the track's Rec button is red.
- Click-and-drag the Overview Bar thumb or the track editor's time bar thumb (see Loop mode) and move it to the right. Release the mouse button when you've reached the point where you want to stop recording. The transport will now start.
- When you think you've recorded a good performance stop the transport.
- Now the takes are available from the track's File Options Menu (the small button below the file name box). You can open a take in a new track by pressing the Shift key while clicking the mouse. You'll typically want to copy the best parts to one track. It's best to start with the track you think is best. Then copy better parts from other tracks to this track. This can be done easily if you keep the Shift key down while dragging the part from one track's editor to another. The Shift key prevents the part from moving left or right.

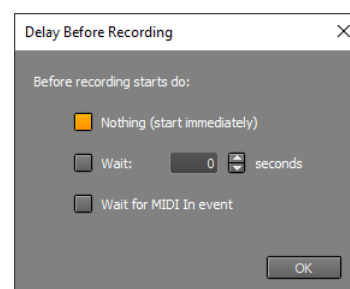
Loop Punch-In Recording step-by-step

- Open the editor of the track you want to record.
- Select the part you want to record in the editor. Note that the looped punch-in recordings won't be available as tweakable edits, so you should make sure the start and end points are in silent or otherwise suitable parts.
- Move the transport position to the point where you want to start playback. This will typically be at least a couple of seconds before the point where you want the punch in recording to start.
- Make sure the Punch button at the top of the screen is red.
- Make sure the track's Rec button is red.
- Click-and-drag the Overview Bar thumb or the track editor's time bar thumb (see Loop mode) and move it to the right. Release the mouse button when you've reached the point where you want to stop recording (make sure the part you're going to record is in the looping region). The transport will now start.
- When you think you've recorded a good performance stop the transport.
- Now you can use the editor's Undo and Redo buttons to select the best version.

4.10 Delay Before Recording

The Delay Before Recording window has several options that can be useful when you are recording on your own. Delay Before Recording allows you to walk to your guitar/microphone etc. before recording starts. There are two ways of doing this:

1. **Wait:** The transport simply waits for a specified number of seconds to elapse.
2. **Wait for MIDI In event:** The transport waits for a MIDI Note or Controller event on the MIDI In port. This works for audio recording as well. If you have a MIDI sustain pedal you can use this to start the transport. Any channel on the MIDI In port can be used to start the transport.



Delay Before Recording window

Note: the settings are used only if there is at least one track in record mode.

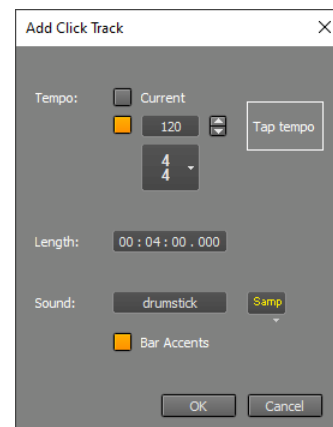
4.11 Add Click Track

The Add Track menu's Click Track option can be used to add a click track (metronome) to the song.

The **Tempo** section specifies the tempo to use. **Current** uses the current tempo, this option can only be selected if the song contains at least one MIDI track. Using the **BPM** option you can specify a new tempo. You can click a new tempo in the **Tap tempo** box. Alternatively you can play the tempo on the space bar.

Length is the length of the click track in hours : minutes : seconds format.

The **Sound** section specifies the drum instrument (MIDI note) and **MIDI Instrument** to use. If you plan on adding a drum track using an editor later, then it's a good idea to use the MIDI Instrument you'll be using for the drums in order to avoid any timing differences. After changing a Sound property a **Store as default** button appears in the bottom-left corner. You can click this button to remember the current settings.



Add Click Track window

Bar Accents increases the volume level of the first beat in every bar. Other subtle accents may be added as well, depending on the time signature.

Tip: You can make the click track mute during playback automatically using the Mute click track during playback option in the Preferences window.

Note: the click track will be updated automatically on editing the time signature. If you don't want that for some reason you can rename the click track (so it's no longer called Clicks.mid).

4.12 Monitoring

Monitoring means: hearing the track you're recording. The best way to achieve this is in hardware ("direct monitoring"), as this doesn't introduce a delay. Soft Monitoring can be used if you need to hear effects like the Guitar Amp while recording. It can also be used if your hardware doesn't support direct monitoring.

Direct Monitoring

Some sound devices come with a software control panel that allows for direct monitoring. Some devices have a hardware knob to control direct monitoring. Not all sound devices have monitoring features though, in this case you can consider using an analog mixer.

Soft Monitoring

You can switch on Soft Monitoring using the **Mon** button at the top of the main window. If this option is used recording audio tracks will apply any effects to the incoming audio signal, and then send it to the Audio Out Device so you can hear the sound including the effects.

It is not recommended to use this feature as a means of monitoring the dry signal you're recording, as there is an inherent latency between the input and the output signal. Using a low latency will increase the risk of glitches in the recordings. All these problems can be avoided using direct monitoring.

Note: this option does not work with the Early Windows audio driver type.

4.13 Practice Mode

These days many instruments are software based. This isn't only true for software MIDI instruments like the Sampler or instrument plugins, but for guitar amp simulators like the Guitar Amp effect as well. Practice Mode lets you use these instruments without actually recording them, so you can practice your part or use a keyboard to figure out chords etc.

Manual Practice Mode

You can switch a track to Practice Mode by doubleclicking its Play button. The button will read 'Practice' while the track is in Practice Mode. The track will stay in Practice Mode until you click either its Play or Rec button.

Note that Soft Monitoring must be used for audio tracks to be audible.

Automatic Practice Mode

A track will be switched to Practice Mode automatically if some conditions are met. A MIDI track will be switched to Practice Mode if the MIDI instrument's window is visible at the time the transport starts while neither the track's Play button nor the Rec button are "on". Similarly, an audio track will be switched to Practice Mode if one of the effect windows is visible at the time the transport starts while neither the track's Play button nor the Rec button are "on".

Automatic Practice Mode also works while the transport is stopped, regardless of the track's Play/Rec buttons. Alternatively you can engage a track's Rec button, in this case there's no need for any effect or instrument window to be visible.

5 Playback and Mixing

5.1 Playback and Mixing

In order to be able to play audio or MIDI files they should be opened in a track. To play a track you should activate its Play button (it turns green) and start the transport.

Tracks have mixing and effect processing capabilities.

You can expand the mixer by adding any number of Group or Effect Return sections.

All Tracks, Groups and Effect Returns are routed through the Master section.

Playing MIDI

If a track's Play button is engaged and the transport is running, all streams in that track will be played.

If the Instrument slot contains an External MIDI Instrument the track's output will be sent to the corresponding MIDI Out Device. In this case the track is not affected by any Group, Effect Return or Master sections.

If a software instrument (Sampler, VST Instrument etc.) is being used the track's output will be routed through any mixer sections, and eventually be sent to the Audio Out Device, as if it were an audio track.

5.2 Tracks

A MultitrackStudio track is a combination of a mixer's channel strip, a tape recorder's record/playback switch and a piece of tape, the latter being replaced by an audio or MIDI file on the hard disk. Tracks can be added using the Add Track menu's Add Audio Track, Add MIDI Track or Import Audio/MIDI File options. The latter can import multiple files in one go using the Shift key or the Ctrl key (Windows) / Command key (Mac). Tracks can be removed by dragging the file name box (on the left) to the Garbage Bin (in the bottom left corner of the main window). The order in which the tracks appear can be changed using drag-and-drop as well.

All tracks have the following basic features:



Track (No file opened)

- **Name box:** Shows the name of the opened file.
The bottom right corner indicates the type of the file:
 - "mono": Mono audio file.
 - "stereo": Stereo audio file.
 - "MIDI": MIDI file. If the file has multiple streams the number of streams is mentioned ("4 MIDI" etc.).
 - "not opened": The file isn't opened, probably because the file does not exist or it's an unsupported file type. In this case the Play and Rec buttons are disabled.
Tip: you can change the width of the Name box in the Preferences Window.
- **File Options Menu** (appears on clicking the Name box)
The file options menu contains the following items:
 - **Color:** Here you can choose a different color for the track name box and the editor. There are 10 colors to choose from.
 - **Open:** Open an existing Audio/MIDI file. This option does not copy the file to the song folder, unlike the Add Track menu's Import Audio/MIDI File option. **Windows:** If the file doesn't exist it will be created. The type of the file is determined by the file's extension ('piano.mid' loads or creates a MIDI file, 'piano.gjm' loads or creates a .GJM Audio file). If no extension is entered a .WAV Audio file is opened or created.
 - **Save:** Save MIDI or .aem file to disk. Use this if you want to save performed edits. This item is available for MIDI tracks and edited audio tracks only. It is disabled if the file is unmodified.
Note: The tracks are saved automatically whenever the Song menu's Save option is invoked, so saving tracks explicitly usually isn't necessary.
 - **Save As:** Copies the file to a new file and opens the new file.
 - **Rename:** Rename the file. *Note: the file will be closed and reopened, so the editor's undo history will be lost.*
 - **Close:** Unload the file.

- **Properties** : Shows the file's properties. If it's an .mp3 file you can edit the file tags in this window.
- **Add Stream**: (MIDI track only). Adds a stream to the MIDI file.
- **Split Streams**: (multiple stream MIDI track only). Splits the MIDI file in separate single-stream files, these new files will be opened in new tracks.
- **Alternate Take**: Creates and opens a new file and puts the track in record mode, so you can quickly record an alternate take. The files will appear on the menu so they can be opened easily. The new file will appear in a new track if you keep the Ctrl key (Windows) / Command key (Mac) down while clicking the mouse.
- **Copy live performance to clipboard**: (MIDI software instrument track only) After a software instrument has been played 'live' without actually recording it, the performance can be copied to the clipboard, and subsequently pasted in a track.
- **Duplicate**: Create a new track with a copy of this track's content.
- **File History**: Every time a file is opened it is added to the menu. Using this item you can reload the file. This can be very useful for auditioning Alternate Takes. If you press the Shift key while clicking the file will be opened in a new track. You can rightclick (Windows) / Ctrl-Click (Mac) for more options. The "Remove from list" options allows the Find Unused Files tool to mark the file unused.
- **Play and Rec** buttons: Put track in playback or record mode. Starting the transport will actually start playback/recording.
- **Level Meter**: The Level Meter shows the sound level.
- **Volume** fader: This fader sets the playback volume for the track.
- **Mute** button: Pressing this button will mute the track.
- **Solo** button: Pressing this button will solo the track. The signal will still be routed through any Group and/or Effect Return sections. Use the Effect Return's Mute button if needed. Multiple tracks can be soloed by keeping the Ctrl key (Windows) / Command key (Mac) down while clicking additional Solo buttons. Double clicking a Solo button invokes 'half solo': other tracks will be attenuated by 12dB rather than muted fully. The Solo button reads 'H' in half solo mode.
- **Pan**: This knob (with a blue dot) sets the Pan position for the track (0% = left, 50% = center, 100% = right).
- **Editor Preview pane**: Displays a compact version of the editor. The editor itself appears on clicking the Editor Preview pane. The data in the panes can be moved left/right. The current transport position changes if you use the trackpad (or a horizontal scroll wheel). The current transport position doesn't change if you drag using the mouse.
Note: an Edit button may be present to show/hide the editor, depending on your Preferences settings.

A click on a Play, Rec, Mute buttons or Editor Preview pane toggles all tracks if the A key is down while clicking. Likewise, the C key affects all tracks that have the same color.

Audio Tracks

Audio tracks (tracks with an audio file) have the following additional features:



Audio track

- **Effect Send**: An Effect Send knob determines the level of the (mono) signal sent to the corresponding Effect Return section. Effect Sends are of the 'post fader' (and 'post effects') type: the Effect Send signal is affected by the Volume fader, the Mute button and the effects.
- **Effect Slots**: The Effect slots can contain effects such as an EQ or a Compressor. Effects processing takes place before volume and pan processing, so compressor settings don't need any adjustments when moving the Volume fader.
- **Output Selector**: The Output Selector determines the routing of the track's output. You can choose between the Master section or one of the Group sections. The *Pro edition* can also route tracks to a pair of channels (3/4, 5/6...) of the Audio Out Device if the song uses multiple stereo outputs (see Song Properties). The Pan knob can be used to send the signal to one channel only. The Output Selector isn't available if there are no options other than Master.

MIDI Tracks



MIDI track (Instrument: External MIDI Instrument)

MIDI tracks (tracks with a MIDI file) have an Instrument slot that determines where the track's output will be routed to. If it contains a software instrument, like the default MultitrackStudio Instruments, the MIDI data will be converted to audio and the output routed through the mixer. If it contains an External MIDI Instrument the output will be sent to an external hardware synthesizer. See the MIDI Instruments section for more information on this subject.

MIDI tracks using a software instrument have all the extra controls audio tracks have (except for the first Effect Slot, which is replaced by the Instrument Slot).



MIDI track (Instrument: Sampler)

5.3 Group

Audio tracks can send their output straight to the Master section, or to a Group section. The Group section's output is routed to the Master section (they can be routed to sound device output channels as well using the Pro edition). Group sections can be added using the Add Track menu. A group can be removed by dragging the text on the left (Group 1 etc.) to the Garbage Bin.

Group sections have the following features:



Group section

- **Volume** fader: This fader sets the volume for the group.
- **Mute** button: Pressing this button will mute the group.
- **Solo** button: Pressing this button will solo the group.
- **Pan**: This knob (with a blue dot) sets the Pan position for the group.
- **Effect Send**: An Effect Send knob determines the level of the (mono) signal sent to the corresponding Effect Return section. Effect Sends are of the 'post fader' (and 'post effects') type (the Effect Send signal is affected by the Volume fader, the Mute button and the effects).
- **Effect Slots**: The Effect Slots can contain effects such as an EQ or a Compressor. Effects processing takes place before volume and pan processing, so compressor settings don't need any adjustments when moving the Volume Fader.
- **Output Selector** (*Pro edition only*): The Output Selector determines the routing of the group's output. The output can be sent to the Master section or to a pair of channels (3/4, 5/6...) of the Audio Out Device (the Pan knob can be used to send the signal to one channel only). The selector does not appear if the song uses only one stereo output (see Song Properties).
- **Level Meter**: The Level Meter shows the actual output level (that is the level after applying effects and volume/pan).

Care should be taken in situations where tracks routed through the group use the same Effect Sends: Effects in the group sections can cause phase shifts that could lead to unexpected coloration.

A Label can be stuck to a group section to show its purpose (ie. 'Backing Vocals').

The order in which the groups appear can be changed using drag-and-drop.

5.4 Effect Return

Each audio track (and MIDI tracks using a software instrument) and each Group will have a corresponding number of Effect Send knobs. All Effect Send signals are routed to the corresponding Effect Return. Here they can be processed and mixed with the tracks. Effect Returns are typically used for adding reverb. The Effect Return sections do not affect MIDI tracks using an External MIDI Instrument. Effect Return sections can be added using the Add Track menu. An Effect Return section can be removed by dragging the text on the left (Effect Return 1 etc.) to the Garbage Bin.

Effect Return sections have the following features:



Effect Return section with Reverb effect

- **Volume** fader: This fader sets the volume for the Effect Return.
- **Mute** button: Pressing this button will mute the Effect Return.
- **Solo** button: Pressing this button will solo the Effect Return.
- **Pan**: This knob sets the Pan position for the Effect Return.
- **Effect Slots**: The Effect Slots can contain effects such as Reverb or Echo.
- **Output Selector** (*Pro edition only*): The Output Selector determines the routing of the Effect Return's output. The output can be sent to the Master section or to a pair of channels (3/4, 5/6...) of the Audio Out Device (the Pan knob can be used to send the signal to one channel only). This feature can be used to send the effects bus to an external hardware effect unit (eg. a reverb unit). The selector does not appear if the song uses only one stereo output (see Song Properties).
- **Level Meter**: The Level Meter shows the actual output level (that is the level after applying effects and volume/pan).

A Label can be stuck to an Effect Return to show its purpose (ie. 'Reverb').

The order in which the Effect Returns appear can be changed using drag-and-drop.

5.5 Master

The Master section affects all Tracks, Groups and Effect Returns (except MIDI tracks using an External MIDI Instrument).

The Master section has the following features:



Master section with Master Limiter effect in last slot

- **Volume** fader: This fader sets the master volume.
- **Mute** button: Pressing this button will mute everything.
- **Pan**: This knob sets the master Pan position.
- **Mono** button: Pressing this button forces mono output (both stereo channels carry the same signal). This can be used for checking mono compatibility.
- **Effect Slots**: The Effect Slots can contain effects such as an EQ or a Compressor. Effects processing takes place after volume/pan processing, thus allowing the Master Limiter effect to clip at the correct level.
- **Level Meter**: The Level Meter shows the actual output level (that is the level after applying effects and volume/pan). This means that the distortion takes place when the meter hits the red section.
- **View** button: Shows/hides an oscilloscope view of the output signal.

5.6 Labels

Labels are typically used on Group and Effect Return sections to indicate what it does. An Effect Return section could have a 'Reverb' label, for example.



Effect Return with "Reverb" label

The Add Track menu's Label item can be dragged and dropped on a mixer section. A name can be typed immediately after dropping a label, press Enter when done. Labels can be removed by dragging them to the Garbage Bin in the bottom left corner of the window.

The label color can be changed using the rightclick menu. It's convenient to match Group label colors to the tracks that are routed to the Group.

5.7 Collapsing Mixer Sections

Mixer sections can be collapsed in order to save space on the screen. This can be useful if the song contains a large number of tracks. Sections can be collapsed, and expanded again, by leftclicking the small button in the top-right corner of the section. While collapsed only the section's name is visible, all controls are hidden.

More powerful options are available if you rightclick (Windows) / Ctrl-Click (Mac) the button:

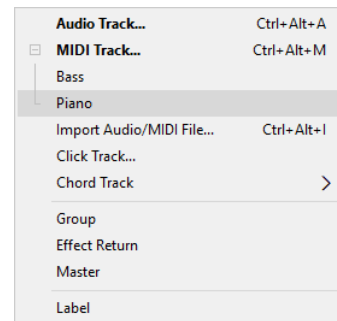
- **Expand/collapse all sections**
- **Expand related sections only** (appears on tracks and groups): expand all sections contributing to the sound of the current one and collapse all other sections.
- **Expand/collapse same color tracks only** (appears on tracks): expand all tracks having the same color as the current one and collapse all other tracks.

You can collapse/expand all same color tracks by pressing the Alt key while clicking the button.

5.8 Mixer Section Templates

Templates of mixer sections can be created by dragging a mixer section to the Add Track menu button and dropping it there. A small window will pop up where you can specify the name of the template.

The Add Track menu will show an 'expander' icon on the left if templates are available for a certain mixer section type. After clicking it the menu shows the templates. If you click a template a mixer section will be added based on the template (ie. it will have the same effects, the same volume fader level etc.). Tracks will also have a new audio or MIDI file, you'll be prompted for a name before the track is actually created.



Add Track menu (MIDI track templates expanded)

Examples of templates include MIDI track templates for your favorite instruments, and audio track templates for your favorite vocal effects.

Templates can be renamed or deleted by right clicking them. They can also be deleted by dragging them to the garbage bin.

6 Mastering and Mixdown

6.1 Mastering

Traditionally the multitrack recording is mixed-down to a stereo tape recorder. This stereo recording is then 'mastered', which usually means that EQ and (multi-band) compression is applied. When mastering for vinyl, EQ and compression had to be applied to keep the needle from jumping out of the groove.

Using MultitrackStudio, mastering after mixdown-to-stereo does not make sense, as all the settings involved in the mix are stored in the song file and can be recalled at any time. You can add effects to the mixer's Master section and use them for mastering purposes. Typically an EQ, a Compressor and a Master Limiter effect will be used. The Master Limiter should be the last effect. If multiband compression is required a Band Effect with compressors can be used.

When mastering a couple of songs that belong together (a CD for instance) it is very important that the songs sound 'the same'. They should be equally loud, have the same tonal balance etc. MultitrackStudio's songlist feature can be very convenient for this job. Using a songlist you can audition your CD before actually mixing the individual songs down to stereo.

The song can be mixed down using the Mix Down menu's "Mix down to audio file" option.

6.2 Preparing MIDI Tracks for mixdown

Before you can mixdown the song, any MIDI tracks using an External MIDI Instrument have to be recorded to one or more audio tracks. To do this you should:

- Connect your synthesizer's output to your Audio In Device. If the synth is on your soundcard it may be possible set up the soundcard to record the synth without any external wires.
- Switch the MIDI track(s) to playback mode. Mute all other tracks.
- Add a new audio track and switch it to record mode.
- Start the transport and stop it when the whole MIDI track has been played.

You can now use the audio tracks instead of the MIDI tracks. To make the audio tracks sound just as loud as the original tracks did adjust the Volume fader while switching between the tracks using the Solo or Mute buttons.

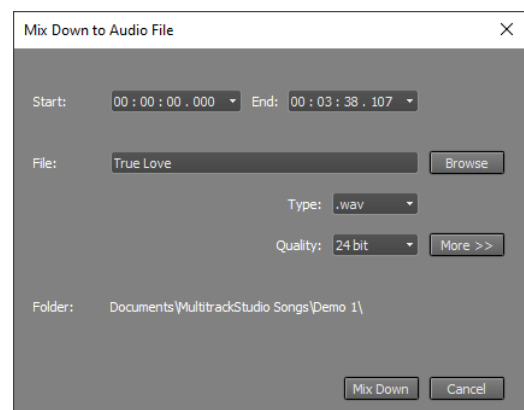
6.3 Offline Mixdown

This Mix Down menu's **Mix down to audio file** option can be used to mix down the current song to a single audio file. The **Start** and **End** boxes determine the part of the song that is going to be mixed down. The down arrows next to the boxes can be used to load marker positions. The **Browse** button invokes a standard file save dialog. The File box displays the file name. You can change the name without using the Browse button as well. The **Type** box lets you choose the file type (.wav, .mp3 etc.). The **Quality** box is available if the file type offers multiple audio qualities.

An additional **Include Varispeed** button is visible if the Pro edition's VariSpeed setting does not equal zero. This button is engaged by default, so the VariSpeed's effect is applied to the file. Speeding up a song slightly to make it a bit catchier is a widely used trick.

The **More** button unhides some advanced settings. The **Channels** box can be used if you want to mix down to a mono file. The **Sample rate** box can be used to make the audio file's sample rate different from the song's sample rate (eg. to mix down a 96 kHz Song to a 44.1 kHz file). The **Noise Shaping** button can be used to avoid applying noiseshaping to the dither signal. If the **Remember Folder** button is engaged the current folder will be used by default when the "Mix down to audio file" appears. If it's not engaged the file will be placed in the folder the current song is in by default.

Note: Any MIDI tracks using an External MIDI Instrument should be recorded to audio tracks before mixing down.



Mix Down to file window

The Mix Down menu's **Playback mixed down file** option closes the current song, and loads the audio file created using the "Mix down to audio file" option in a new song. You can browse for an audio file if there's no mixed down file available (i.e. in case the "Mix down to audio file" hasn't been used since opening the current song).

Note: the track's volume fader is set to +3dB automatically to compensate for the 3dB attenuation caused by the pan knob.

6.4 Realtime Mixdown

Certain sample based VSTi plugins can suffer from audio drop-outs using offline mixdown. This typically happens if the samples don't fit the computer memory. In this case realtime mixdown can be used to record a master file.

Follow these steps to record a master file in real time:

- Add a new track with an audio file (for instance: Mix.wav). Use a stereo 16 bit .wav if the file is to be burned to CDR.
- Click the small arrow next to the track's Rec button and select 'Master Out'. Now the track will record the output of the master section instead of your soundcard's inputs.
- Switch the new track to record mode. Make sure all tracks that should be on the master are in playback mode.
- Start the transport, and stop it when the song has reached the end.

This way you can record a stereo .WAV file that can be used for CD burning etc. Note that this file will always start at position 0, if you want to "top" or "tail" the file (remove unwanted parts at the beginning or end) you can open the file in a track and use the track editor's Export option to export the part you want to a new file.

Audio CD's always use a sample rate of 44.1 kHz. If you did not use a sample rate of 44.1 kHz use the Sample Rate Converter. Pro edition users can mix down to a 24 or 32 bit file in order to avoid rounding errors. Note that the final file that will be burned to CDR must be a 16 bit file in any case.

6.5 Reference Files

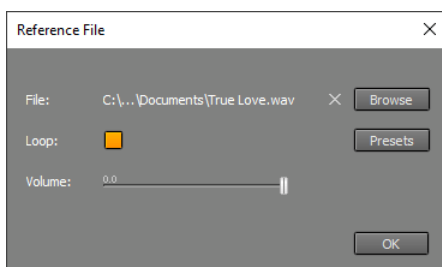
Note: this feature is available in the Pro edition only.

Comparing your master with similar commercial recordings can be very helpful. If it sounds similar you can expect your master to sound good on a wide range of playback systems. If it sounds very different you've probably made a mix that sounds good on your audio system only.

The Reference File feature makes comparing easy. Once set up you can click the Ref button (at the bottom of the main window) to toggle between the Master output and the reference file. The button's down arrow provides access to the Reference File settings:



Ref button



Reference File settings window

You can click the **Browse** button to load an audio file. If **Loop** is engaged the file will loop. The **Volume** slider can be used to make the reference track level identical to the master level.

It often makes sense to play only the chorus of a song. You can load the audio file in a track, select a chorus and export the selected part. This new file can be used as reference file. Make sure the loop button is engaged.

The Reference File plays back mono if the Master section's Mono button is engaged, so you can compare mono versions too.

You can also use this feature if you're trying to make a better mix of a song. First, mix the old version down to an audio file and use this audio file as reference file. Now you can easily compare your new mix to the old one.

Note: the audio files aren't copied to the song folder in order to avoid having multiple copies of relatively large files. Presets don't contain the audio file itself either.

Note: the Reference File is audible only if at least one track plays back audio. Both audio tracks and MIDI tracks using a software instrument count.

7 Audio Effects

MultitrackStudio features a large number of built-in high-quality audio effects. In addition AU / CLAP / VST plugins can be used.

The following audio effects are available:

- Auto Wah
- Automated Fader
- Band Effect
- Chorus
- Compressor
- Convolver
- Deesser
- Doubler
- Dynamics
- Echo
- EQ
- Exciter
- Flanger
- Guitar Amp
- Master Limiter
- Mid/Side Effect (Pro)
- Multi Effect
- Multiband Compressor (Pro)
- Noise Gate
- Parallel Effect
- Phase Inverter
- Phaser
- Reverb
- Rotor
- Saturator
- Stereo Effect
- Stereo Imager
- Transposer
- Tremolo
- Tuner
- Vibrato
- Vocal Tuner
- AU Plugins
- CLAP Plugins
- VST Plugins

Effects are reached via Effect Slots. Effects can be selected by clicking the slot's down arrow (or by right-clicking the slot). The Effect Selector contains all native MultitrackStudio effects, AU / CLAP / VST plugins, Convolver impulse responses and effect presets. The Plugins item's 'hamburger' button provides access to the Plugin Manager. A search text can be typed to filter the list. AU, CLAP and VST list items have invisible tags so you can use 'au', 'clap' or 'vst' search terms to hide the other type of plugin.

While an effect's user interface is visible you can press the F3 key (Windows) / Option-Command-F (Mac) to pop up the selector list. It remembers the search text, so you can try the next effect which matches the search text easily.

Clicking the slot's button will show the effect's user interface. All effects have a **Bypass** button. If the effect is not actually active (it's either bypassed or its controls are in neutral position) the text in the effect slot's display appears dimmed. Inactive effects do not use any processing power.

Tip: you can click the bottom left corner of an effect slot to toggle the effect's Bypass button. A 'B' appears if you hover the mouse over this area.

Effects can be moved using drag-and-drop, keeping the Ctrl key (Windows) / Option key (Mac) down while doing this will copy the effect instead of move it. Adding or removing effects can be done while the transport is running.

Presets

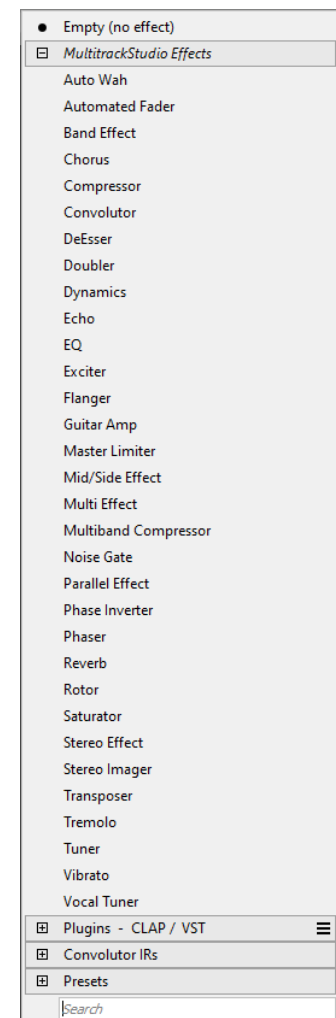
Presets can be loaded or created using the Presets button which appears on the effect's user interface. Most effects come with built-in presets.

Controlling the Transport

You can use still the keyboard or the mouse to control the transport while an effect's user interface is visible.

Third party plugins may steal keyboard focus, so the MultitrackStudio keyboard shortcuts no longer work. You can click the righthand part of the plugin window (the "MultitrackStudio part") to restore keyboard focus.

MultitrackStudio tries to let Space, Left Arrow, Right Arrow, Home, End, Page Up and Page Down keys control the transport even if the plugin steals keyboard focus. You can add the Ctrl key to force sending a key to the plugin only, so it doesn't affect transport. If this feature causes problems with a plugin you can go to the Plugin Manager and check the Keybrd box.

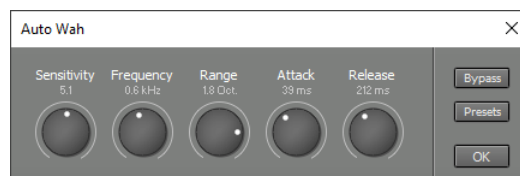


Effect Selector (Pro)

7.1 Auto Wah

The Auto Wah is a resonant low pass filter. Its cut off frequency goes up if the signal level goes up and vice versa.

The **Frequency** knob sets the lower limit for the filter frequency. **Range** sets the difference between the highest and lowest filter frequency. **Sensitivity** determines how much the filter frequency changes in response to a certain input level. The **Attack** and **Release** knobs determine how fast the filter frequency responds to level changes.



Auto Wah window

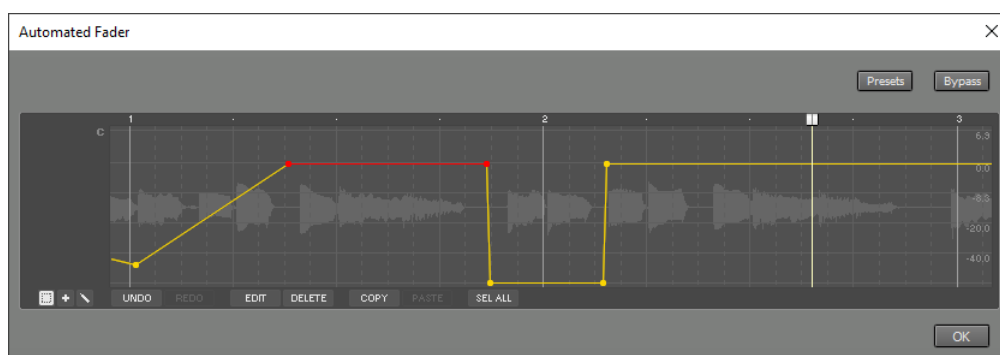
7.2 Automated Fader

The Automated Fader is a volume control that can be programmed to change over time. It can be used to attenuate, amplify or mute part of a track. It can also be used to turn off Reverb or Echo effects if used in an Effect Return section or in a Parallel Effect.

The current position is indicated in the effect slot itself.

The fader will move in a linear fashion from one dot to another. Dots can be added, removed or moved using the editor.

The editor can work in one of three modes:



Automated Fader window (two dots selected)

- **Select:** clicking a dot selects it, pressing the mouse in "empty space" and moving it selects dots. Selected dots can be moved.
- **Add:** clicking in "empty space" adds a dot, clicking a dot selects it. Moving the selected dot(s) is possible as well. You can add 4 dots in one go by moving the mouse horizontally while clicking to add a dot. After moving a certain distance (approx. a centimeter) 4 dots will appear.
- **Draw:** draw free-hand.

The buttons in the bottom left corner can be used to switch mode. The Alt key (Windows) / Option key (Mac) can be used to temporarily switch between Select and Add mode. Selected dots appear in red.

Undo and **Redo** let you undo and redo edits.

Edit: if a single dot is selected the Edit button pops up a window where you can type a new value for the selected dot (eg. "-20" to move the dot to -20 dB). If multiple dots are selected the Edit button pops up a window where you can apply several functions like 'Amplify' (change the vertical distance between the dots) or create sine/triangle/square wave shapes.

Delete removes the selected dot(s).

Sel All selects all dots.

Copy and **Paste** let you exchange data between Automated Faders, MIDI Controller editors and Automation editors

Audio can be converted to dots. You can drag audio from an audio track editor to an Automated Fader, or you can use copy-and-paste. By default the amplitude envelope will be used, you can click the EDIT button and switch to pitch instead. The EDIT button provides access to several options like envelope attack/release times. This works similar to tweakable edits in audio/MIDI editors.

If used in a track the track's audio/MIDI data is displayed in the background. Scrubbing will be available as well, it doesn't include any effects (including the Automated Fader itself).

Note: Editing tracks in Ripple mode does not update Automated Faders. The Song Editor does.

7.3 Band Effect

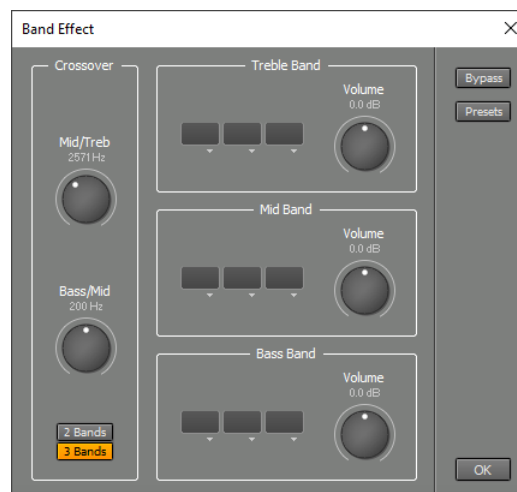
The Band Effect splits the audio signal in two or three frequency bands. Each band can have its own effects. After effects processing the three bands are mixed, where the **Volume** knobs control the band levels.

The bands are split using first order filters.

Using the Band Effect you can build a three band compressor for mastering purposes, for example.

Vocal Removal

The Vocal Removal preset is a vocal remover built with a Band Effect. The Mid Band includes a Stereo Effect with a Phase Inverter effect in order to remove the sound at the center of the stereo image. As a result, the mid frequencies at the center of the stereo image are removed. The Bass/Mid and Mid/Treble knobs can be adjusted to keep as much bass and treble as possible while still attenuating the vocals sufficiently. Vocal Removal only works if the audio signal is stereo, the vocals are panned center, and there's not an excessive amount of stereo reverb on the vocals.



Band Effect window

7.4 Chorus

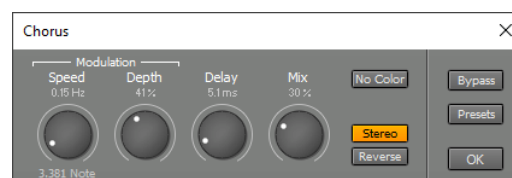
The Chorus effect adds thickness and warmth to the signal. The output signal is a mix of the input signal and a delayed copy of it. The delay time is modulated.

The **Delay** knob sets the average delay time. The **Speed** and **Depth** knobs control the modulation.

The **Mix** knob sets the dry/wet ratio (0% being dry only, 100% being wet only). If you use an Effect Return for adding Chorus set Mix to 100%. If used as an insert effect Mix will usually be set below 50%.

The **No Color** button removes the coloration traditionally associated with Chorus effects. This works best with Mix values of approximately 50%.

If the **Stereo** button is active a stereo chorus effect will be applied to mono signals. This is typically the effect you're looking for. The **Reverse** button makes the stereo effect 'spin' in opposite direction.



Chorus window

7.5 Compressor

The Compressor attenuates loud parts, while leaving soft parts untouched. Apart from this, it can make sounds 'fatter' or just make them fit better in the mix without any significant compression taking place.

Threshold controls the level above which compression takes place.

Attack controls how fast the Compressor will attenuate loud signals, while **Release** controls the time it takes to stop attenuating after a loud signal ended. Low Release times can cause distortion at low frequencies.

Gain sets the amount of gain applied after the compressing action is done. As the Compressor attenuates loud parts the overall level drops. The Gain control compensates for this level drop. By activating the **Auto Gain** button the Compressor will automatically adjust the Gain control.

Program selects the program used:



Compressor window

- **Clean** is as transparent as possible. This is a 'feedforward' compressor, which is the way typical modern compressors work.
- **Vintage** is less transparent, but has more character. This is a 'feedback' compressor, which is the way older (tube or opto) compressors work.
- **Vintage Warm** is like Vintage, but modified to produce more even harmonics.

The **Side Chain** section is available with the Clean program only.

Typical applications of Side Chain section's effect slot are:

- Use an EQ effect to attenuate the bass frequencies in order to avoid the compressor overreacting to it, which can lead to "pumping".
- Use an EQ effect to boost certain unwanted frequencies, so the compressor attenuates them

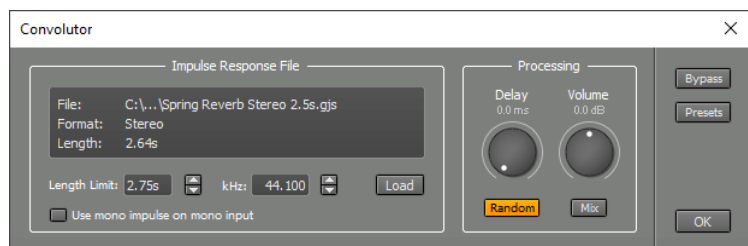
The **Reduce** meter indicates the amount of gain reduction. This value appears in the effect slot itself too.

The **Transfer Curve** (bottom left) shows the effect of the Threshold, Ratio and Knee settings. It ignores the effect of the Gain knob. The horizontal axis represents the input, the vertical axis represents the output. The **Level History** (top left) shows the relative amount of time the input signal is at a certain level (the higher the bar, the more time). The Level History will be reset when either the Transport is started or the Compressor window pops up. You can reset it manually by pressing the F5 key (Windows) / Command-R (Mac).

7.6 Convolver

The Convolver effect processes the audio signal using an impulse response file. Its main purpose is generating Reverb. In this case the effect will typically be used in an Effect Return section.

In simple terms the Convolver works like this: If you clap your hands in a hall you hear a few seconds of reverb. It's not hard to imagine that knowing this reverb it is possible to calculate the hall's response to a guitar (or any sound). This indeed is the case. We use ideal handclaps (impulses) and generalized reverbs (impulse responses). When viewed in an editor an impulse looks like one small dot (and the rest is just silence). Now you can understand what the convolver does: a recording of a guitar contains lots of dots in the editor, and the convolver treats every single dot as a handclap. Adding all the handclaps makes the hall's response to the guitar!



Convolver window

Note that if you whistle in a hall the hall's response only contains tones you whistled. This is a necessary condition for creating the exact response: the thing you want to model may not generate frequencies you didn't put in. This means you cannot use the Convolver to generate distortion or to shift pitch.

Using the **Load** button you can load an impulse response file. The Pro edition comes with the "Vintage Reverbs", a collection of 4 plate reverbs, 2 spring reverbs and 2 digital reverbs. You can organize your own impulse responses just like you can sampler patches (see Organizing your patches).

Length Limit controls the part of file that's actually being used. The lower this value, the lower the Convolver's CPU usage.

Use the **Use mono impulse on mono input** button if you don't want mono input signals to be converted to stereo (this happens if the impulse file is stereo). Doing this halves the Convolver's CPU usage. Clicking the Mono Button has no effect until the Transport is restarted.

kHz should be set to the sample rate of the impulse response file. MultitrackStudio will detect this value automatically on loading a file if the file provides sample rate information. Impulse response file are typically sampled at 44.1 kHz.

Volume controls the output level.

The **Mix** button adds the dry input signal to the output of the effect.

Use the **Delay** knob to add a delay to the processed signal. This can be useful for reverb applications.

The **Random** button applies subtle modulation which makes reverbs sound smoother. You can switch this off if you're using non-reverb IRs like guitar speakers or mics.

The Convolver is 'zero latency', so it doesn't add a delay to the signal. If the Convolver is used 'live' (either in a recording MIDI track with a software instrument, or in a recording audio track using the Soft Monitoring feature) a small latency may occur if the sound device buffer size isn't a power of two (256, 512, 1024 etc.).

Recording impulse response files

You can create your own impulse response files using the Impulse.gjm file. This file contains a single impulse at about 50 ms from the start of the file (to make sure that it gets at the output of your sound device, even if it has some kind of fade-in algorithm to avoid clicks).

Windows: Impulse.gjm is located in the folder where MultitrackStudio is installed (usually C:\Program Files\MtStudio).

Mac: To use Impulse.gjm you should Ctrl-click MultitrackStudio.app and choose Show Package Contents. Now copy the Impulse.gjm from the Contents/Resources folder to a more convenient location.

Recording an impulse response file is easy:

1. Connect your sound device's output to the input of the piece of gear you want to use.
2. Connect the piece of gear's output to your sound device's input.
3. Load 'Impulse.gjm' in a track. The track should be in playback mode.
4. Set up another track that will record the impulse response file.
5. Record a few seconds and then use the recording track's Editor to check the level of the recording: it should be just below full scale. If necessary record it again.
6. Export the piece of the recording that contains the impulse response. The starting point is just before the pulse appears in Impulse.gjm. The ending point is where the impulse response has faded (look at editor and/or listen). Impulse responses typically have a length of 1..4 seconds for reverbs. For other things 0.5 seconds usually will do.

If your sound device makes clicking sounds when you start the Transport you should edit Impulse.gjm so that the impulse is at about 1 second from the start.

7.7 Deesser

The Deesser effect reduces 'S' sounds in vocals in a very unobtrusive manner.

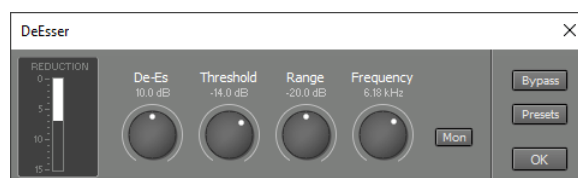
De-Es controls the amount of attenuation applied to 'S' sounds. Applying too much attenuation will result in unnatural sounding vocals.

Threshold controls the level above which the Deesser becomes active.

Range controls the dynamic range the Deesser operates on. The threshold can be made to float within a certain range, so low-level parts can also be effectively deessed.

Frequency controls the frequency above which 'S' sounds are detected. If this control is set too low the Deesser will be too sensitive (i.e., sounds that are not a 'S' will be attenuated). By engaging the **Mon** Button you can hear the filtered signal the Deesser uses. You can use this option to judge whether the Frequency knob is set up correctly (ideally you only hear 'S' sounds and nothing else).

The **Reduction** meter shows the amount of 'S' sound reduction. This value appears in the slot itself too.



Deesser window

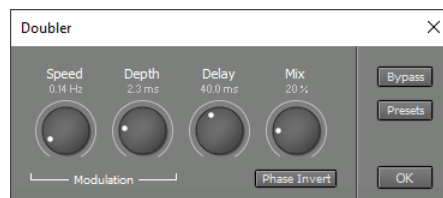
7.8 Doubler

The Doubler emulates "Artificial Double Tracking" as it was done with tape recorders in the sixties. It is typically used on vocal tracks to make the vocals sound a bit 'fatter'.

The Doubler mixes a delayed copy of the signal with the original signal. The delay time is modulated with a randomized triangle wave. This results in slight timing and pitch differences between the two voices.

The **Delay** knob sets the average delay time. Low delay values result in a 'fatter' voice rather than two separate voices. High delay values result in two separate voices. The **Speed** and **Depth** knob control the modulation.

The **Mix** knob sets the dry/wet ratio (0% being dry only, 100% being wet only). Lower values result in a subtle thickening of the sound without noticeable doubling.



Doubler window

If you want to pan the two voices to a different position in the stereo image you can use a Stereo Effect. Load a Doubler in one channel and set its Mix control to 100%. You can then use the Stereo Effect's Pan controls.

The Doubler effect can also model sixties style phasing/flanging effects, since these were done with tape recorders in a similar setup as well. The following settings can be used as a starting point for this: Speed=0.18 Hz, Depth=1.5 ms, Delay=2 ms, Mix=46%, Phase Invert=On.

The **Phase Invert** button inverts the phase of the delayed signal. This results in a different sound, particularly at lower delay settings.

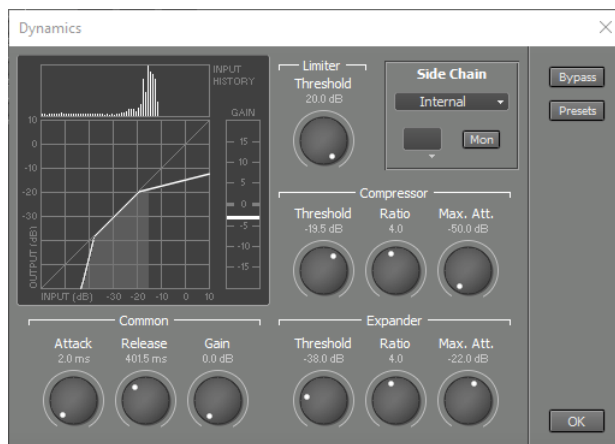
7.9 Dynamics

The Dynamics effect combines a Limiter, a Compressor and an Expander in one effect. The Expander part can be used to attenuate background noise for example.

Attack controls how fast the Compressor and Limiter will attenuate loud signals, while **Release** controls the time it takes to stop attenuating after a loud signal ended. Low Release times can cause distortion at low frequencies.

Gain sets the amount of gain applied after dynamics processing has been done.

The **Transfer Curve** on the left shows the effect of the current settings of the Limiter Threshold knob, the Compressor/Expander Threshold, Ratio and Max.Att. (maximum attenuation) knobs and the Gain knob. The horizontal axis represents the input, the vertical axis represents the output. The vertical Gain meter shows the current amount of gain applied by the effect. This value appears in the slot itself too. The **Level History** (top left) shows the relative amount of time the input signal is at a certain level (the higher the bar, the more time). The Level History will be reset when either the Transport is started or the Dynamics window pops up. You can reset it manually by pressing the F5 key (Windows) / Command-R (Mac).



Dynamics window

7.10 Echo

The Echo effect produces one or more echoes, depending on the **Feedback** control. If Feedback is zero, only one echo is produced. Otherwise a decaying sequence of echoes is produced.

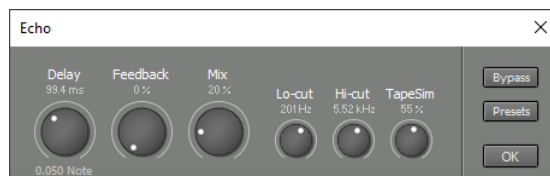
Delay controls the time it takes for the first echo to arrive (and the time between two consecutive echoes). The delay time is displayed in milliseconds and notes.

Lo-cut sets the frequency below which attenuation takes place (this typically happens in tape echo units).

Hi-cut sets the frequency above which attenuation takes place (this also happens in nature and in tape echo units).

TapeSim controls the amount of flutter and distortion.

Mix controls the level of the echoes that are mixed with the dry (input) signal (0% is dry only, 100% is echo only).



Echo window

7.11 EQ

The EQ effect consists of 6 tone control sections. The colored dots correspond to the 6 sections. You can move them to control the section Gain and Frequency knobs.

The overall transfer is displayed in the display at the top. A small version appears in the effect slot itself.

Each section has its own Bypass button ('B').

Lo Cut

The Lo Cut section is a lo cut filter. The cut off rate can be 6, 12 or 18 dB/octave. The cut-off frequency can be 20 Hz up to 2 kHz.

Bass

The Bass section can be a shelving or bell-type equalizer. Boost/Attenuation can be -12 dB to +12 dB. Frequency can be 20 Hz to 1 kHz. If the Vintage button is active the equalizer follows the classic Baxandall curves: cutting low frequencies will be accompanied with a slight boost of the lower-middle range and vice versa. If the Shelf button is active no dipping or peaking will occur. If the Bell button is active the equalizer will affect a one octave band only.

Lo Mid

The Lo Mid section is a parametric equalizer. The center frequency can be 50 Hz up to 2 kHz. The Bandwidth can be 0.05 to 2 octaves. The Gain can be -12 dB to +12 dB. The section is inactive when Gain is zero (the green indicator will dim).

Hi Mid

The Hi Mid section is a parametric equalizer. The center frequency can be 500 Hz up to 12 kHz. The Bandwidth can be 0.05 to 2 octaves. The Gain can be -12 dB to +12 dB. The section is inactive when Gain is zero (the green indicator will dim).

Treble

The Treble section can be a shelving or bell-type equalizer. Boost/Attenuation can be -12 dB to +12 dB. Frequency can be 1 kHz to 20 kHz. If the Vintage button is active the equalizer follows the classic Baxandall curves: cutting high frequencies will be accompanied with a slight boost of the upper-middle range and vice versa. If the Shelf button is active no dipping or peaking will occur. If the Bell button is active the equalizer will affect a one octave band only.

Hi Cut

The Hi Cut section is a hi cut filter. The cut off rate can be 6, 12 or 18 dB/octave. The cut-off frequency can be 500 Hz up to 20 kHz.

Spectrum Display

The actual frequency spectrum of the audio signal can be shown in the graph. This can be a great help in setting up the EQ.



EQ window, with spectrum and 'Standard' reference spectrum (blue curve)

EQ window, with spectrum and 'Standard' reference spectrum (blue curve)

There's a Spectrum box below that graph, more options appear after you've selected a signal for display:

- EQ input
- EQ output
- Master section's output (if the EQ is used in the mixer's Master section) (*Pro edition only*)
- Band Effect in/output (if the EQ is used in a Band Effect) (*Pro edition only*)

The spectrum can be shown using:

- No Bands: high resolution, but of little psycho-acoustic value.
- 1/3 Octave Bands: similar to Critical Bands at higher frequencies, but higher resolution in the lower range.
- Critical Bands: this is the way the human ear works.

The realtime behavior can be one of the following:

- Real Time: This option looks nice, but isn't of great value when it comes to setting up the EQ.
- Average: a moving average is displayed.
- Total Average: The average is displayed.

The averages will be reset automatically when either the Transport is started or the EQ window pops up. You can reset the averaging mechanism manually by pressing the F5 key (Windows) / Command-R (Mac).

The full scale value can be 0...-30 dB, use the mouse to move the graph up or down. The scale can be either 10 or 20 dB/division, use the button in the bottom right corner or pinch on your trackpad.

Reference Spectrum

A reference spectrum can be displayed. This can help you setting up the EQ for mastering purposes. You can compare the song's spectrum to other songs of yours, or to comparable commercial recordings.

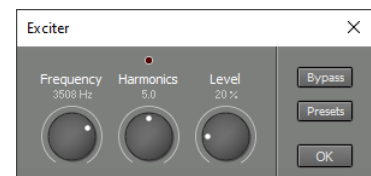
The built-in Standard reference spectrum is typical of many well mastered recordings.

You can click the Reference box and choose 'Import...' to extract the spectrum from an audio file. Alternatively you can drop a file on the Reference box. The new spectrum will be added to the list, and it can be renamed or deleted just like presets.

7.12 Exciter

The Exciter effect adds harmonics to the treble part of the audio signal. The harmonics generator is modeled after a vacuum tube.

The **Frequency** knob controls the frequency above which harmonics are added. For best performance only the top octave of the input signal should be used. If Frequency is set too low the output will sound distorted instead of excited.



Exciter window

The **Harmonic** knob controls how hard the internal harmonics generator is driven. The higher its value, the more harmonics will be generated. If the harmonics generator is driven too hard the signal will be limited to avoid excessive distortion, and the indicator above the knob will light. This is to be avoided, as the effect is intended to add more harmonics when the signal is loud.

The **Level** knob controls the level of the added harmonics.

The Exciter can be set up this way:

1. Make sure the Transport is started.
2. Set the Frequency and Level knobs to their maximum value, set the Drive knob to its middle position.
3. Turn down the Frequency knob until you hear the highest frequencies of the signal.
4. Adjust the Harmonics knob. If set too low, the level of the generated harmonics will be too low (you'll just hear a high-pass filtered version of the original signal). If set too high, the indicator above the knob will light during signal peaks.
5. Set the Level knob to its minimum value.
6. Turn up the Level knob until you're satisfied with the sound.

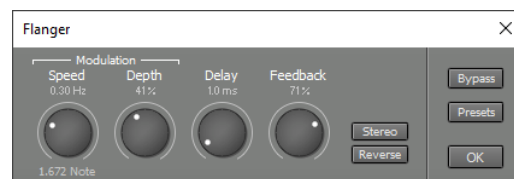
7.13 Flanger

Flanging is the effect that occurs when two tape recorders playing back the same signal run slightly out of sync.

The **Delay** knob sets the average delay time. The **Speed** and **Depth** knobs control the modulation.

The higher the **Feedback** position, the more effective the effect is.

If the **Stereo** button is engaged the delay times of both stereo channels will be modulated with out-of-phase signals. With low delay settings this sounds like a rotating speaker. The **Reverse** button makes the stereo effect 'spin' in opposite direction.



Flanger window

7.14 Guitar Amp

The Guitar Amp effect emulates three vintage guitar amps: Combo USA, Combo UK and Stack. It emulates the amp, its speaker and the microphone recording it. In addition up to three stompbox effects can be used.

Guitar section

The **Level** knob controls the level of the guitar signal presented to the amp. The three lights located next to the knob serve as level indicator. They can be used to make the amp see the same input level a hardware amp would. The SC (single coil) light will light if the level equals the output of a single coil pickup. The HB (humbucker) light will light if the level equals the level of a humbucker pickup. The Hot light will light if the level is even higher. Note that the lights assume you're playing the guitar as hard as possible (eg. some powerful rhythm chords). The lights are supposed to light during the loudest signal peaks only. Don't worry if no light ever lights while playing more subtle parts: a real amp would see a lower level too.



Guitar Amp window

The lights are just a way to make it easy to set up the amp to work just like the hardware version. You can ignore them if you like. You can, for example, use a higher setting to get more distortion.

A guitar amp's 'Lo' input is typically 6 dB less sensitive than the 'Hi' input. You can turn the Input knob down by 6 dB in order to virtually plug your guitar in the Lo input.

Stompbox effect sections

Three stompbox effects can be inserted between the guitar and the amp. Auto Wah, Booster, Chorus, Compressor, Delay, Echo, Flanger, Noise Gate, Phaser, Pickup EQ, Reverb and Tremolo are available. Each effect features two knobs.

Booster is a treble booster. A huge number of classic rock sounds were created using a device like this.

Pickup EQ can be used to change the characteristics of the guitar pickup. You can turn its Treble knob down to compensate for a shrill sound caused by a very short guitar cable, or to make a single coil pickup sound more like a humbucker. Turning Treble up can make a humbucker sound more like a single coil pickup.

Amp section

The **Model** buttons control the type of amp that's being used. The other controls are different for each amp model.

The **Combo US** model features **Volume, Treble, Mid** and **Bass** knobs and a **Bright** switch. The Bright switch has no effect if the Volume knob is all the way up.

The **Combo UK** model features two channels. The **Brilliant** channel features **Volume, Treble, Bass** and **Cut**. The Cut knob attenuates high frequencies.

The **Normal** channels features **Volume, Bass** and **Cut** knobs. The Bass knob cuts a certain amount of bass, closely emulating the the bass response of various versions of this particular amp.

The **Stack** model features **Volume, Treble, Mid** and **Bass** knobs. In addition there are **Bottom, Hot** and **Gain** buttons. These buttons change certain components of the amp, and hence change the sound. All variations correspond to versions of the hardware amp being modeled.

Speaker/Mic section

The **Cntr/Edge** knob controls the position of the recording microphone. 0% is at the center of the guitar cab's speaker, 100% is at the edge. The knob offers 7 positions.

You can use the box below the Cntr/Edge knob to load your own speaker impulse response file. The Cntr/Edge is not available in this case.

Note: the impulse responses are shared with the Convolver effect.

The **Output** knob controls the output level. Typical values range from 0 dB (overdrive sounds) to approx. 10 dB (clean sounds). The horizontal meter shows the output level. It is important to stay out of the red section if the amp is played live, in order to avoid clipping.

Using the Guitar Amp

It's best to connect your guitar to a high impedance input. Low impedance inputs compromise the guitar pickup's treble response. Some sound devices have a dedicated instrument input. A high-impedance DI box or preamp can be used if your sound device doesn't have one. You can also try using a stomp box effect as DI box.

To play the Guitar Amp live you should click the Track's Rec button, and turn on the Mon (Soft Monitoring) button (located at the top of the main window). This does not work with the Early Windows driver type.

In addition to the two stompbox effects you can use effects in the track's effect slots. You can place them in a Multi Effect if need more slots.

The Guitar Amp's output signal is similar to the signal coming from a microphone placed close to a guitar cab. One will typically apply studio type effects like EQ, compression and reverb to it. Clean guitar sounds will benefit from a Compressor effect (turn up the Attack knob to approx. 25 ms.).

The Guitar Amp uses significantly more CPU power than most other effects because it runs at a higher sample rate internally. It is, however, much more efficient if the input is silent (because the guitar plays the chorus only, or it plays the solo and the outro only etc.). You can take advantage of this feature by using an Automated Fader effect before the Guitar Amp to mute the silent parts in recordings. This is necessary because the noise which is always present in recordings will be seen as a non-silent signal by the Guitar Amp.

7.15 Master Limiter

The Master Limiter can be used to maximize the level of the mix. It's supposed to be used in the last (right hand) effect slot of the Master section.

Note that the output signal will be delayed by the amount of time set by the Ahead control.

Drive controls the amount of amplification. This will typically be the only knob you have to use.

The Master Limiter 'looks ahead into the future', so it can turn down the level before the signal peaks. **Ahead** controls how far the limiter will look into the future. The attack time of the limiter depends on the Ahead control (the shorter this time, the faster the attack).

The Master Limiter automatically optimizes the limiter's release time (ie. the time it takes to turn up the level again after the signal peaked) to ensure fast release times while keeping distortion low. The **Release** control acts as a multiplier for this value.

The level is always limited just below the digital full scale level (-0.3 dB). This small margin serves to avoid distortion in sample rate converters, CD players, soundcards etc.



Master Limiter window

The **RMS Output** meter indicates the perceived loudness. A pop song's chorus typically reads approx. -17 dB, that's why this level is marked by a triangle. Classical music typically reads approx. -23 dB during forte parts.

Note: the -17 dB and -23 dB levels correspond to the 0 dB levels of the K-14 and K-20 metering systems respectively.

In case you wonder why -17 dB equals the K system's -14 dB: MultitrackStudio uses math textbook RMS values, whereas the K system uses AES-17 RMS values which are 3 dB higher.

The **Peak Statistics** display shows the relative amount of time the input signal is at a certain level (the higher the bar, the more time). This gives you an idea as to what the limiter is doing to the audio signal. There's a colored 'curtain' on the right side of the display that can be moved using the Drive knob. The vertical bars that are covered by the curtain are limited. You'd typically want to limit a couple of small bars only. The statistic display will be reset when either the Transport is started or the Limiter window pops up.

The small horizontal bar at the bottom of the Peak Statistics display shows the current input peak level.

In short, setting up the Master Limiter goes like this:

- Make sure the Master Limiter's window is on screen.
- Start the Transport and play a chorus. Adjust the Drive knob so the RMS Output meter reads approx. -17 dB.
- Make sure the Peak Statistics display doesn't indicate too much limiting (ie. no large bars are behind the curtain). You may have to turn down the Drive knob a bit, or apply more compression before the Master Limiter.

The amount of gain reduction is shown in the effect slot containing the limiter, so you can get an idea of what the limiter is doing without having to open its user interface.



Limiter Slot

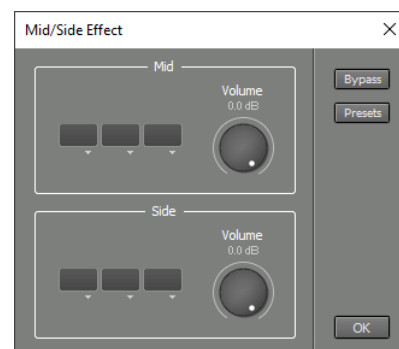
The **No gain** button can be used while toggling the Bypass button in order to compare the sound using the Master Limiter to the sound without. The No gain button compensates for the gain that's applied by the Drive knob, so the signals have equal levels.

7.16 Mid/Side Effect

Note: this feature is available in the Pro edition only.

The Mid/Side Effect lets you apply effects to the Mid and Side parts. The incoming stereo channels (left and right) are converted to Mid and Side parts. Then any effects or level changes are applied. Finally the Mid and Side parts are converted back to left and right channels.

The Mid/Side Effect can be used to correct problems in a full mix. In a typical pop song lead vocals and bass will be in the Mid part exclusively, while many backing instruments are in the Side part or in both parts. An EQ is the most commonly used effect. You can use it in the Mid section to EQ the lead vocals. You use it in the Side section to make the cymbals a bit louder without affecting the vocals, for example. Another idea is to use a Band Effect with a Dynamics effect in one of its bands, in order to make the vocals a bit louder or brighter etc.



Mid/Side Effect window

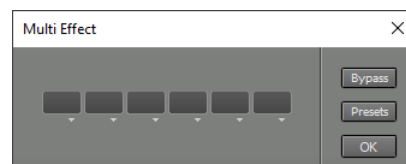
The Mid/Side Effect has no effect if the input signal is mono.

Note: mid/side tricks typically come into play when it's not possible to redo the mix. Redoing the mix is often easier and better.

7.17 Multi Effect

The Multi Effect is a container for other effects. Use it if you need more effect slots than available.

When loading a Multi Effect the effect which is currently in the slot is moved to the Multi Effect. If you keep down the Ctrl key (Windows) / Command key (Mac) while clicking the effect selector's Multi Effect item all related effect slots will be moved to the Multi Effect (eg. all the track's effects, all a Stereo Effect's Left Channel effects etc.).



Multi Effect window

The Multi Effect can also be used for making effect presets consisting of more than one effect (for instance a 'vocal channel' consisting of EQ, Compressor and Deesser).

7.18 Multiband Compressor

Note: this feature is available in the Pro edition only.

The Multiband Compressor splits the audio signal in three frequency bands, and applies compression to each band. It is typically used in the Master section when a single band compressor can't provide the amount of compression required without introducing side effects like a loud kick drum noticeably muting high frequency parts.

The **Bass/Mid** and **Mid/Treb** knobs set the frequency band crossover points.

The three compressors have six knobs each:

Threshold controls the level above which compression takes place. **Gain** sets the amount of gain applied after the compressing action is done. As the compressor attenuates loud parts the overall level drops. The Gain control compensates for this level drop.

Ratio and **Knee** control the shape of the compression curve.

Attack controls how fast the compressor will attenuate loud signals, while **Release** controls the time it takes to stop attenuating after a loud signal ended. Low Release times can cause distortion at low frequencies.



Multiband Compressor window

Low Ratio settings and relatively low Threshold settings are typically used for mastering purposes.

The display shows the average gain (including the Gain knobs) as a solid line. If you want to apply compression without changing the frequency spectrum significantly you can use the Gain knobs to make each band's average gain approximately 0 dB.

The bars at the top of the display represent the peak reduction (not including the Gain knobs).

The effect slot itself shows the peak reduction level of the band that's reducing most.

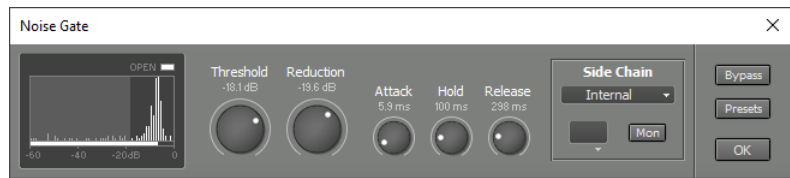
7.19 Noise Gate

The Noise Gate attenuates signals below a certain level. It can be used to remove noise (or headphones recorded by a vocal mic) from a track.

Threshold determines the level below which the signal is attenuated. **Reduction** controls the amount of attenuation applied to signals below the threshold. Applying lots of attenuation can make a Noise Gate slow.

Attack controls the time it takes for the Noise Gate to open (ie. let the signal through). **Release** controls the time it takes for the Noise Gate to close (ie. attenuate the signal). Attack and Release show the time needed for 60 dB

attenuation change. **Hold** sets an absolute time to wait after the signal drops below the threshold. The release phase starts when the Hold time has elapsed.



Noise Gate window

The **Open** indicator lights when the gate is open. This slot itself shows this too.

The **Level History** on the left shows the relative amount of time the sidechain signal (after effects processing) is at a certain level (the higher the bar, the more time). Also, the current input level is shown horizontally at the bottom. This Level History makes it very easy to set up the threshold. There's a colored 'curtain' on the left side of the display that can be moved using the Threshold knob. The signal bars that are covered by the curtain are muted (the gate is closed). The Level History will be reset automatically when either the Transport is started or the Noise Gate window pops up. You can be reset it manually by pressing the F5 key (Windows) / Command-R (Mac).

In short, setting up the Noise Gate goes like this:

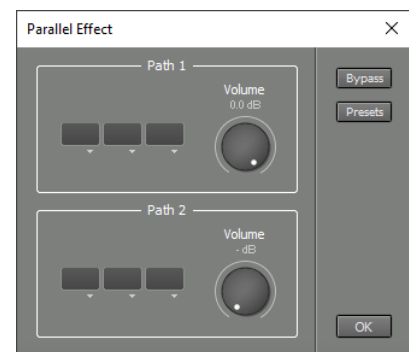
- Make sure the Noise Gate's window is on screen.
- Press the Space bar to start the Transport, play the whole song and press the Space bar again to stop.
- If there are two distinct groups of vertical bars, then adjust the Threshold knob so that the 'curtain' covers the left group. If there's just one group, or two groups that aren't separated very well, then you can try using an EQ effect in the Side Chain section.

7.20 Parallel Effect

The Parallel Effect has two signal paths. Each path has its own effect slots. The outputs of the two paths are mixed using the **Volume** controls.

The Parallel effect can be used to add effects. For example, echo can be added to a part of a track using an Echo and an Automated Fader effect in one of the paths.

Another application is parallel compression, which is popular in classical music. By using a Compressor effect in one of the paths the dry and compressed signals can be mixed.



Parallel Effect window

7.21 Phase Inverter

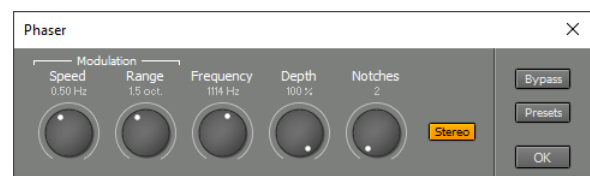
The Phase Inverter inverts the phase of the signal, just like a mixing desk's polarity switch. This effect can be used to correct out-of-phase stereo recordings. Another possible application is larger-than-live stereo positioning (using the Stereo Effect).



Phase Inverter window

7.22 Phaser

The Phaser effect has a selectable number of **Notches** (frequency regions that are attenuated) that can be moved through the frequency spectrum slowly. Traditional stomp-box type of phaser used with electric guitars typically have two notches, expensive studio devices have a higher number of notches. The Phaser effect is particularly suited for electric piano and electric guitar.



Phaser window

Frequency controls the tonal character of the effect.

Range determines the distance the notches move. High values can lead to noticeable pitch shifts.

Speed controls the speed used to move the notches.

Depth controls how deep the notches are (the deeper the notches, the more intense the effect).

The **Stereo** button can be used to create a stereo effect by moving the left and right channel notches in opposite directions.

7.23 Reverb

The Reverb effect offers four programs:

- **Room** is a small room program, can be used to add 'ambience' to vocals.
- **Chamber** is an echo chamber program.
- **Hall** is a concert hall program.
- **Plate** is plate program.

The Reverb effect is typically used in an Effect Return section.



Reverb window

Rvrb time controls the reverb time.

Mix mixes the wet (ie. reverb) and the dry (ie. input) signal. 0 % is dry only, 100% is wet only. 100% will typically used if the effect is used in an Effect Return section.

Width controls the stereo width of the reverb.

Pre Delay controls the time it takes for the first reflection to appear.

The Color section contains controls that affect the tonal character of the reverb.

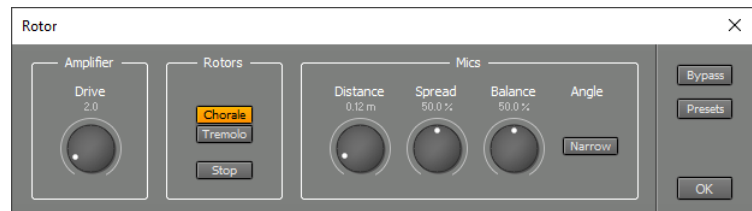
Lo Mult is a multiplier for the low frequency reverb time, while **Lo Freq** sets the frequency below which Lo Mult is active.

Hi Cut sets the frequency above which the reverb time is decreased gradually.

If **Spin** is not zero some of the reverb algorithm's parameters are modulated with a low frequency signal. This makes the reverb more random and smoother. Too much Spin will introduce noticeable pitch shifts in the reverb (easily noticeable on piano parts). Percussion parts may benefit from a higher Spin setting.

7.24 Rotor

The Rotor effect simulates a rotating speaker. It consists of bass and treble speakers rotating independently. The speakers are driven by a tube amplifier and two microphones are used to pick up the sound.



Rotor window

The Amplifier section contains the **Drive** control that controls the level the 'tube amplifier' is operating on. This can be used to add tube distortion.

The Rotors sections controls the speaker's rotation speed. **Tremolo** is fast, **Chorale** is slow. Your MIDI keyboard's Modulation wheel can be used to switch speed if the Rotor is used in a Wheel Organ's effect slot. (Controller #1: 64 or higher is Tremolo, lower values correspond to Chorale.) The **Stop** button can be used to keep the rotors at a fixed position.

The Mics section controls the microphone placement used to record the speaker cabinet. **Distance** controls the distance between the mics and the cabinet. **Spread** controls the stereo channel separation. **Balance** controls the relative levels of the treble and the bass speakers. The cabinet is miked with two microphones at a 180 degree angle. This angle can be reduced to 90 degrees using the **Narrow Angle** button.

7.25 Saturator

The Saturator effect adds either Tube or Tape type distortion, depending on the **Tube** and **Tape** buttons. The Drive knob controls the amount of distortion. The output level is approximately equal to the input level.

Tube

The Tube program simulates a preamp with an output transformer. The preamp mainly generates second order harmonics, the transformer generates lower order odd harmonics. The Tube program adds harmonics, not unlike an exciter effect.

Drive controls the signal level that's fed to the virtual preamp's input. The VU meter shows the average value. At 0 dB total harmonic distortion is approx. 2%.

Tape

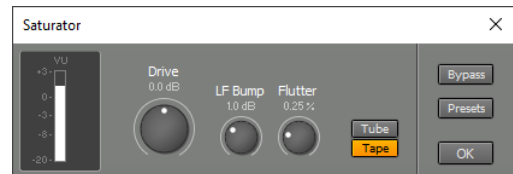
The Tape program models distortion, high frequency compression, low frequency peaks and wow & flutter. It can be used on individual tracks to make them sound a bit warmer. The Tape program can also be used on a full mix (ie. in the Master section). This makes the tracks blend better.

Drive controls the virtual recording level. The VU meter shows the average value of the recording level. At 0 dB VU total harmonic distortion is approx. 1%.

LF Peak controls low frequency peaks ("bumps"). **Flutter** controls the amount of wow & flutter.



Saturator window ('Tube')



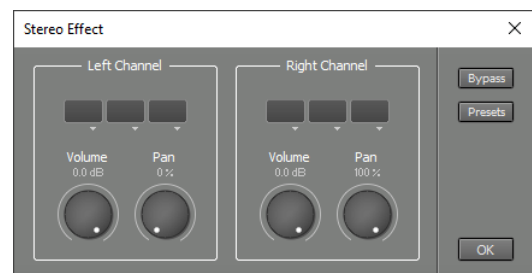
Saturator window ('Tape')

7.26 Stereo Effect

The Stereo Effect has separate groups of effect slots for the left and right channels. After effects processing the two signals are mixed to stereo using their **Volume** and **Pan** controls.

Use the Stereo Effect if you want to apply different effects to the left and right channels. You can, for instance, apply tremolo, vibrato or echo to one channel only.

The Stereo Effect can also be used to narrow stereo-width or swap the channels (using the Pan knobs), or to mute one of the channels.



Stereo Effect window

7.27 Stereo Imager

The Stereo Imager effect can change the width of the stereo image. It works with both stereo and mono input signals.

The **Width** knob controls the stereo image width. The **Reverse** button reverses the left and right channels.

Mono input signals are converted to stereo using a filter. Two filter types are available:

- **Shelve**: Low frequencies are directed to the left channel, high frequencies are directed to the right channel. The **Color** knob controls the crossover-frequency.
- **Comb**: A delayed signal is added to the left channel and subtracted from the right channel. The **Color** knob controls the distance between the notches of this comb filter.

The Stereo Imager is mono compatible: if the stereo outputs are summed the resulting signal is equal to the original mono input signal.



Stereo Imager window

7.28 Transposer

The Transposer effect shifts the pitch of the audio signal by the amount set by the **Semitones** and **Cents** knobs. Pitch can be shifted up to one octave up or down. The Transposer features two programs: **Monophonic** and **Polyphonic**.

Monophonic

The Monophonic program is optimized for monophonic ("one note at a time") audio. It features a Formant knob which shifts the formant of the sound. Pitch shifting sounds most natural if the formant is shifted in the other direction (eg. if pitch is shifted up 2 semitones the formant should go down two semitones).



Transposer window ('Monophonic')

Polyphonic

The Polyphonic program is optimized for polyphonic audio. It is extremely CPU efficient while still producing good sounds. Part of the efficiency comes from a limited headroom, which is where the **Level** knob comes in. If the light above it lights up the audio signal is clipped and you should turn the Level knob down a bit. This typically won't happen, but it may if the signal has been amplified by other effects. If a track has been recorded at a very low level you can turn up the Level knob to maximize sound quality.



Transposer window ('Polyphonic')

Note: the Transposer only works if delay compensation is available. In short this means it doesn't work 'live' using Soft Monitoring.

7.29 Tremolo

Tremolo modulates the level of the signal with a sine wave.

Modulation **Speed** and **Depth** can be adjusted.

The **Stereo** button can be used to create a stereo effect by modulating the right channel with a phase shifted version of the sine wave.

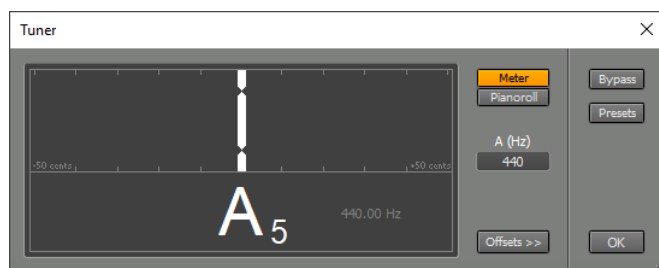
If the **Vintage** button is checked the characteristics of a vintage analog tremolo effect are emulated. The Tremolo effect can also be used as an 'analog warmer' (set Depth to zero).



Tremolo window

7.30 Tuner

The Tuner effect can be used to tune instruments like guitar, bass etc.



Tuner window (Meter mode)

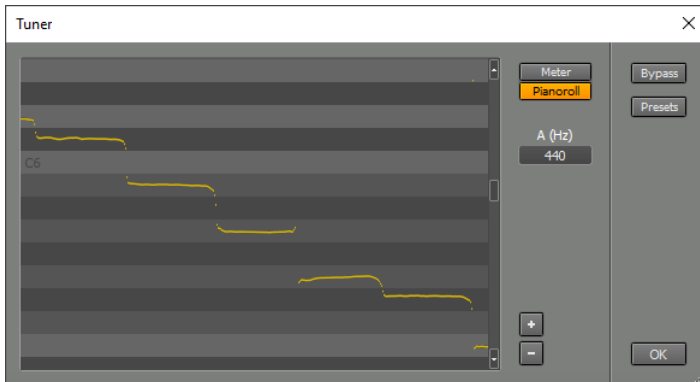
The **A** box determines the frequency of note A5. The Tuner effect can be used to measure the frequency of an A5 played on, for example, a piano. This value can be entered in the A box, so other instruments can be tuned to the same pitch.

Offsets can be specified for non-chromatic tunings.

Tip: The Tuner typically works best if it's used before any other effects (like the Guitar Amp).

Pianoroll Mode

The Tuner has a Pianoroll mode, which can be used for practicing vocals or violin etc. A pitch track appears on a piano layout. It scrolls from right to left automatically.



Tuner window (Pianoroll mode)

7.31 Vibrato

Vibrato modulates the pitch of the signal with a sine wave.

Modulation **Speed** and **Depth** can be adjusted. The **Stereo** button can be used to create a stereo effect by modulating the right channel with a phase shifted version of the sine wave. The **Reverse** button makes the stereo effect 'spin' in opposite direction.



Vibrato window

7.32 Vocal Tuner

The Vocal Tuner can be used to correct out-of-tune vocals. It features two programs: **Natural**, which corrects pitch in a very unobtrusive manner, and **Modern**, which sounds a bit synthetic and robot-like. The Vocal Tuner is a mono effect, you can use it on a stereo track but the signal will be converted to mono.

Natural

The Natural program works as unobtrusively as possible.

The **Speed** knob sets the speed at which pitch is corrected. A slow setting leaves note onsets and vibrato intact.

Preserve Formant corrects the formant so the results sound more natural. This isn't necessary if pitch is shifted by a small amount only.



Vocal Tuner window: gray curve is input, blue curve is output pitch

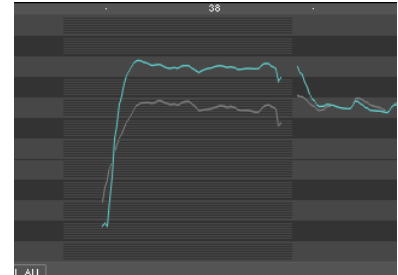
Modern

The Modern program sounds a bit synthetic and robot-like. This sound has become quite popular in recent years.

The **Correction** knob sets the amount by which out-of-tune notes are corrected. At 100% pitch is perfect, which usually sounds rather synthetic. Lower settings allow for more natural sounds. The **ignore** section contains knobs that make the tuner ignore certain parts of the sound in order to avoid unwanted artifacts. **Ambient** ignores background noise during silent parts. **Sibilant** ignores unpitched sounds like "s". Note that the Vocal Tuner doesn't do anything if you turn an "ignore" knob up by too much.

The key editor

The key editor shows both the input pitch (dimmed color) and the output pitch (bright color). The Vocal Tuner quantizes pitch to the closest key. Using the key editor you can turn keys off for certain parts. If a key is off pitch is quantized to the closest key which is on. The Vocal Tuner doesn't do anything if all keys are off. The key editor looks like a one-octave pianoroll. You can select part of a horizontal bar that represents a key using the mouse, and use the ON or OFF buttons to switch the selected part on or off. Selecting multiple adjacent keys is possible as well.



Vocal Tuner editor, all keys off except A

The best way to use the Vocal Tuner depends on the vocal track:

- If it's more or less OK you can use a Vocal Tuner to add some polish, no editing required.
- If the vocals are really good but a few notes are off you can process just those notes. To do this you can click "SEL ALL" followed by "OFF" to turn all keys off. Then find the bad notes, select all 12 keys in those places and switch them on.
- If the vocals are pretty bad the Vocal Tuner may quantize to the wrong notes. This can happen if, for example, an F is so low it's closer to E than to F. You can solve this by selecting the E key and turning it off.

The Vocal Tuner can be used to change the melody. In the picture below all keys are off except A, so the G is turned into an A.

Note: When used in an audio track the Vocal Tuner updates the key editor pitch curves even if the transport isn't running. It uses the track's audio file directly for this, so any effects preceding the Vocal Tuner aren't applied. For example: if an Automated Fader effect is used to mute a note the muted note will still be visible in the Vocal Tuner.

Note: the Vocal Tuner only works if delay compensation is available. In short this means it doesn't work 'live' using Soft Monitoring.

7.33 AU Plugins

Note: AU Plugins are supported in the Mac version only. If a song with an AU plugin is opened with MultitrackStudio for Windows a Missing Audio Effect placeholder will appear.

AU (Audio Unit) plugins are .component files located in the user or system Library/Audio/Plug-ins/Components folder. macOS comes with several AU plugins, and many third parties offer AU plugins as well.

Virtually all AU plugins are AUv2 plugins. Some new ones are AUv3. MultitrackStudio supports both versions.

AU plugins can be loaded in an effect slot using the slot's down arrow. The AU plugins appear in the effect selector's Plugins section. The plugin will be shown in a window with Bypass and Presets buttons. Any presets coming with the plugin appear in the Presets menu.

If an AU plugin gets in a bad state somehow you can press Command-R while the plugin interface is visible. This will save the settings, reload the plugin and load the settings again.

Some plugins generate MIDI data. This MIDI output is merged with the data coming from MIDI input devices if the plugin is in a recording audio track and Soft Monitoring is enabled. MIDI output from plugins is only converted

from MPE to MIDI 2.0 if the plugin either sends MPE configuration messages (RPN 6) or reports it supports MPE (as per the MPE specs).

Note: if you install AU plugins while MultitrackStudio is running you may have to restart MultitrackStudio in order for the new plugin to be listed (the plugins are collected only once).

7.34 CLAP Plugins

The CLAP plugin format is a new plugin format. Noteworthy characteristics include extensibility, fast plugin scanning and MIDI 2.0 protocol support. It strives to avoid misinterpretation of the specs, which should lead to less compatibility issues. CLAP is open source. It's released under the MIT license, so developers don't need a proprietary license agreement to use it.

CLAP plugins can be loaded in an effect slot using the slot's down arrow. The CLAP plugins appear in the effect selector's Plugins section.

Windows: CLAP plugins are files, the name ends with .clap.

64 bit plugins are located in the C:\Program Files\Common Files\CLAP\ folder.

32 bit plugins are located in C:\Program Files\Common Files\CLAP\ (if your Windows version is 32 bits), or C:\Program Files (x86)\Common Files\CLAP\ (64 bits Windows version).

64 bits MultitrackStudio can only use 64 bits plugins, 32 bits MultitrackStudio can only use 32 bits plugins.

Mac: CLAP plugins are bundles, the name ends with .clap. They're located in the user or system Library/Audio/Plug-ins/CLAP folder.

You can create the CLAP folder yourself if it's not present.

For plugin developers

The CLAP plugin API is available at <https://cleveraudio.org>

Almost all extensions are supported, except for the draft ones. The draft context-menu, param-indication, plugin-invalidation, preset-discovery, remote-controls and track-info extensions are supported.

7.35 VST Plugins

VST plugins are third party plugins. Many commercial and free plugins are available in this format.

VST plugins can be loaded in an effect slot using the slot's down arrow. The VST plugins appear in the effect selector's Plugins section.

If a VST plugin gets in a bad state somehow you can press the F5 key (Windows) / Command-R (Mac) while the plugin interface is visible. This will save the settings, reload the plugin and load the settings again.

Note: a VST plugin that's installed while MultitrackStudio is running may not be recognized automatically (the plugins are collected only once per session). You can press the F5 key (Windows) / Command-R (Mac) while an effect selector is visible in order to force VST plugins to be rescanned.

MultitrackStudio supports VST3 and VST2 plugins.

Tip for Mac users: VST plugins that haven't been updated to Apple Silicon yet can be used on an Apple Silicon Mac if you open MultitrackStudio using Rosetta: find MultitrackStudio in Finder, Ctrl-click it, choose Get Info and check the Open in Rosetta option.

VST3 plugins

Windows: VST3 plugins are .vst3 files.

64 bit plugins are located in the C:\Program Files\Common Files\VST3\ folder.

32 bit plugins are located in the C:\Program Files\Common Files\VST3\ (if your Windows version is 32 bits), or the C:\Program Files (x86)\Common Files\VST3\ folder (64 bits Windows version).

64 bits MultitrackStudio can only use 64 bits plugins, 32 bits MultitrackStudio can only use 32 bits plugins.

Mac: VST3 plugins are .vst3 files. They're located in the user or system Library/Audio/Plug-ins/VST3 folder.

You can use MtStudioLinks.txt files to exclude files or folders (see the VST2 description). Including files or folders isn't possible.

Any presets coming with the plugin appear in the Presets menu. The presets can be stored in the plugin itself, or they can be .vstpreset files in one of these folders:

Windows:

- C:\Users\USERNAME\Documents\VST3 Presets\COMPANYNAME\PLUGINNAME\
- C:\Users\USERNAME\AppData\Roaming\VST3 Presets\COMPANYNAME\PLUGINNAME\
- C:\ProgramData\VST3 Presets\COMPANYNAME\PLUGINNAME\

Mac:

- User or system Library/Audio/Presets/COMPANYNAME/PLUGINNAME/
- Network/Library/Audio/Presets/COMPANYNAME/PLUGINNAME/

VST2 plugins

Windows: VST2 plugins are .dll files. In the Plugin Manager a folder can be selected where the VST plugins are located. MultitrackStudio looks for VST plugins in this folder and its subfolders.

Mac: VST2 plugins are .vst files. They're located in the user or system Library/Audio/Plug-ins/VST folder.

Plugins that do supply a graphical user interface will be shown in a window with Bypass and Presets buttons. Plugins that do not have their own user interface will be made to look like native MultitrackStudio effects.

Any presets coming with the plugin appear in the Presets menu. The presets can be factory presets (stored in the plugin itself), presets stored in .fxb bank files or presets stored in .fxp files. MultitrackStudio looks for matching .fxb/.fxp files in the folder where the plugin is located, and all of its subfolders.

There are a couple of 'powered' plugins on the market that come with their own dedicated hardware to run on. These kind of plugins are not supported.

Bridging

Note: bridging is available for Windows only. The Mac version supports 64 bit plugins only.

Both 32 and 64 bit versions of MultitrackStudio support 32 and 64 bit VST2 plugins. 64 bit Windows is required to run 64 bit plugins. 64 bit MultitrackStudio runs 32 bit plugins 'bridged', or 'out-of-process' in computer lingo. Similarly, 32 bit MultitrackStudio runs 64 plugins bridged. This happens automatically.

Bridging plugins has some drawbacks: there's some performance overhead, and you may hear glitches while recording them at low latencies. It's best to use mostly 64 bit plugins with the 64 bit version of MultitrackStudio.

Note: not all VST2 plugins are happy running bridged. Some seem to work fine running one instance, but weird things happen if you add more instances. Some copy protection mechanisms may fail. Some won't work if UAC (User Account Control) is enabled.

A bridged plugin that crashes shouldn't tear down MultitrackStudio. You can choose to run a buggy plugin bridged for this reason. The Plugin Manager can be used to force new instances of a plugin to run bridged. The window title bar of a bridged plugin reads "VST plugin (bridged): name".

Under the hood

Each bridged plugin appears in the Windows Task Manager as "MtStudioVSTServer.exe" (32 bit plugin) / "MtStudioVSTServer64.exe" (64 bit plugin).

Customizing the VST2 folder

On Windows the Plugin Manager allows for specifying one VST2 folder. On Mac there are two default VST folders, and you can specify an additional one in the Plugin Manager. If you need more flexibility you can place an MtStudioLinks.txt file in the VST folder, a folder that's included by an MtStudioLinks.txt file or any of the

subfolders. MtStudioLinks.txt must be a plain text file. NotePad (Windows) / TextEdit (Mac) can be used to create/edit such files.

This example file demonstrates the options:

Windows:

```
g:\OtherFolder\  
g:\OtherFolder\TheReverb.dll  
-SamplesDir\  
-BuggyPlugin.dll
```

Mac:

```
/Volumes/MyDrive/OtherFolder/  
/Volumes/MyDrive/OtherFolder/TheReverb.vst  
-SamplesDir/  
-BuggyPlugin.vst
```

The first line includes the OtherFolder folder. The second line includes the TheReverb plugin. The third line excludes the SamplesDir subfolder, this can be useful if folders with huge amounts of samples slow down plugin scanning. The last line excludes the BuggyPlugin plugin.

Tip: you can press the F5 key (Windows) / Command-R (Mac) while an effect selector is visible in order to force VST plugins to be rescanned.

7.36 Automatic Delay Compensation

Some effects introduce a delay which would make tracks go out of sync. Automatic Delay Compensation (often called Plugin Delay Compensation or PDC) serves to compensate for the effect's delay automatically.

Automatic Delay compensation is available in:

- Tracks which are in playback mode. The delay is compensated if it's 10 ms or more.
- Group and Master sections. The delay is compensated if it's 1 ms or more.
- Effect Return sections. There's no minimum delay here.
- Multi Effects, Stereo Effects, Parallel Effects and Mid/Side Effects loaded in the aforementioned mixer sections. There's no minimum delay here.
- MultitrackStudio Instruments (playback mode).
- The Output mixer of VST/AU plugins that have more than 2 outputs.

Delay compensation is NOT available in:

- The "Side Chain" box of sidechaining effects (Dynamics etc.).
- The instruments in the Multi Instrument (the effects do have PDC).

7.37 External Sidechain Routing

Note: this feature is available in the Pro edition only.

All versions of MultitrackStudio feature "internal sidechaining". In this scenario an effect (typically an EQ) can be inserted in the sidechain, while the sidechain input is always connected to the effect input. The Pro edition also features "external sidechaining", where the sidechain input can be connected to sources outside the effect.

The Compressor, Dynamics and Noisegate effects, as well as some VST / AU plugins, feature sidechain inputs that can be connected to various signals:

- **Internal:** the effect's input.
- **Track:** the output of an audio or soft instrument track.
- **Group Bus:** the sum of the tracks that are routed to a specific Group (available if the effect is in a Group, Effect Return or Master section).
- **Effect Send:** the mix of the Effect Sends of Tracks and Groups (available if the effect is in a Group, Effect Return or Master section). Effect Send signals of Groups will not be sent to effects that are in a Group section, but they will be sent to Effect Return and Master sections.



Sidechain section

- **Band Effect In:** the Band Effect's input (available if the effect is in a Band Effect).

Track sidechaining

Track sidechaining can be used to perform "ducking" (i.e. mute background music whenever the announcer speaks, or mute bass guitar every time the kick drum hits). Example: load a Compressor in the bass guitar track, switch it to the Clean program (which supports sidechaining) and select the kick drum track as sidechain input.

The only limitation that applies to track sidechaining is that sidechains can't "feed" themselves, eg. Track 1 can't use Track 2 as sidechain input if Track 2 uses Track 1 as sidechain input already. This typically isn't a problem in practice.

Some VST plugins can use the right channel of a stereo pair as sidechain input. To take advantage of this you can use a Stereo Effect before the VST plugin, with a Dynamics effect in the right channel effect section. Click the Dynamic effect's Mon button and select the sidechain input, which will now be routed to the VST plugin. You might want to use another Stereo Effect after the VST plugin to mute the right channel and pan the left channel center.

Group Bus sidechaining

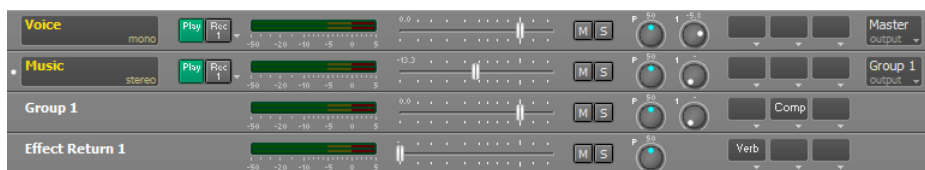
Group Bus sidechaining can be used instead of track sidechaining if you want to control multiple tracks with another track as sidechain source, or if you want to control a track with the sum of several other tracks.

Effect Send sidechaining

This was the only way to do "ducking" until track sidechaining was introduced. It is rather complicated to set up, but it can still be useful.

Effect Send bus sidechaining is best explained using an example:

In this example the level of the lower track will be muted when the upper track is loud. The upper track's Effect Send (the rotary knob with the black dot) sends the track's signal to the



Using Effect Send bus as sidechain input

Effect Send bus. The lower track's output is sent to Group 1. One of this Group's Effect Slots contains a Compressor effect using Effect Send 1 as sidechain input.

Effect Return 1's fader is all the way down in order to avoid sending the signal to the Master section.

In this example the upper track will be audible (the Effect Send is connected post-fader, so the fader can't be all the way down). If you don't want this you can send its output to an additional Group and mute the Group.

The Compressor can be placed in a Band Effect to compress a specific frequency range only.

Note: the Group's Effect Send does not affect the signal sent to the Compressor's Sidechain input, however the signal is sent to the Effect Return section as expected.

Band Effect sidechaining

The Band Effect In input can be used to build your own dynamic noise filters (using a Noisegate or Dynamics effect's expander in the treble band) etc.

Plugin sidechaining

AU, CLAP and VST audio effect plugins which have more than 2 input channels will get a Side Chain box just like the one in the Dynamics/Compressor/NoiseGate effects. Input channels 3 and 4 will receive the sidechain source signal.

Instrument plugins which have audio inputs get a Side Chain box as well. You can, for example, load vocal pitch correction plugins in an instrument slot and route the vocal track to it using the Side Chain box. Now you can use the track's MIDI editor to enter notes which the plugin can use to determine the correct pitch.

Some VST2 plugins come with proprietary sidechain input plugins. This is a secondary plugin that picks of the sidechain source and routes it to the primary plugin. This setup won't work without glitches in MultitrackStudio on multiple CPU machines without telling MultitrackStudio these plugins belong together. If you rightclick a VST2 plugin in an effect/instrument selector you can check the "Has sidechain input plugin" option. New instances of the plugin will now get a Sidechain Plugin box. This box is identical to a Side Chain box, except that its output is ignored. You can load the secondary plugin in the effect slot and choose the sidechain source. Now MultitrackStudio's sidechaining mechanism will make sure it works OK under any circumstances.

Multi-output Instrument sidechaining

Some AU / CLAP / VST instrument plugins have more than 2 output channels. The Sampler can have multiple outputs too. The outputs of these instruments are available as sidechain sources. Up to 30 outputs per instrument can be used as sidechain sources. This feature is especially useful with drum instruments. You can, for example:

- Use the kick drum channels as sidechain source for a Compressor or Dynamics effect in the bass track.
- Route the instrument outputs to tracks, so you can mix the drum instruments in the main window instead of the instrument's Output Mixer. An instrument output can be routed to a track by adding an audio track and loading a Dynamics effect in its first effect slot. In this Dynamics effect you can select the sidechain source and click the Mon button. If you route all the drum instrument outputs to tracks this way you can use the instrument track's Mute button to mute it. Note that you'll have to unmute this track if you want to play the instrument live, or in order to hear notes when clicked in the track's editor. This is because the sidechains only work while the track is playing back.

7.38 Audio to MIDI Plugins

Some plugins can convert audio to MIDI. This is typically used for playing MIDI instruments using an electric guitar.

You can use these plugins in MultitrackStudio like this:

1. Add an audio track, and load the plugin in one of the effect slots.
2. Switch the track to Practice Mode. You can doubleclick its Play button to do this.
3. Enable Soft Monitoring.
4. Engage the Rec button of the MIDI track you'll be recording.

The MIDI track now responds to the audio input, and you can start transport to actually record it as MIDI,

This MIDI output is merged with the data coming from MIDI input devices if the plugin is in a recording audio track and Soft Monitoring is enabled.

MIDI 2.0 / MPE

MIDI output from audio effect plugins is only converted from MPE to MIDI 2.0 if the plugin either sends MPE configuration messages (RPN 6) or reports it supports MPE (as per the MPE specs).

8 MIDI Instruments

MIDI Instruments are used to convert MIDI messages to audio. These instruments are available:

1. MultitrackStudio Instruments, a GM compatible instrument collection.
2. Wheel Organ, emulates wheel organ.
3. SoundFont Player, generates audio using .sf2 files. (*Mac only*)
4. Sampler, generates audio using samples.
5. Matrix Sampler, plays back samples.
6. Multi Instrument, can contain multiple instruments.
7. External MIDI Instruments, can be either an external hardware synth, a synth on your soundcard, or a software emulation of such a device.
8. AU Instrument Plugins, an AU Plugin that can convert MIDI to audio.
9. CLAP Instrument Plugins, a CLAP Plugin that can convert MIDI to audio.
10. VST Instrument Plugins, a VST Plugin that can convert MIDI to audio.

MIDI Instruments are reached via Instrument Slots. An instrument slot appears on any track containing a MIDI file, replacing the left hand effect slot. Instruments can be selected by clicking the slot's down arrow (or by right-clicking the slot).

The Instrument Selector contains all native MultitrackStudio instruments, AU / CLAP / VST plugins, sampler patches and instrument presets. The Plugins item's 'hamburger' button provides access to the Plugin Manager. A search text can be typed to filter the list. AU / CLAP / VST list items have invisible tags so you can use 'au', 'clap' or 'vst' search terms to hide the other type of plugins. The items in the 'MTSi and Sampler Patches' section have invisible 'mtsi' and 'sampler' tags. While an instrument's user interface is visible you can press the F3 key (Windows) / Option-Command-F (Mac) to pop up the selector list. It remembers the search text, so you can try the next instrument which matches the search text easily.

Instruments can be copied from one instrument slot to another using drag-and-drop.

Clicking the slot's button will show the instrument's user interface. When this window appears the instrument will be 'live', so it responds your MIDI keyboard. The instrument will be live while the track's Rec button is engaged as well. All instruments feature a red indicator on the right hand side that lights when the instrument is currently responding to messages received on the MIDI In Device (ie. your MIDI keyboard). If an instrument is live and the Transport is not running (ie. its user interface is visible or the Rec button is engaged) the instrument will be deactivated if a 'buffer error' occurs because of CPU usage being too high. The red indicator will go off. If this happens the instrument can be activated again by either hiding and showing its user interface or by reactivating the track's Rec button.

Presets

Presets can be loaded or created using the Presets button which appears on the instrument's user interface. Instrument presets can optionally include the audio and MIDI effects in the track.

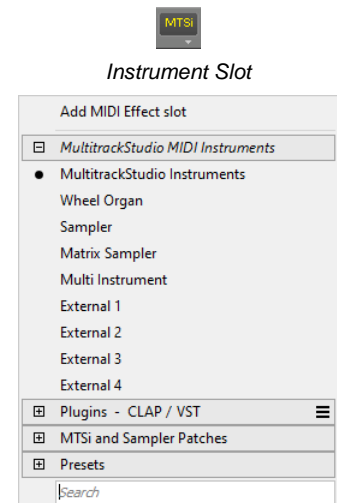
Note Names

Each instrument window has an option to override the note names, accessible via the 'hamburger' button. These note names appear in the Drum Editor.

Articulations

External MIDI Instruments and AU / CLAP / VST plugins can be multitimbral (have multiple sounds). You can set up a MIDI controller to switch between sounds. The track editor's controller editor can then be used to switch sounds using the "Articulation" controller. In addition to using a controller you can choose an articulation for a single note in the Note Editor. The Articulations feature is intended for using multiple articulations of an instrument, like bowed and pizzicato violin, in a single track.

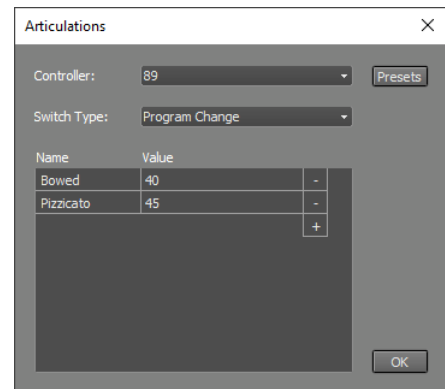
The instrument window's 'hamburger' button provides access to the 'Articulations' feature. You can define up to 16 articulations.



Instrument Selector (Pro edition)

Three switch types are available for plugins: Program Change messages, MIDI channel and Keyswitch (note messages). The MIDI channel switch type (obviously) prevents a plugin from using MPE. External MIDI Instruments only have the Program Change option.

Note: the articulations only work in MultitrackStudio. If you plan on exporting the MIDI tracks to a MIDI file you probably should use separate tracks instead.



Articulations window

Under the hood

The MIDI 2.0 note-on attribute is used for the articulation setting in the Note Editor. 99.99% of the 3rd party MIDI effect plugins don't support MIDI 2.0 yet, so the per-note articulation values will be lost if you use a MIDI effect plugin in your track.

The note-on attribute is stored in the MIDI (1.0) file as an NRPN value.

Using software instruments in record mode

Real time audio processing on a computer involves a trade-off between latency and reliability. MultitrackStudio is designed for high reliability in order to minimize the possibility of glitches to occur. The downside of this approach is a fairly high latency (usually slightly higher than 0.5 seconds). This means that it takes about half a second until you hear the effect of moving a Volume fader or any other control.

Obviously playing a MIDI keyboard would be impossible to do with such a high latency between playing and hearing the actual sound. Therefore MultitrackStudio takes a different approach when recording using a software instrument. The output of tracks containing software instruments will not be routed through the mixer, but straight to the Audio Out Device instead. The track's Effect Sends and Output Bus Selector are not available in this situation.

The software instrument latency can be set in the Studio menu's Devices window.

"Freezing" software instruments

MIDI tracks using a software instrument can be saved to an audio file using the track's Save As option. This can be useful if a software instrument uses a lot of CPU power. The software instrument is effectively replaced by an audio file, but all effects and mixer settings etc. stay the same, so the sound is identical. The track's File Options Menu can be used to load the MIDI file again (it appears in the File History at the bottom of the menu). The software instrument will be reloaded automatically. This feature is usually called 'freeze'.

A software instrument's output level could be too high for an audio file, so the signal gets clipped. If this happens you can use the MIDI track's Controller editor to turn down the Volume or Expression controllers. Pro edition users can use 32 bit float type .wav files. These files do not clip the audio signal so the problem won't occur.

8.1 MultitrackStudio Instruments

The MultitrackStudio Instruments are a General MIDI compatible instrument collection. It contains over 100 instruments including a drum kit.

Note 1: The MultitrackStudio Instruments do not have any reverb, so a Reverb effect should be used to add reverb.

Note 2: You can play back a MIDI track containing multiple streams ("instruments"). However, it is recommended to click the track's file name box and choose "Split Streams". This gives you more control over instrument sounds, levels and reverb send levels.

The **Instrument** box lets you pick an instrument. The instruments appear in five categories: Keyboard, String, Wind, Percussion and Synth. You can type (part of) an instrument name in the Search box to find an instrument quickly.

The **Controls** section contains knobs, drawbars or buttons which control the sound of the selected instrument. Not all instruments offer controls.

The **Effects** section contains three effect slots. Some instruments use one or more effects by default.

Keyboard instruments

Acoustic and electric piano's feature a Strength knob which controls how hard the piano is played. It adds a value to a note's velocity. '2.5' is neutral position.

The electric piano's Dynamics knob controls the velocity curve, ie. it controls how sensitive the piano is to key pressure. Bass and Treble are tone controls, as found on amplifiers or even some electric pianos.

The Percussive Organ is percussive even if another note is playing. This is different from the Wheel Organ which follows the traditional style.

String instruments

Bass guitars feature a Strength knob which controls how hard the bass is played. It adds a value to a note's velocity. '5' is neutral position.

Violin Section, Violin Section 2, Viola Section, Cello Section and Contrabass Section are specialized versions of String Ensemble 1. There are two violin sections in order to lessen phasing problem with unison notes. Bowed strings feature a Vibrato knob similar to the winds (see below).

Wind instruments

Most wind instruments feature a Vibrato knob. Vibrato is applied automatically depending on the musical context (especially note duration). The knob controls the amount of vibrato. You can avoid vibrato on certain notes by programming MIDI controller #1. The value at approx. 300 ms after the note onset is the value that counts. It's not possible to add vibrato where the automatic system thinks it's not appropriate.

Percussion instrument

The Drum Kit uses MIDI channel 10 in order to be compatible with General MIDI. A suitable channel is picked automatically when you load an instrument, so you typically don't need to pay attention to the **Channel** box.

Synthesizers

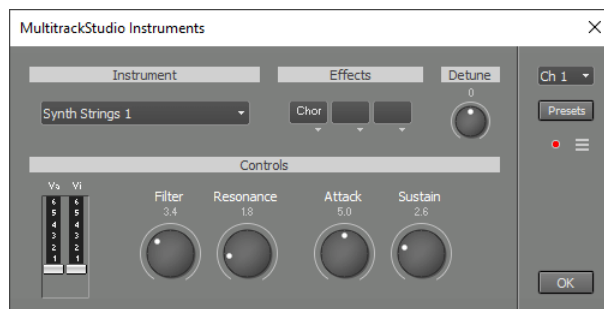
Almost all synth sounds use the same synthesizer which comes in three versions: square, sawtooth and triangle. The bottom-right corner of the Controls box shows the version. The sawtooth version is used for most sounds.

The four drawbars control the level of four oscillators. **8'** is the root note. **8'D** is a slightly detuned version. **5¹/₃** is a fifth and **4¹** is one octave up.

The **Attack**, **Decay**, **Sustain** and **Release** knobs represent a classic ADSR envelope. If Sustain is higher than "5" the level will rise during the decay phase. The pad sounds use this swelling effect.

Muting notes

Some instruments, like Harp and Drum Kit, ignore note-off events. A sustain-off event will mute all sounding notes for which a note-off event has been received, so you can use the sustain pedal to mute harp strings or cymbals etc.



MultitrackStudio Instruments window ("Synth Strings 1")

MIDI Implementation

The MultitrackStudio Instruments respond to Volume (#7), Pan (#10), Expression (#11) and Sustain (#64) controllers. Pitch Bend is also supported.

Acoustic pianos respond to Soft pedal (#67), and they support 'half pedal' sustain (values 64..95 are 'half').

Bowed strings and many winds respond to Legato (#68).

Brightness and Treble knobs respond to #74. Vibrato knobs respond to #1. Attack, Decay, Sustain and Release knobs respond to #73, #75, #79 and #72 respectively. Drawbars and drum level knobs respond to #12, #13, #14 etc.

The MultitrackStudio Instruments respond to poly aftertouch and MIDI 2.0 per-note pitch bend and release time. The synths respond to MIDI 2.0 per-note brightness, timbre, attack time and decay time. Per-note brightness and timbre control the filter cut off frequency and resonance respectively.

For attack time and decay time the value at note on counts. For release time the value at note off counts.

GM compatibility

The MultitrackStudio Instruments are largely compatible with GM level 1. Some notable differences are:

- The "Sound Effects" programs, like Helicopter or Gun Shot, are not available.
- A couple of percussion instruments are not available: vibraslap, guiro and cuica.
- The MultitrackStudio Instruments contain a couple of instruments which are not part of GM. The MIDI file will contain a program number which matches the sound closely. For example: if you pick "Violin Section" the MIDI file will contain the "String Ensemble 1" program, so the file plays back correctly using any GM player.
- The MultitrackStudio Instruments are typically limited to the 'real' instrument's note range. Violins, for example, won't play notes below the open G string.

Under the hood

The MultitrackStudio Instruments are modeled, they don't contain any samples. This allows for randomizing many parameters, so each note has a unique sound which helps reducing "machine gun" effects.

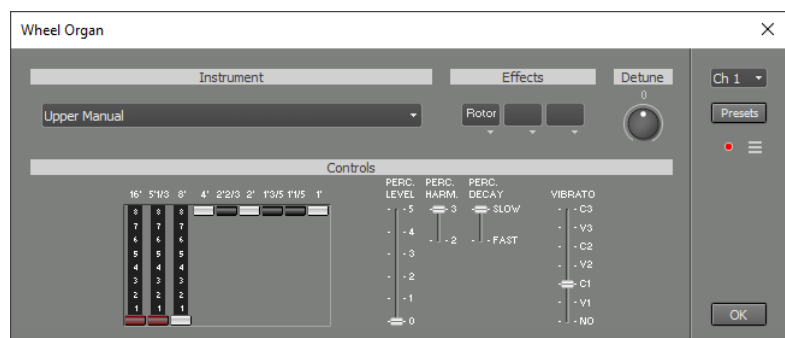
8.2 Wheel Organ

The Wheel Organ is a software version of the classic B3 tonewheel drawbar organ. All its typical characteristics have been modeled including the key clicks, the scanner vibrato, the tonewheel crossfeed and the harmonic foldback.

Instrument

The Instrument section offers a choice of four different combinations of organ manuals / pedals:

1. **Upper Manual:** The upper manual spans five octaves ranging from C3 (note 36) to C8 (note 96).
2. **Lower and Upper Manual:** The lower manual spans five octaves ranging from C0 (note 0) to C5 (note 60). The upper manual spans five octaves (minus the lower C) ranging from C#5 (note 61) to C10 (note 120).
3. **Pedal, Lower and Upper Manual:** The pedal spans two octaves ranging from C0 (note 0) to C2 (note 24). The lower manual spans three octaves (minus the lower C) ranging from C#2 (note 25) to C5 (note 60). The lower manual does not have the lowest and highest octave of the five octave version. The upper manual spans five octaves (minus the lower C) ranging from C#5 (note 61) to C10 (note 120).
4. **Upper Manual M-type:** This one has the same range as the normal Upper Manual instrument. It has no harmonic foldback, and the volume levels of the tonewheels are a bit different.



Wheel Organ window ("Upper Manual" instrument)

Effects

The Effects section contains three effect slots. By default, one of them contains a Rotor effect.

Drawbars

The manuals have 9 drawbars each, the pedal has only two. Moving drawbars does not affect notes that are currently playing (unlike the real tonewheel organ's drawbars). The drawbars also serve to set the relative volume levels of the upper/lower manuals and pedal keyboard.

The 8' drawbar is the fundamental tone. The 4', 2 2/3', 2', 1 3/5', 1 1/5' and 1' drawbars correspond to the 2nd, 3rd, 4th, 5th, 6th and 8th harmonic respectively. The 16' drawbar is one octave below the fundamental, and the 5 1/3' is the third harmonic of the 16' drawbar's frequency.

Drawbar settings (traditionally called 'registrations') are usually written as a sequence of 9 numbers like 88 8000 000. In this example the three drawbars on the left are pulled out all the way ('8'), while the other six aren't pulled out at all ('0'). 88 8000 000 and 88 8800 000 are widely used, but any other setting can be used.

Percussion

The percussion feature adds a short sound when a key is pressed. The percussion signal is added to a new note only if there's no other key being pressed, so the percussion can be controlled by playing 'legato'. Percussion is applied to the upper manual only.

Perc. Level controls the level of the percussion signal (off, 1..5). The original tonewheel organ has only two levels: 'Soft' (equals '5') and 'Normal' (equals '3'). A few more levels have been added to the Wheel Organ, as tweaking the percussion level is one of the most popular modifications to tonewheel organs. **Perc. Harm.** controls whether the percussion signal is the 2nd or 3rd harmonic of the note being played, these harmonics correspond to the 4' and 2 2/3' drawbars respectively. **Perc. Decay** controls the decay time of the percussion signal (slow or fast).

Vibrato

The vibrato control has seven positions: Off, V1/2/3 and C1/2/3. Most, if not all, of the time one of the C (Chorus) positions will be used. The V positions provide Vibrato. Vibrato is applied to all manuals and pedals.

Playing instrument 2 or 3 with one MIDI keyboard

MultitrackStudio's Keyboard Mapper can be used to play instrument 2 or 3 using only one MIDI keyboard. Follow these guidelines to set up the Keyboard Mapper:

- Enable the Split option.
- Make sure the Left Hand and Right Hand section's Channel values equal the Channel Indicator in the top-right corner of the Wheel Organ window.
- The Split Note can be set at C5 for a start.
- The Left Hand Transpose Oct can be set at -3, the Right Hand Transpose Oct can be set at 2.

The Split Note and Transpose Oct controls can be adjusted to reach different parts of the manuals.

Playing instrument 2 or 3 with two MIDI keyboards

MultitrackStudio Pro supports multiple MIDI In devices. Instrument 2 or 3 can be played using two MIDI keyboards if the MIDI keyboards have an octave-shift function. Using 5-octave keyboards, the lower keyboards will be shifted 3 octaves down, and the upper keyboard will be shifted 3 octaves up.

MIDI Implementation

The Wheel Organ responds to Volume (#7), Expression (#11) and Sustain (#64) controllers. Pitch Bend is also supported. Note that the original tonewheel organ didn't have Sustain or Pitch Bend features.

The upper manual drawbars respond to #12 to #20, the lower manual drawbars respond to #21 to #29, the pedal drawbars respond to #30 and #31.

Percussion can be controlled with #70 (volume), #71 (decay) and #72 (harmonic).
Vibrato can be controlled with #76.
The Rotor effect's rotation speed can be controlled with the Modulation (#1) controller.

8.3 SoundFont Player

Note: the SoundFont Player is available in the Mac version only.

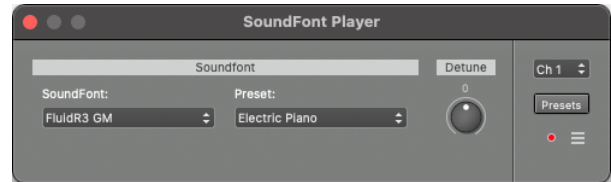
The SoundFont Player can load .sf2 files. Many .sf2 files are available on the internet.

Use the **SoundFont** box to load one of the available .sf2 files.

The Import option allows for importing additional ones. Alternatively you can drop a .sf2 file on the SoundFont Player window.

The 'hamburger' button at the right hand side of the Import option provides access to the SoundFont Manager. It allows for adding categories and overriding soundfont names. It's similar to the Plugin Manager.

Use the **Preset** box to pick one of the presets provided by the current SoundFont.



SoundFont Player window

8.4 Sampler

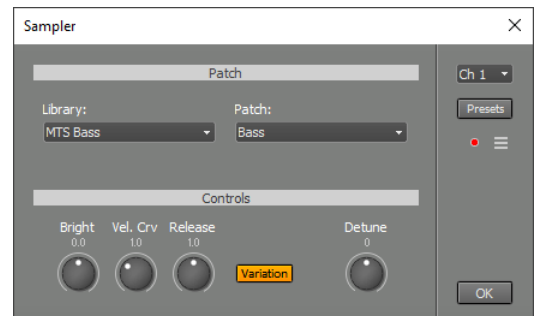
MultitrackStudio includes a disk-streaming sampler. Samples can be played direct from disk, so patches can be larger than the amount of RAM memory available.

You can load a sample library using the Library box.

The **Import...** option allows for importing .sf2, .sfz, .gig or .exs files, as well as MultitrackStudio's .zptc and .ptc files.

The **Export...** option exports the library to .zptc format. You can use this to move a library to a different computer for example.

Tip: On Windows you can import the system MIDI bank to get started. It's usually at C:\Windows\system32\drivers\lgm.dls



Sampler window

The Patch box can be used to pick one of the patches the library provides.

Edit patch... invokes the Patch Editor.

The controls in the Controls section override the values stored in the patch (as set by the Patch Editor).

Tip: simple patches, containing just one sample, can be created easily by dragging an audio file from File Explorer (Windows) / Finder (Mac) to a MIDI track's Instrument Slot. You can also drag the selected part of a track editor or clips from the Clip Shelf to an Instrument Slot. A Sampler will be loaded in the Instrument Slot and a patch will be created for it. To use the patch in other songs you need to export the library and import it again.

The Sampler supports the following MIDI messages:

- Note On/Off
- Modulation (cont. 1)
- Volume (cont. 7)
- Pan (cont. 10)
- Expression (cont. 11)
- Sustain (cont. 64)
- Legato (cont. 68)
- Brightness (cont. 74)
- Pitch Bend
- Poly Aftertouch
- MIDI 2.0 per-note pitch bend
- MIDI 2.0 per-note modulation
- MIDI 2.0 per-note volume
- MIDI 2.0 per-note pan
- MIDI 2.0 per-note expression

Tip: to use per-note modulation with an MPE keyboard you can use the Keyboard Mapper. Set it up to map per-note aftertouch or per-note brightness to per-note modulation.

If the track has multiple MIDI streams the Sampler uses only the first stream.

The Sampler responds to messages on all MIDI channels, so the **Channel** value typically doesn't matter. It does matter if you're recording using the Keyboard Mapper's split option or multiple keyboards: in these situations you want only messages received on this channel to be recognized.

The **Output** button, available if the patch uses multiple outputs, pops up an 8 channel output mixer. This is typically used for drums. In the Pro edition these output channels are available as sidechain sources in other tracks.

The Options menu offers some settings:

- **Polyphony:** The number of samples a Sampler is allowed to play simultaneously. You can lower this setting to reduce CPU or disk usage.
- **Memory Limit:** The amount of memory all Samplers combined are allowed to use. The operating system will be forced to use the hard disk if too much memory is being used. This 'disk swapping' will decrease performance significantly, and should therefore be avoided. This setting is intended for lowering the Sampler's memory usage to make room for other audio programs (eg. sampler type instrument plugins). If memory available for Samplers is limited dropouts may occur if a Sampler is used in record mode. You don't need to worry about this: the sound will be OK during playback.

Note: the Sampler does not support all the features an .sf2, .sfz, .gig or .exs file can use. Differences include:

- *The Sampler can't play multiple samples for a single key press. A 'piano + strings' soundfont that wants to play back piano and string samples simultaneously won't sound as intended, for example. Worst case you'll hear piano for some keys and strings for others, in this case you could delete some samples using the patch editor.*
- *There's no filter, modulation or effects. You could try using some MultitrackStudio effects make a patch sound more exciting.*

Under the hood

Imported sample libraries are converted to MultitrackStudio .ptc format patches. Each library gets its own folder which has the same name as the library ("MyPiano.sf2") for example. You can change the location of these folders in the Studio-->Preferences window. The audio samples themselves are stored as losslessly compressed .gjm/.gjs files. so the converted libraries typically use significantly less disk space than the originals. Libraries can be exported to .zptc format, this is a .zip file containing the .ptc file(s) and the samples used.

8.5 Matrix Sampler

The Matrix Sampler can load up to 16 audio samples. They can be played using the Matrix onscreen keyboard for example.

A 4x4 matrix of cells appears on the left. On clicking one of the 16 cells the corresponding controls appear on the right. The **Load** button allows for loading samples. Several options are available:

- Import an audio file.
- Paste data copied from audio or MIDI track editor.
- Remove.



Matrix Sampler window

In addition you can copy from one cell to another using drag-and-drop. Dropping a file on a cell is possible as well. Samples can be up to 6 seconds in length. If you have longer samples you can consider slicing them into parts using a track editor, the parts can then be loaded in multiple cells using the paste option.

The text box next to the load button shows the **name** of the cell, and allows for changing it. The name appears in the cell itself if a sample is loaded.

Volume controls the volume of the sample. **Semitones** and **Cents** control the pitch. **Stretch** can be used to make the sample shorter or longer, so it matches the song tempo. The box accepts fractions, so you can type '120/80' instead of '1.5' to make a 120 BPM sample match your 80 BPM song for example. If **Oneshot** is engaged the sample will play all the way to the end regardless of note-off messages.

You can use the play button to playback the sample.

The Matrix Sampler responds to messages on all MIDI channels, so the **Channel** value typically doesn't matter. It does matter if you're recording using the Keyboard Mapper's split option or multiple keyboards: in these situations you'll want only messages received on this channel to be recognized.

The Matrix Sampler supports the following MIDI messages:

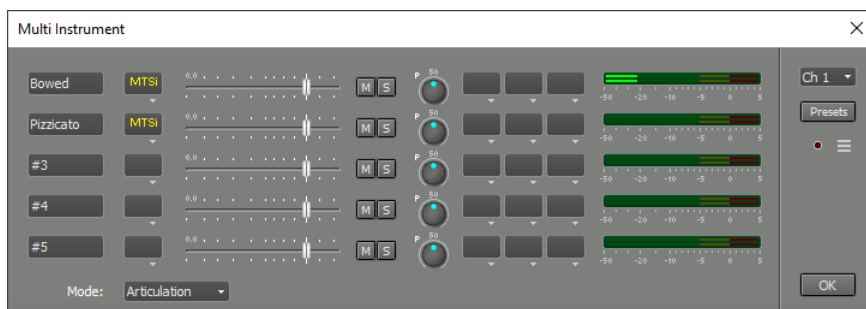
- Note On/Off
- Volume (cont. 7)
- Pan (cont. 10)
- Expression (cont. 11)
- Poly Aftertouch
- MIDI 2.0 per-note volume
- MIDI 2.0 per-note pan
- MIDI 2.0 per-note expression

The cells are mapped to MIDI notes 36..51.

8.6 Multi Instrument

The Multi Instrument turns up to 5 MIDI instruments into a single instrument. You can either use a MIDI controller to pick one of the sounds (see articulations), or you can play them all at once (aka 'layering').

There's a full mixer with effect slots to mix the instruments.



Multi Instrument window

The **Mode** box lets you choose between Layered and Articulation mode. It also allows for customizing the MIDI the controller used for switching articulations (it defaults to 89). This controller appears as 'Articulation' in the track editor's Controller editor.

The names on the left appear in the Articulation controller editor.

External MIDI Instruments can't be used in the Multi Instrument.

8.7 External MIDI Instruments

An External MIDI Instrument sends the track's MIDI data to a MIDI Out device. This can be either a MIDI (or USB) connector, a synth on the soundcard, or a software emulation of such a device.

Patch section

The large display in the **Patch** section shows the name of the patch. Clicking the **Select** button lets you select a patch by name. The names are stored in a Patchmap file. The 'hamburger' button menu can be used to select the Patchmap file that corresponds to your MIDI device. Also see the MIDI-CI paragraph below.



External MIDI Instrument window

Tip: You can use the Up/Down Arrow keys to step through the patches.

The **Bank:Prog** display indicates the bank (optional) and the program used. The bank/program value can be altered by clicking it. Bank and program are numbers (0..16383 and 0..127 respectively) separated by ':' (for example: 1:2 means Bank 1 and Program 2). The Bank number equals $128 * \text{MSB} + \text{LSB}$, where MSB is CC0 and LSB is CC32. You can type something like MSB:LSB:2 and the bank number will be calculated from the MSB and LSB values. Press Enter to accept the new value, or Esc to cancel the operation.

Channel indicates the MIDI channel being used.

Controls section

The **Controls** section affects the way the patch sounds.

Detune detunes the patch using Pitch Bend messages. The value is stored in the MIDI file as RPN 1.

Bright, **Reverb** and **Chorus** control MIDI controllers 74, 91 and 93 respectively. Some synths (e.g. SoundBlaster Live!) may need to be set up properly in order to respond to controllers 91 and 93 (Reverb and Chorus).

Controller 74 (Brightness) may not be supported by your synthesizer.

The MIDI Out Device

A MIDI Out Device can be either a MIDI connector or a synth on the soundcard. MultitrackStudio Pro supports four devices, lower editions supports two MIDI Out devices. To select MIDI Out devices go to the Studio menu's Devices window.

The MIDI In and MIDI Out device are connected by default (messages received on an incoming channel are forwarded to the corresponding outgoing channel). When a software instrument is used in record mode the MIDI In channel being used is disconnected from the MIDI Out channel.

Note: Interconnecting a MIDI In and MIDI Out device creates a loop that will slow down (and ultimately halt) your computer. MultitrackStudio will detect this loop and disconnect the MIDI in and out devices in order to avoid freezing the computer.

Virtual MIDI channels

A MIDI Out Device contains 16 MIDI channels. MIDI Out devices are virtualized by MultitrackStudio, meaning that a single MIDI channel on a MIDI Out device can be used by more than one stream. MultitrackStudio will automatically take care of playing each note using its own stream's patch and controllers. Obviously, this only works if streams using the same MIDI channel don't play notes at the same time.

The following controllers have a default value, and don't need any attention:

- Modulation (#1)
- Volume (#7)
- Pan (#10)
- Expression (#11)
- Sustain (#64)
- Soft (#67)
- Brightness (#74)
- Reverb (#91)
- Chorus (#93)
- Aftertouch
- Pitch Bend

All other controllers do not have a default value. If they are used in one stream they should be defined in all other streams using the same channel on the same MIDI Out Device.

MIDI 2.0

'Multi-timbral expression' is used to convert MIDI 2.0 per-note controls to MIDI 1.0. This should work with most MIDI gear, provided it is multitimbral (this means you can play 16 instruments on 16 channels). Like MPE, each notes gets its own MIDI channel. Channels 12..16 and the channel used by the track are used for this purpose,

that's 6 channels in total (or 5 if the track uses channel 12 or above). The other channels are available for other tracks.

'Multi-timbral expression' works with per-note pitch bend, brightness, aftertouch and expression. These messages are converted to their channel counterparts. 'Multi-timbral expression' will be used automatically when per-note pitch bend, brightness or expression are sent.

MultitrackStudio won't use pitch bend range values exceeding 24 semitones in order to ensure good compatibility. Pitch bend values will be converted automatically if a track uses a higher pitch bend range. If your hardware doesn't support 24 semitones you can set a lower value in the per-note pitch bend editor.

macOS 11 supports MIDI 2.0. 'Multi-timbral expression' won't be used if the connected device uses the MIDI 2.0 protocol.

Tip: to use per-note expression with an MPE keyboard you can use the Keyboard Mapper. Set it up to map per-note aftertouch or per-note brightness to per-note expression.

MIDI-CI

Note: MIDI-CI support is available in the Mac version only.

MIDI-CI is part of MIDI 2.0, it allows a sender to receive information from a receiver. MultitrackStudio supports MIDI-CI to retrieve program names and controller names from a MIDI Out Device. This obviously only works with devices that support this.

The Patchmap menu, available via the 'hamburger' button, features a "Allow MIDI-CI" option. It reads "Allow MIDI-CI (available)" if program names are actually available. If they are, the MIDI-CI information replaces the selected patchmap automatically. "Allow MIDI-CI" is enabled by default, you can switch it off if you want to use a patchmap file instead.

Note: Currently, MIDI-CI is available for MIDI Out Device 1 only, and for USB MIDI 2.0 class compliant devices only. macOS 14 is required.

Under the hood

The part of MIDI-CI used is called Property Exchange. The ResourceList, ChannelList, ProgramList and ChCtrlList resources are used. MultitrackStudio subscribes to the ChannelList resource, so it gets notified when something changes.

8.8 AU Instrument Plugins

Note: AU Instrument Plugins are supported in the Mac version only. If a song with an AU Instrument plugin is opened with MultitrackStudio for Windows a Missing Instrument placeholder will appear.

An AU (Audio Unit) Instrument is an AU Plugin that can convert MIDI events to audio. You can select an AU Instrument by clicking the instrument slot's down arrow. The AU Instrument plugins appear in the list's Plugins section.

AU Instruments look like AU Plugins. They have an additional **Channel Selector**. Some AU Instrument plugins respond to all MIDI channels the same way, in this case the channel setting doesn't matter unless you're recording using the Keyboard Mapper's split option or multiple keyboards. Other plugins, especially the ones providing many different sounds, do always require the correct channel to be specified.

AU Instruments respond to all the streams that are in the track's MIDI file. However, in most cases it will be easier to use multiple tracks (each using an instance of the AU Instrument) instead.

MIDI 2.0 / MPE

AU instruments receive per-note pitch bend, per-note brightness and poly aftertouch via MPE. Switching to MPE happens automatically when per-note pitch bend or per-note brightness are sent to the plugin. MPE won't be used if you've set the per-note pitchbend range to zero.

Plugins may have an MPE mode setting that needs to be set manually.

In macOS 12 AU plugins that support the MIDI 2.0 protocol will receive MIDI 2.0 instead of MPE.

Any MIDI output from the plugin is converted from MPE to MIDI 2.0. You can avoid this by setting the per-note pitchbend range to zero (in this case MPE to MIDI 2.0 conversion will only take place if the plugin sends MPE configuration messages (RPN 6)).

8.9 CLAP Instrument Plugins

A CLAP instrument is a CLAP Plugin that can convert MIDI events to audio. You can select an CLAP instrument by clicking the instrument slot's down arrow. The CLAP instrument plugins appear in the list's Plugins section.

MIDI 2.0 / MPE

CLAP instruments can use MIDI 2.0 protocol messages, CLAP note expressions or MPE. CLAP note expressions support per-note Pitch Bend, Volume, Pan, Expression, Brightness, Vibrato Depth and Aftertouch. It's up to the plugin to tell the host which protocols it supports and which one it prefers to use.

8.10 VST Instrument Plugins

A VST Instrument (or VSTi) is a VST Plugin that can convert MIDI events to audio. You can select a VST Instrument by clicking the instrument slot's down arrow. The VST Instrument plugins appear in the list's Plugins section.

A VST plugin will initially appear in both Effect and Instrument selectors. The first time it is loaded MultitrackStudio determines whether it's an effect and/or an instrument. From then on it will appear in the appropriate selector only.

VST Instruments look like VST Plugins. They have an additional **Channel Selector**. Some VST Instrument plugins respond to all MIDI channels the same way, in this case the channel setting doesn't matter unless you're recording using the Keyboard Mapper's split option or multiple keyboards. Other plugins, especially the ones providing many different sounds, do always require the correct channel to be specified.

VST Instruments respond to all the streams that are in the track's MIDI file. However, in most cases it will be easier to use multiple tracks (each using an instance of the VST Instrument) instead.

If the plugin has more than two outputs an **Output** button will be available. On clicking this button the Output Mixer window will appear. This mixer mixes the plugin's outputs down to stereo.

Tip (Pro edition only): The outputs of a multiple output VST Instrument plugin can be routed to tracks using sidechaining (see External Sidechain Routing). You can use this if you'd rather mix the outputs in the main window rather than the VST Instrument Output Mixer window. This is especially useful for drum plugins.

If a VST Instrument plugin gets in a bad state somehow you can press the F5 key (Windows) / Command-R (Mac) while the plugin interface is visible. This will save the settings, reload the plugin and load the settings again. This doesn't work while the track is recording.

MIDI 2.0 / MPE

VST3 instruments that support VST3 note expression receive per-note Pitch Bend, Volume, Pan, Expression, Brightness and Vibrato Depth. Poly Aftertouch is sent as well. VST3 instruments that don't support note expression will receive MPE just like VST2 plugins (see below).

A VST3 plugin that generates MIDI output can use note expression to send per-note controls.

VST2 instruments receive per-note pitch bend, per-note brightness and poly aftertouch via MPE. Switching to MPE happens automatically when per-note pitch bend or per-note brightness are sent to the plugin. MPE won't be used if you've set the per-note pitchbend range to zero.

Plugins may have an MPE mode setting that needs to be set manually.

Any MIDI output from a VST2 plugin is converted from MPE to MIDI 2.0. You can avoid this by setting the per-note pitchbend range to zero (in this case MPE to MIDI 2.0 conversion will only take place if the plugin sends MPE configuration messages (RPN 6)).

9 MIDI Effects

A MIDI Effect processes MIDI messages. These MIDI Effects are available:

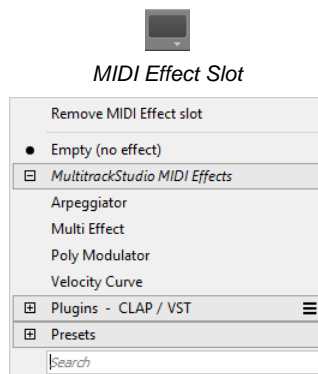
1. Arpeggiator.
2. Multi Effect.
3. Poly Modulator.
4. Velocity Curve.
5. AU MIDI Effect Plugins, an AU Plugin that can process MIDI.
6. CLAP MIDI Effect Plugins, a CLAP Plugin that can process MIDI.
7. VST MIDI Effect Plugins, a VST Plugin that can process MIDI.

MIDI Effects are reached via MIDI Effect Slots. To add a MIDI Effect slot to a MIDI track, click the Instrument Slot's down arrow and then click the **Add MIDI Effect slot** option. Likewise, to remove a MIDI Effect slot click its down arrow and then click the **Remove MIDI Effect slot** option. A track can have only one MIDI effect slot. You can use a Multi Effect if you need more slots.

The data that appears in the track editor is sent to the MIDI effect. The MIDI effect processes the data and sends it to the MIDI instrument. A recording track records the data coming from your MIDI keyboard (ie. the MIDI effect isn't in the recording).

A MIDI effect's 'hamburger' menu features an **Apply to track** option. This option applies the effect to the track, and engages the effect's Bypass button.

If a MIDI track has multiple streams the MIDI effect will be applied to the first stream only.



MIDI Effect Selector

9.1 Arpeggiator

The Arpeggiator turns a chord into an arpeggio.

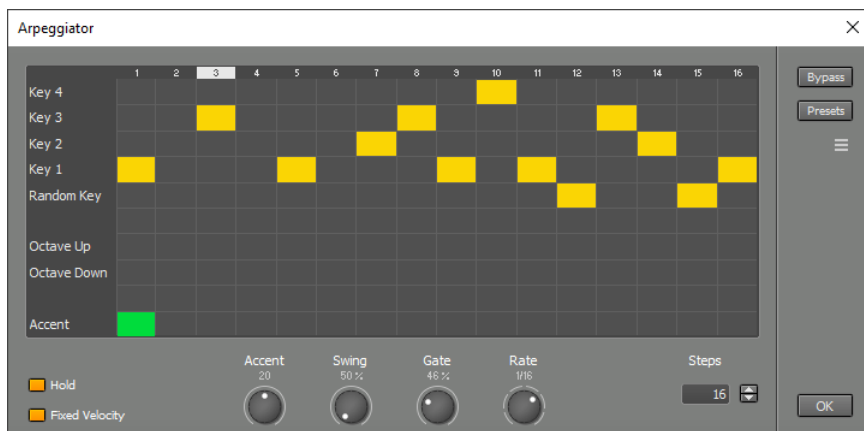
The arpeggio pattern is fully customizable:

Key 1..Key 4 are the keys that are currently being played, Key 1 being the lowest in pitch.

Random Key is a random pick of one of these keys. You can pick one (or no) key for each step.

Octave Up / Octave Down can be checked to transpose the note.

Accent can be checked to make the note a bit louder. See the Accent knob.



Arpeggiator window

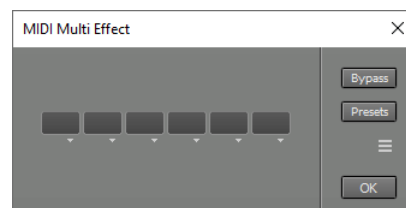
The following controls are available:

- **Steps:** The number of steps in the pattern. The maximum value is 32.
- **Rate:** The speed at which the steps are played. It can be 'normal' notes like 1/16 or triplets.
- **Accent:** Steps which have the Accent box checked play a bit louder. This knob determines the amount added to the note velocity.
- **Swing:** The amount by which 2nd, 4th, 6th (and so on) steps are delayed. 50% means "no swing".
- **Gate:** The (relative) note duration. You can turn this down to make the note sound more staccato.
- **Fixed Velocity:** Ignore the velocity of the incoming notes, and use a fixed value (90) instead.
- **Hold:** Ignore incoming note-off messages, so the arpeggio keeps playing when you've released the keys. The notes will be stopped when you play a new chord. This feature can make playing the arpeggiator using a MIDI keyboard easier. You can push and release the sustain pedal to stop the arpeggiator.

9.2 MIDI Multi Effect

The MIDI Multi Effect is a container for other MIDI effects. Use it if you need more than one MIDI effect slot.

When loading a MIDI Multi Effect the effect which is currently in the slot is moved to the MIDI Multi Effect.



MIDI Multi Effect window

9.3 Poly Modulator

The Poly Modulator generates per-note controllers using an envelope and a low frequency oscillator (LFO). Each note gets its own envelope and LFO, they both start when the note starts.

The Poly Modulator works with instruments that respond to MIDI 2.0 per-note controllers, CLAP/VST3 note expressions, MPE or CLAP polyphonic modulation.



Poly Modulator window

Envelope

The envelope consists of four phases, the duration of the phases is controlled by the **Delay**, **Attack**, **Hold** and **Release** knobs.

The **Note to Time** Velocity and Note knobs make the envelope phase times depend on the note velocity and note number (pitch) respectively.

The **Vel** button makes the envelope level depend on the note velocity.

LFO

The 3 buttons next to the graph offer sine, triangle or square wave forms. The **Shape** knob moves the middle zero crossing, so it can turn the triangle into a sawtooth etc.

The **Speed** knob controls the oscillator frequency. If the **Beat** button is engaged the Speed knob offers several beat values instead of Hz, so the actual speed depends on the song tempo at the time the note is played.

The **Envelope to** Speed and Level knobs apply the envelope to the LFO speed and amplitude. At positive values the envelope's Hold level is neutral, and the rest reduces speed/amplitude. At negative values the envelope's Delay level (and the level after the Release phase) is neutral, and the rest reduces speed/amplitude.

Destination

There are 3 Destination sections, each one can send a mix of the envelope and the LFO to a per-note controller.

Env and **LFO** control the amount of the Envelope and LFO that's added to the destination controller. It can be positive or negative.

Note adds an amount to the destination controller depending on the note's note number (pitch). Middle C is neutral, so either lower notes get a negative value and higher notes a positive value, or vice versa. This is a 'static' modulation, it doesn't depend on the Envelope or LFO.

Offset adds a fixed offset to the destination controller.

The display shows the amount of modulation for the notes that are playing. The center values represent 'no modulation', higher or lower values represent positive or negative modulation respectively.

The knobs can't be automated. You can use the option menu's "Apply to track" option. Then you can use the Per-Note Controller Editors.

CLAP polyphonic modulation

CLAP instrument plugins can have parameters that can be modulated polyphonically. These parameters can be selected in the Destination boxes if the Poly Modulator is used in a track that uses a CLAP instrument plugin. If the Poly Modulator is in a Multi Effect it must be in the last (right hand) slot in order to use CLAP polyphonic modulation.

Note: "Apply to track" doesn't work with CLAP polyphonic modulation (they don't map to MIDI).

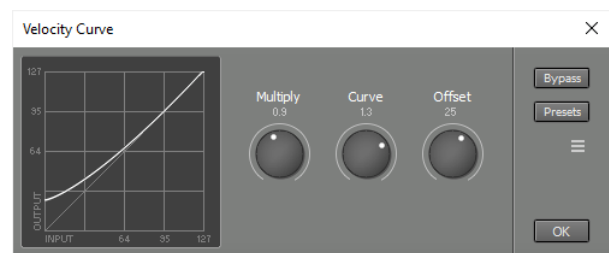
9.4 Velocity Curve

The Velocity Curve effect re-maps note-on velocities. You can use this to make the note-on velocities coming from your keyboard cover the 1..127 range nicely, so a multi-layer piano instrument responds correctly, for example.

Multiply multiplies the incoming velocities.

Curve bends the curve in a non-linear way.

Offset shifts the curve up or down.



Velocity Curve window

The math: $output = Offset + (input \times Multiply) ^ Curve$

9.5 AU MIDI Effect Plugins

Note: AU Plugins are supported in the Mac version only. If a song with an AU plugin is opened with MultitrackStudio for Windows a Missing MIDI Effect placeholder will appear.

An AU MIDI Effect is an AU Plugin that can process MIDI messages. You can select an AU MIDI Effect by clicking the MIDI effect slot's down arrow. The AU MIDI Effect plugins appear in the list's Plugins section.

Note: the 'Apply to track' option relies on plugins being able to save and restore settings, so it won't work with demo versions that can't do this.

MIDI 2.0 / MPE

Starting with macOS 12 AU plugins that support the MIDI 2.0 protocol will receive MIDI 2.0. AU MIDI effects do not receive per-note controls otherwise.

MIDI output from plugins is converted from MPE to MIDI 2.0. You can avoid this by setting the per-note pitchbend range to zero (in this case MPE to MIDI 2.0 conversion will only take place if the plugin sends MPE configuration messages (RPN 6)).

9.6 CLAP MIDI Effect Plugins

An CLAP MIDI Effect is a CLAP Plugin that can process MIDI messages. You can select a CLAP MIDI Effect by clicking the MIDI effect slot's down arrow. The CLAP MIDI Effect plugins appear in the list's Plugins section.

MIDI 2.0 / MPE

Per-note controls can be sent to the plugin as MIDI 2.0 or as CLAP note expressions. It's up to the plugin to tell the host which protocols it supports and which one it prefers to use. Plugin output can be MIDI 2.0, CLAP note expressions or MPE.

9.7 VST MIDI Effect Plugins

A VST MIDI Effect is a VST Plugin that can process MIDI messages. You can select a VST MIDI Effect by clicking the MIDI effect slot's down arrow. The VST MIDI Effect plugins appear in the list's Plugins section.

Note: the 'Apply to track' option relies on plugins being able to save and restore settings, so it won't work with demo versions that can't do this.

MIDI 2.0 / MPE

VST3 MIDI effects can receive and send per-note Pitch Bend, Volume, Pan, Expression, Brightness and Vibrato Depth. Poly Aftertouch is supported as well.

VST2 MIDI effects do not receive per-note controls. MIDI output from VST2 plugins is converted from MPE to MIDI 2.0. You can avoid this by setting the per-note pitchbend range to zero (in this case MPE to MIDI 2.0 conversion will only take place if the plugin sends MPE configuration messages (RPN 6)).

10 Automation

Note: this feature is available in the Pro edition only.

The mixer sections and audio effects can be automated (ie. the knobs can be programmed to turn automatically while the transport is running). This can be used to change a track's volume level, to add more reverb to part of a track etc.

You can add automation by recording knob movements while the transport is running, or by using the automation editor.

A small blue square appears in the bottom right corner of an automated control. Automation can be undone by deleting all dots in the editor (click Sel All followed by Delete). An automated control can still be controlled using the mouse. This will move the whole automation curve, as it appears in the control's Automation Editor, up or down.



Automated fader and rotary knob (note the blue squares)

Recording fader/knob movements

Fader and knob movements can be recorded while the transport is running. The Automation Recording button (near the bottom right corner of the main window) needs to be engaged for this. By default, the control won't return to the old value until transport stops ('latch mode'). The control will revert to the old value upon releasing the mouse button immediately if the Automation Touch Mode button is engaged.

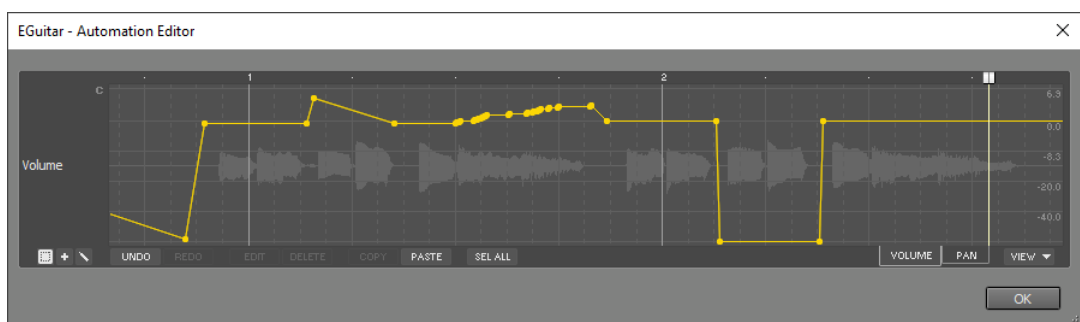


Automation Recording and Automation Touch Mode buttons

Note: automation recording isn't available while transport is cycling.

Using the Automation Editor

There are 3 ways to pop up the Automation Editor for a control:



Automation Editor

1. Rightclick the control and choose 'Show Automation Editor' from the menu.
2. Engage the Automation button in the bottom right corner of the main window, and then click the control.
3. Click the control while pressing the 'A' key.

The Automation Editor works just like an Automated Fader effect. If the mixer section is a track or the effect is in a track the track's audio/MIDI data is displayed in the background. Scrubbing is available as well, it uses the parameter values at the needle position and doesn't include any effects.

The **VIEW** button can be used to add tabs for other automatable parameters of the mixer section/effect. You can switch between parameters easily using the tabs.

Tip: type 'used' in the VIEW menu search box to see the automated parameters only. Type 'checked' to see the items that have a check mark, and hence appear as a tab.

10.1 Mixer Automation

A mixer section's Volume fader and the Pan and Effect Send knobs can be automated.

Note: Automation doesn't work for a MIDI track using an External MIDI Instrument while the track is recording.

10.2 Effect Automation

The rotary knobs of all audio effects can be automated. The Band Effect, the Convolver's Delay knob and the Guitar Amp's Cntr/Edge and Output knobs can't be automated. The Compressor's Autogain button has no effect if the Threshold, Ratio or Gain knobs are automated. The Arpeggiator (MIDI effect) can't be automated either.

'Delay' type knobs may cause glitches while turning. It's best to move these knobs in a quiet part. This applies to the following knobs:

- Chorus, Doubler, Echo, Flanger: Delay.
- Master Limiter: Ahead.
- Reverb: Predelay.
- Pseudo Stereo: Color (Comb mode only)
- Vibrato: all.
- Guitar Amp: Cntr/Edge (not a 'delay type knob', but it does glitch)
- Phaser: Notches (not a 'delay type knob', but it does glitch)

Plugins

AU, CLAP and VST plugins can be automated too. CLAP/VST3 plugin controls can have a 'Show automation editor' option in their rightclick menu if the plugin supports this. If that's not the case you can rightclick the right hand side of the effect window (the area where the Bypass button is), and use 'Show automation editor' from the menu that appears.

Tip: click a control before popping up the automation editor. The editor will now show this parameter.

Knob movements can be recorded while the transport is running, just like MultitrackStudio's own faders and rotary knobs.

A multiple output AU / CLAP / VST plugin's output mixer can be automated too.

11 Editing

Each track has an editor that can be opened using the Edit button located on the right hand side of the track. The Tempo Editor affects the tempo of MIDI tracks, and optionally audio tracks as well. The Song Editor can remove or insert parts and affects "everything" (tracks, automation, markers etc.).

All editors feature a "needle" which indicates the current transport position (its position equals the value of the transport's position indicator). The thumb at the top of the needle can be moved using the mouse. At the top of every editor is a Time Bar that shows either seconds or bars (can be changed in the Editing Options section). Clicking this bar will move the needle to the corresponding position and the transport's position indicator will be updated accordingly. You can also grab the time bar with the mouse and drag it left or right. In this case the transport position remains unchanged unless the needle moves out of the visible area. Double-clicking the time bar starts the transport, clicking stops it.

Selecting a part

A part can be selected by left-clicking the editor's display and dragging the mouse while keeping the mouse button down. The selection can be resized by dragging its beginning or end. The editor will scroll horizontally automatically if the mouse approaches the left or right side of the editor.



Moving or copying a part

The selected part can be moved. The part is copied if the Ctrl key (Windows) / Option key (Mac) is pressed while moving.



Stretching or warping a part

Resizing the selected part while the Alt key (Windows) / Command key (Mac) is pressed stretches (or shrinks) the part. The part can be 'warped' using this key as well. It's recommended to make sure any monophonic audio tracks use the monophonic transpose algorithm. Use their editor's Edit button to access this option (a part needs to be selected for this button to be enabled).



Tweakable Edits

MultitrackStudio features 'tweakable edits', which means that after performing an edit (for instance pasting some audio) you can tweak the edit (for instance adjust position and length of the pasted part, adjust volume, or even add effects). Every time you make an adjustment the initial edit will be completely redone, thus ensuring optimal sound quality. An edit is tweakable as long as the selected part is surrounded by a dotted line.

Common Editor features

Most editors feature the following buttons:

- **Undo:** Undo edit.
- **Redo:** Redo an edit that was undone previously.
- **Delete:** Deletes the selected part.
- **Copy:** Copies the selected part to the clipboard.
- **Paste:** Paste from the clipboard to the editor. The data on the clipboard will be placed at the current transport position (that's where the needle is).
- **Sel All:** Selects all.

In addition the "More" buttons offers:

- **Cut:** Copies the selected part to the clipboard and then deletes the selected part.
- **Repeat:** Repeats the selected part a number of times.

All editors have a popup menu with these options:

- **Find Selected Part:** Adjusts the transport position so the selected part becomes visible.
- **Unselect**
- **Select Left:** Select left hand part.
- **Select Right:** Select right hand part.

Editing Options

The editing options area at the top of the main window contains several options concerning editing.



Editing options

- **Time Sig / Tempo:** Editing these values change the Time Signature or Tempo of the whole song (from start to end). If the tempo isn't constant throughout the song the various tempo value's will be adjusted proportionally. Right-clicking either box shows the Tempo/Time Signature Editor.
These options are available only if there is at least one MIDI track.
The down arrow next to the Tempo box offers 3 options:
 - **Tempo / Time Signature Editor:** open this editor.
 - **Tap Tempo:** tap a new tempo on the space bar.
 - **Extract tempo from track:** This track has to contain beats only (ie. you can't extract tempo from an album track or a guitar solo track). Typically, one will have to record a track while playing back the song. The track can be either MIDI (tap the beat on the MIDI keyboard) or audio (clap your hands to the beat, counting "one two three four" will probably work too if done "staccato"). The track containing the beats can be selected from a list containing all the song's tracks. Also, you can specify what the beats represent (quarter notes, 8th notes etc.). After extracting the tempo you can edit the Time Signature manually. Typically, the length of the first measure (#0) will be adjusted so the second measure (#1) coincides with the start of the song. This might require the use of a weird time signature like 27/4 in the first measure.
- **Song Editor:** shows the Song Editor.
- **Ripple:** When active pasted (or drag-and-dropped) parts will be inserted. Existing data will be overwritten otherwise. Ripple mode will usually be off in order to avoid misaligned tracks.
- **Snap:** Turning on Snap makes the start and end point of all currently selected parts snap to the (visible) grid. All subsequent mouse movements will snap to the grid as well. Use the Zoom In and Zoom Out functions to change the grid. If the grid is in bars you can click the editor grid box at the bottom of the main window to override the automatic values. Options available include swing and custom tuplets.
- **Bars:** Grid in bars. Also, MIDI paste and drag operations will be done in beats instead of seconds (e.g., if you move a slow part to a fast part it will be made faster).
- **Follow:** Editors follow transport position. You can switch this off if you want to apply some edits while the transport is running so you don't have to worry about the editor moving to the next page unexpectedly. If Follow is off the page up/down and left/right arrow keys control the editors rather than the transport position.
- **Zoom In/Out:** Use the Zoom In and Zoom Out functions to change the horizontal scale of the editors (all editors have the same time scale). The current scale is displayed on the bottom bar. Scale 1:1 means that one screen pixel represents one audio sample. Zooming out will put more samples on a pixel.
- **Editing Options menu:** provides access to various editors. If the main window is small some items from the editing options area may be moved to the menu.

11.1 Editing Tracks

Each track has an editor that can be opened using the Edit button located on the right hand side of the track. MIDI tracks are capable of editing individual events when viewed as Pianoroll, Score or Drum (see MIDI Event Editing). The Controller Editor can be used to edit MIDI controllers like Volume or Sustain.

Common track editor buttons

Track Editors feature the following buttons:

- **Undo:** Undo edit.
- **Redo:** Redo an edit that was undone previously.
- **Edit:** Shows an Edit Control window. Using this window volume changes, fades etc. can be applied to the selected part. Edit Controls can have different features on different editors.
- **Delete:** Deletes the selected part.
- **Copy:** Copies the selected part to the clipboard.
- **Paste:** Paste from the clipboard to the editor. The data on the clipboard will be placed at the current transport position (that's where the needle is).
- **Sel All:** Selects the whole track.

The More button offers:

- **Cut:** Copies the selected part to the clipboard and then deletes the selected part.
- **Merge Paste:** Works like Paste, but existing data is not deleted.
- **Repeat:** Repeats the selected part a number of times.
- **Export:** Save the selected part to a new file.

Moving audio or MIDI between tracks.

Data can be copied to another track by dragging and dropping, or by using the clipboard functions. In either case MultitrackStudio automatically converts between mono and stereo audio if necessary. MIDI is converted to audio and vice versa automatically as well. Audio to MIDI conversion works with monophonic (ie. just one note sounds at a time) audio only. The reliability of the note recognition process depends on the audio signal. Some editing will typically be necessary to fix some errors.

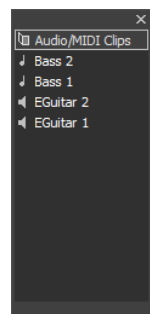
MIDI to audio conversion makes use of a software instruments. This software instrument appears on the Edit Control window of the receiving track.

Using an editor's Cut, Copy and Paste options you can move or copy a part to this or another editor. This process uses the clipboard. MultitrackStudio doesn't use the operating system clipboard, but temporary files instead.

Audio/MIDI Clips

Clips (pieces of audio or MIDI) can be stored on the Clip Shelf. The clip shelf appears upon clicking the Studio menu's Show Clip Shelf option.

Pieces of audio or MIDI can be dragged from track editors to the clip shelf and vice versa. Clips can be removed by dragging them to the Garbage Bin in the bottom left corner of the window.



Clip Shelf

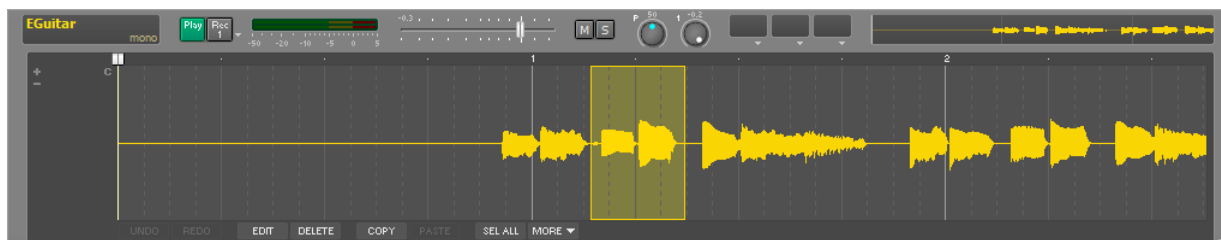
Dropping audio/MIDI files on track editors

Audio and MIDI files can be dragged from File Explorer (Windows) / Finder (Mac) to a track's editor. Some plugins allow dragging audio or MIDI from their user interface to a track editor as well. The sample rate of audio

files will be converted to the song's sample rate if necessary. "ACIDized" wav files will be converted to the song tempo.

11.2 Editing Audio Tracks

The Edit button shows/hides the track's editor. The editor shows a graphical representation of the audio signal. A part of it can be selected using the mouse (press left button and drag).



Audio track (mono) with editor

The two channels of a stereo track will be displayed separately. Editing just one channel of a stereo track is not possible.

At the bottom of the editor the common editor buttons appear (see Common Editor Features).

Understanding audio editing

Audio editing is always non-destructive. This means that the file containing the original recording remains unaffected. When an audio file is being edited for the first time a .aem file will be created. This file contains a reference to the original audio file. It can contain references to one or more edit files as well. An edit file replaces a part of the original file. Edit file names look like "trackname - Edit123456.wav", where 123456 is a unique sequence of random characters.

Example: Guitar.gjm is being edited. Guitar.aem will be created. A file called "Guitar - Edit123456.wav" will be created (this file contains audio data). Guitar.aem contains information on what files to play when.

The files referenced by a .aem file can be viewed in a track's Properties window.

Note: Do not delete edit files manually in order to avoid losing edits or punch-in recordings. Use the Clean up Song Folder tool instead.

Crossfades are applied automatically in order to avoid clicks. The crossfades behave just like traditional tape splices.

Audio Edit Control

The Audio Edit Control, invoked by clicking the **EDIT** button located below the editor, can be used to manipulate the selected part in various ways.

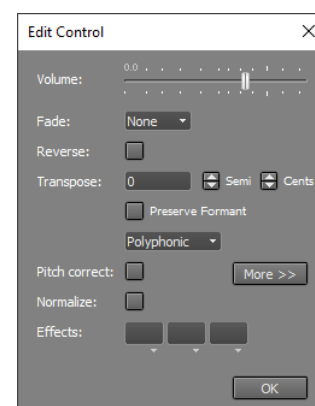
Audio Edit Controls have the following features:

- **Volume** fader: Changes the volume of the selected part. Note: In most cases it is better to use an Automated Fader effect to change volume levels of certain parts of a track, as this leaves the audio file untouched.
- **Fade**: Performs a fade in or fade out on the selected part.
- **Reverse**: Reverses the select part.
- **Transpose**: Pitch shifts the audio signal by the specified amount of semitones and cents. This features is powered by Zynaptiq's ZTX technology.

Preserve Format corrects the formant to make the transposed signal sound like the original (ie. to avoid the 'chipmunk' effect).

Two algorithms are available: **Polyphonic** and **Monophonic**. If the audio track is monophonic you can switch to Monophonic which is faster and offers better sound quality. The selected algorithm is used for stretching and warping as well.

- **Pitch correction**: see Vocal Pitch Correction.
- **Normalize**: Makes the selected part as loud as possible.
Note that normalizing a file introduces rounding errors and thus compromises sound quality, especially



Audio Edit Control window

with 16 bit files. The Master Limiter effect should be used to make the final mix as loud as possible instead.

- **Effect Slots:** The Effect Slots can contain audio effects.

These effect slots support ARA 2: VST3 plugins that support ARA 2 can be used here without having to transfer data to the plugin yourself. On Mac AU plugins can be used too, but VST3 is the format of choice for ARA.

The effect slots can be used to apply effects that are in the track itself:

1. In the track editor click SEL ALL.
2. Click EDIT to pop up the Audio Edit Control.
3. Drag the effect(s) from the track slots to the Audio Edit Control slots.
4. Optionally check if the track clips. If it does you can move down the Audio Edit Control's volume slider.

Dragging audio by a small amount

For best results the Ctrl key (Windows) / Option key (Mac) can be pressed while dragging audio by a small amount. This is best explained using an example:

Consider a word in a vocal track that's a bit too early. You can select the word (including some surrounding "studio silence") and drag it to the right. Now a piece of silence will appear on the left side of the selected part. This happens because the original word is removed. Better result may be obtained using the Ctrl key (Windows) / Option key (Mac). Now the piece is copied instead of moved, so the original word will stay in place. The result is that the background noise that appears just before the word is repeated once. This usually is less objectionable than plain silence.

Deleting audio

A part of an audio track can be deleted using the track editor's Delete button. However, it can be more convenient to take advantage of the Tweakable Edit feature: select the part you want to delete, click the Edit button and drag the Volume fader all the way left. Now the part is deleted, and you can fine-tune the edit by dragging and/or resizing the selected part. In critical cases, where the Delete function results in noticeable silence, you can consider pasting a recording of "studio silence" instead of using the Delete function.

Sometimes you might want to truncate a file destructively (eg. a master file which appears to be a bit too long), rather than turning it into a .aem file. You can rightclick an audio track's editor and choose "Truncate File" to truncate the file at the mouse position. Note however that this is a destructive operation which cannot be undone. Use a track editor's Export function instead if you feel you don't fully understand this.

Scrubbing

The editor has a built-in "scrubber", meaning that you can actually hear the part being selected. This can help in finding the desired location, in addition to the visual clues given by the editor. With tape recorders this was done by moving the reels manually ("reel rocking"), now it can be done by moving the mouse. The scrubber is active while moving the needle, while selecting a new part, and while resizing an existing selection.

The speed and pitch of the scrubbing sound are determined by the mouse movements. Spectral filtering is applied to avoid damage to loudspeakers or ears by excessive high or sub-low frequency content.

This feature can be turned on/off in the Preferences window.

11.3 Vocal Pitch Correction

The audio track editors feature vocal pitch correction powered by Zynaptiq's ZTX technology. It's typically easier to use the Vocal Tuner effect instead. Using the editor options can be a better choice in these situations:

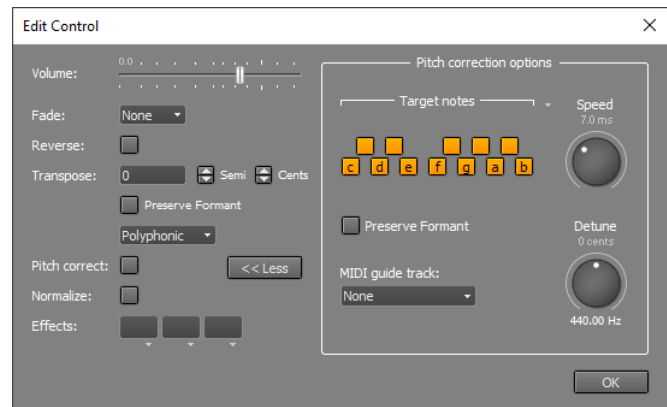
- The vocal track is stereo (the Vocal Tuner is a mono effect).
- You want to use a MIDI guide track (see below).
- You want to fix a small number of issues only.

Basic pitch correction

Pitch correction is very easy if the vocal track is just a little bit out of tune:

1. Select the part you want to process in the track's editor.
2. Click the editor's Edit button to pop up the Audio Edit Control.
3. Click the Pitch Correction button.

The **More** button shows more pitch correction controls. **Speed** controls the speed of the pitch correction. If it's fast the result will sound synthetic (the "Cher effect"). If it's too low the first part of a note may not be fully pitch corrected. **Detune** can be used if the song isn't in concert pitch.



Audio Edit Control, Pitch correction options opened

Excluding notes

If the vocal track has severe pitch problems you may find that the Basic pitch correction method produces the wrong notes. That happens if the vocals are so much out of tune it's closer to a neighboring note than to the intended note. You can exclude notes to solve this problem:

1. In the Audio Edit Control click the More button to show the "Pitch correction options".
2. In the "Target notes" section you can turn off notes which aren't in the selected vocal part. After applying pitch correction the vocal track will have "on" notes only. Clicking the down arrow pops up a menu which offers various presets like major and minor scales.

Changing the melody

If excluding notes doesn't give you enough flexibility, or if you want to change the melody, you can use a MIDI track to specify the notes. If you don't have a suitable MIDI track already you can use the built-in audio to MIDI conversion feature to create a MIDI track:

1. Add a MIDI track using the "Add Track" menu.
2. Open the MIDI track's editor and the vocal track's editor.
3. In the vocal track editor select the part you're interested in, drag it to the MIDI track editor and drop it there.

Now you can use this MIDI track to guide the pitch correction:

1. In the Audio Edit Control make sure the "Pitch correction options" are visible.
2. Select the MIDI track in the "MIDI guide track" box.

If you're not happy with the results you can edit the MIDI track. Then go to the Audio Edit Control, the changes will now be applied automatically.

Preserve Formant can be used if the pitch changes more than approx. a semitone.

Note: the "Target Notes" section can still be used while using a MIDI guide track, but it only affects the parts where no MIDI notes are playing.

11.4 Editing MIDI Tracks

The Edit button on the righthand side of the track shows/hides the track's editor. The editor can show the MIDI notes in three different ways: Pianoroll, Score and Drum. The tabs on the right (Piano/Score/Drum) can be used to switch between these editors. The default editor is Pianoroll, this can be changed in the Preferences window.

All three editors can edit MIDI as if it were audio, and they can edit the MIDI notes themselves as well. This section deals with editing MIDI as if it were audio, the next sections cover editing notes and controllers.



MIDI track with pianoroll editor

At the bottom of the editor the common track editor buttons appear (see Common track editor buttons). Editing actions, like paste, delete or undo, affect both notes and controllers.

MIDI edits are not written to disk immediately. When a track is closed (this also happens when the song is closed) a window appears asking whether to save the changes or not. If you want to save the changes explicitly you can use the File Options Menu's **Save** option.

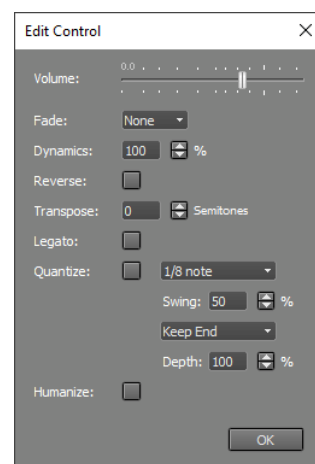
MIDI tracks have built-in scrubbing features similar to audio tracks.

MIDI Edit Control

The MIDI Edit Control, invoked by clicking the editor's **Edit** button, can be used to manipulate the selected part in various ways.

MIDI Edit Controls have the following features:

- **Volume** fader: Changes the volume of the selected part.
- **Fade**: Performs a fade in or fade out on the selected part.
- **Dynamics**: Compress (0..100%) or expand (100..400%) the dynamic range of the notes.
- **Reverse**: Reverses the select part.
- **Transpose**: Transpose all notes in the selected part by a number of semitones.
- **Legato**: Note durations are adjusted to make note-to-note transitions smoother. Can be used to make 'smooth' instruments like violins sound more natural.
- **Quantize**: Notes that are slightly too early or too late are moved towards the correct positions. The amount of correction can be from 5% up to 100% ('hard quantizing'). The box below the "%" box sets the resolution. Three categories are available:
 - **Normal**: 1/1, 1/2, 1/4, 1/8, 1/16 or 1/32 note.
 - **Swing**: 1/8 or 1/16 note. The 2nd, 4th, 6th (and so on) notes of a bar are delayed. The swing percentage can be 52..71% (50% means "no swing").
 - **Triplet**: Triplet of 1/4, 1/8, 1/16 or 1/32 notes.
- Three types of quantization are available:
 - **Full**: quantize both note-on and note-off.
 - **Keep Note-Off**: quantize note-on, don't touch note-off. This is the default type.
 - **Keep Duration**: quantize note-on, move note-off to keep duration the same.
- **Humanize**: Shifts note events a (small) random amount of time, and changes the note volumes slightly.



MIDI Edit Control window

11.5 Editing Notes

The Pianoroll, Score and Drum editors not only can select a part of a track (like an audio editor), they can select or add notes as well. You can use this to correct the odd mistake, but you can also use it to build tracks from scratch.

The Pianoroll, Score and Drum editors share many common properties:

Editor Modes

The editor can work in one of three modes:

- **Select Part:** works just like an audio editor, ie. the mouse doesn't "see" the notes at all.
- **Select Notes:** clicking a note selects it, pressing the mouse in "empty space" and moving it lassoes notes. Selected notes can be moved.
- **Add Notes:** clicking in "empty space" adds a note, clicking a note selects it. Moving the selected note(s) is possible as well.

The buttons in the bottom left corner can be used to switch mode. The Alt key (Windows) / Option key (Mac) can be used to temporarily switch between Select Notes and Add Notes mode: in Select Notes mode you can add a note using this key, in Add Notes mode you can lasso notes using this key.



Mode buttons

Adding Notes

In Add Notes mode notes can be added by clicking the mouse.

Selecting Notes

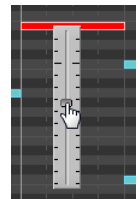
In Select Notes or Add Notes mode a note can be selected by clicking it. Multiple notes can be selected by keeping the Ctrl key (Windows) / Command key (Mac) down while clicking a note. In Select Notes mode you can also lasso a rectangular region. Selected notes appear in red.



Lasso in action

Moving Notes

Notes can be moved using the mouse. The editor will scroll automatically if the mouse approaches any of the four sides of the editors. Notes that are being added, dragged or selected are audible. This feature can be turned on/off in the Preferences window.



Note Velocity

Changing Note Velocity

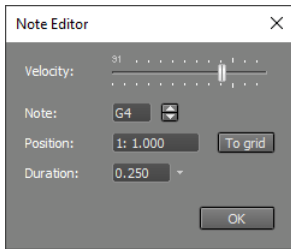
The Note Editor (see below) can be used to change a note's velocity (volume). It can be done faster using the 'V' mouse modifier key (see Mouse Modifiers): press the left mouse button while keeping the 'V' key down. A vertical slider pops up which can be controlled by moving the mouse. The slider disappears upon releasing the mouse button.

Note Editor

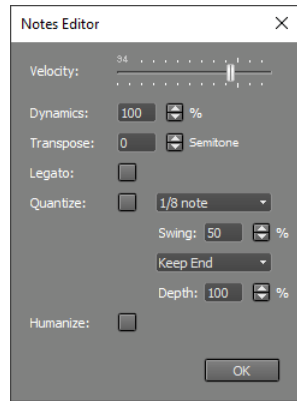
If a single note is selected clicking the **Edit** button will pop up the Note Editor. Alternatively you can double-click the note.

If the Time Scale is set to bars the **Position** of the note is expressed in bars and beats, and the **Duration** of the note is expressed in musical notes (ie. 0.25 is a quarter note). Values like '1/4' can be typed in the Duration box as well. The down array next to the Duration box can be used to select a value from a predefined list.

The Edit button pops up a slightly different window if multiple notes are selected.



Note Editor



Multiple Notes Editor

Popup menus

Rightclicking (Windows) / Ctrl-clicking (Mac) a note pops up a menu offering Edit and Delete functionality. Doing the same in 'empty space' pops up a menu to add notes or chords.

11.6 Pianoroll Editor



Pianoroll editor

In Add Notes mode notes can be drawn by moving the mouse horizontally while keeping the left mouse button down. Clicking the mouse without dragging it will add a note having the same duration as the last one. Notes can be dragged or resized using the mouse in both Select Notes and Add Notes mode.

The name of the chord constituted by the selected notes will be displayed in the editor while selecting.

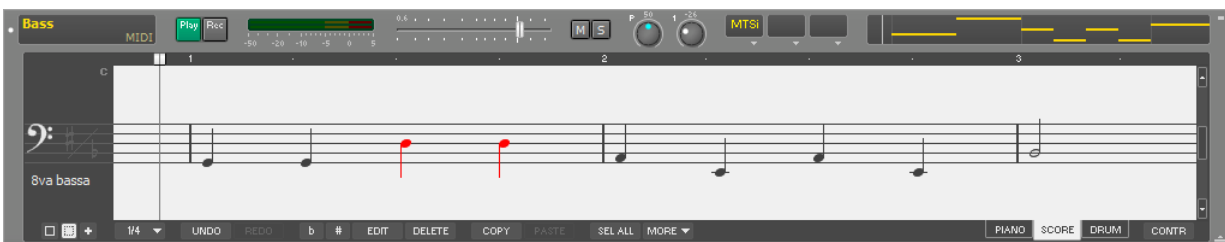
Right clicking a note pops up a menu to (among other things) split the note or to join it with the previous note.

Step Recording

The Pianoroll editor can be used for step recording. If the vertically oriented piano on the left is clicked while the Ctrl key (Windows) / Command key (Mac) is pressed, the corresponding note will be recorded at the current transport position. Also, the transport position will move to the end of the new note. The duration of the new note equals one step of the current grid. You can add the Alt key (Windows) / Option key (Mac) key to go one step to the left before the note is added, so you can easily add a couple of notes at the same position.

Clicking while pressing the Shift key adds a rest (ie. the transport position moves to the right). You can add the Alt key (Windows) / Option key (Mac) key to go one step to the left instead.

11.7 Score Editor



Score editor

Adding Notes

In Add Notes mode notes can be added by leftclicking the mouse. The dropdown list next to the Add Notes mode button determines the duration of notes being added. Keeping the S or F key down while clicking the mouse adds or subtracts a semitone ('Sharp' or 'Flat'), so you can add notes that are not in the current scale directly.

The **b** and **#** buttons can be used to transpose the selected notes one semitone down or up. Right clicking a note pops up a menu to (among other things) join the note with the previous note.

In order to improve readability notes will be moved horizontally, so notes are spaced nicely without any overlaps. This means that, unlike all other MultitrackStudio editors, the notes don't necessarily line up visually with other tracks. The bar lines, however, always do. In Add Notes mode a one-bar helper grid will be displayed to help you find the position of new notes. You may have to zoom in a bit in order to be able to put short notes (16th, 32nd) at the place you want them to be.



Helper grid

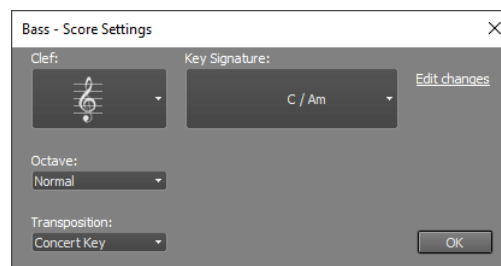
The Score editor has a resolution of 1/32nd note. It snaps to the grid automatically, regardless of the Snap setting. Although it is possible to use the Score editor when the time scale is set to seconds, this obviously doesn't make sense.

Tuplets

Triplets, quintuplets and septuplets are recognized automatically. Tuplets can be added by right clicking the editor, and picking one out of the items in the menu's Add Tuplet section. Alternatively you can add a note and use the 'More...' button's 'Split in equal parts' option.

Clef and Key Signature

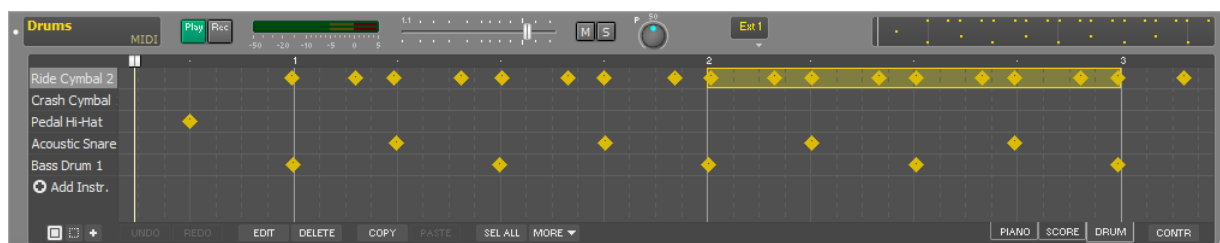
The section on the left shows the clef and the key signature. Clicking this section pops up the editor's Score Settings window. In this window you can choose the **clef**, possible values are Bass, Treble, both Bass and Treble, Tenor and Alto. The **Octave** setting can be used for instruments which are notated one octave off. The 8va bassa setting is suitable for bass guitar and double bass, for example. The **Transposition** settings can be used for transposing instruments like Bb clarinets. When both Bass and Treble staves are used the **Split Point** setting determines which notes appear on either the Bass or the Treble staff. The Octave and Transposition settings aren't available in this case.



Score Settings

The **Key Signature** is a value ranging from 7 flats up to 7 sharps. Key signature changes throughout the song can be programmed after clicking the **Edit Changes** link. Key signature changes always occur at the start of a bar. When any changes are present the left hand section shows the key signature of the first bar that's (partially) visible. The key signature settings affect all MIDI tracks. It is stored in the MIDI files.

11.8 Drum Editor



Drum editor

The Drum Editor features a horizontal strip called a Drum Instrument Editor for each instrument used. The drum instrument's name is shown on the left hand side of the Drum Instrument Editor. A different instrument can be selected upon doubleclicking it. New instruments can be added by clicking **Add Instr.** Every instrument corresponds to a MIDI note (eg. C3 is a bass drum, E3 is a snare and B4 is a hihat in General MIDI). The note corresponding to the instrument will be shown in case no name is available. Drum Instrument Editors work like

any other MultitrackStudio editor. Drum instruments can be reordered by dragging the instrument names (on the left) up or down.

In Add Notes mode notes can be added by leftclicking the mouse. Notes appear in the editor as diamond shapes. The note's volume is indicated by a small black dot (the higher the dot the higher the volume).

In Select Part mode you can select a part of the track by moving the mouse vertically while selecting a part. If the mouse ends on the same instrument as it started only this instrument is selected, if it ends on a different one all instruments are selected. The **Select All** button selects only the instrument if a part of an instrument is selected, it selects all instruments otherwise. You can switch from 'one instrument' mode to 'all instruments' mode and vice versa by clicking an instrument's name.

If audio is drag-and-dropped from an audio track editor to a drum instrument editor only beats are detected (no pitch). You can, for example, tap a drum break on the table, record it as audio and move it to a drum editor.

Selecting similar notes

A menu appears if you rightclick a note. It has a **Select similar notes** option which selects all similar notes in similar bars. "Similar note" means a note at the same position (eg. at beat 1). "Similar bar" means a bar having the same time signature. You can use this feature to, for example, select all hihat hits which are on beat 1 and make them all a bit louder.

If multiple notes are selected "Select similar notes" will work on the selected notes only. You can, for example, lasso all choruses and then select a particular note within the choruses.

11.9 Controller Editor

MIDI instruments can use controller events to alter the sound they generate. A track editor's **CONTR** button opens/closes the Controller Editor. The editors appear in tabs, which can be added or removed using the **VIEW** button. The All submenu lists all controllers except for the per-note controllers, which have their own submenu. The VIEW menu itself lists all controllers that are supported by the MIDI instrument. This isn't possible for External MIDI Instruments and plugins, for those a few commonly used controllers appear instead.

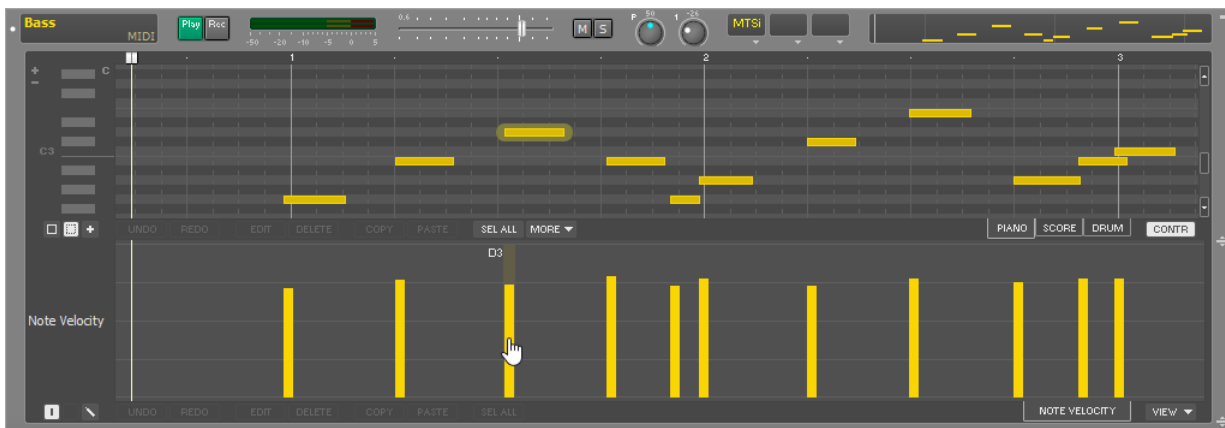
Tip: type 'used' in the All or Per Note submenu search box to see the controllers that have content in their editor only. Type 'checked' to see the items that have a check mark, and hence appear as a tab.

Note: the controller editor's Undo/Redo buttons do exactly the same as the main editor's, ie. both work on both note and controller edits.

Note Velocity Editor

The editor that appears by default actually doesn't control a MIDI controller but note velocities instead. Note velocities are represented by vertical bars which can be moved up or down with the mouse. A halo appears around the corresponding note in the pianoroll/score/drum editor so you can easily see which note the bar belongs to.

The Mode buttons in the bottom-left corner offer Bar mode, to move bars up and down, and Draw mode, to draw a curve to which the bars will be adjusted.



Note Velocity Editor

A similar 'Note Off Velocity' editor is available as well.

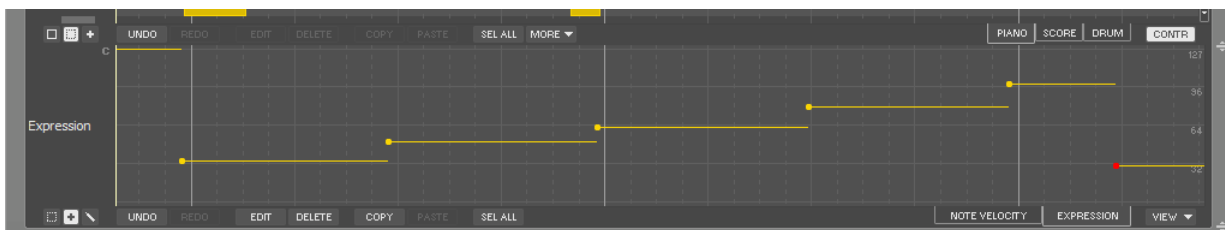
Tip: with the Drum editor you can make just a single instrument appear in the note velocity editor by clicking an instrument name on the left (so it's highlighted).

Controller Editors

All controller editors use dots to represent the controller value. They work just like Automated Fader effects.

The VIEW menu lists pitch bend, aftertouch and all MIDI controllers except for the data entry and RPN controllers (#5, #38 and #96...101).

Tip: in MultitrackStudio Instruments and External MIDI Instrument windows you can rightclick a control to make the corresponding controller editor visible.



Controller Editor

Editors are available for NRPN parameters too.

Pitch Bend Range

The Pitch Bend editor features a small button labeled **RNG=..** in the bottom left corner (see picture below). You can click it to change the pitch bend range. Valid values are 0..96 semitones (but most synths support higher values up to 24 semitones only). "0" prevents MTS from sending pitchbend range messages, you can use this if these messages interfere with a plugin's MIDI implementation.

External MIDI Instruments won't pick up the new value until the transport is restarted. Other instruments will pick up the new value when a pitch bend event appears.

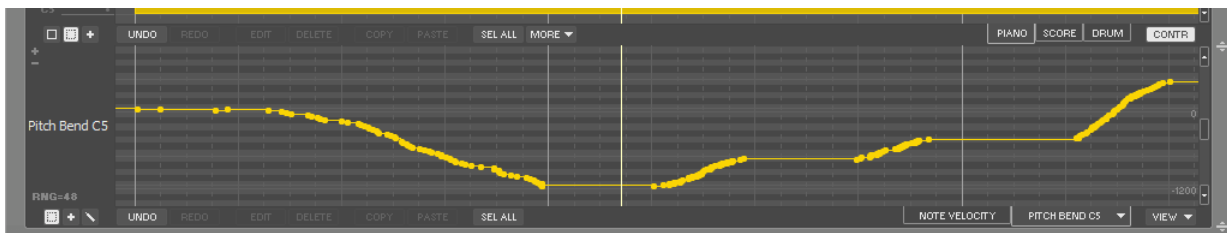
Note: External MIDI Instruments and AU / CLAP / VST instrument plugins may not support changing the pitch bend range.

Per-Note Controller Editors

The VIEW menu's "Per Note" section lists MIDI 1.0 poly aftertouch and MIDI 2.0 per-note pitch bend and registered controllers. All MIDI 2.0 registered per-note controllers are available, except for #3 (absolute pitch).

The picture below shows per-note pitch bend for note C5. The view changes automatically when a note is selected: if you click a D4 in the pianoroll the per-note controller editor switches to D4 for example. Alternatively you can click the down arrow on the tab below the editor and pick a note from the list.

All editors update the per-note controllers automatically: whenever notes are moved, deleted etc. the associated per-note controls are updated.



Per-note Pitch Bend Editor

The per-note pitch bend editor has a pitch bend range setting, just like the channel pitch bend editor. This value is the same for all notes. It defaults to 48 semitones, which is the default value MPE uses.

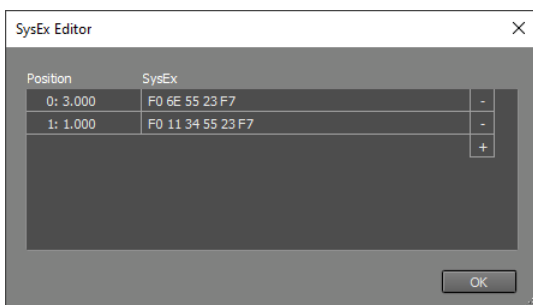
SysEx Editor

SysEx (System Exclusive) messages appear in the SysEx editor.



SysEx Editor

The EDIT button pops up a list of all SysEx messages. You can modify them or add new ones. SysEx messages always start with F0 and end with F7.



SysEx editor window

Note: SysEx events aren't tied to a MIDI channel. If a certain SysEx does contain a channel field you have to update it manually if you change the track's MIDI channel in the External MIDI Instrument window.

Tip: make sure messages like "XG On" are at position 0 (the first beat of the first bar). This allows Export MIDI Tracks to put it before any other messages.

The SysEx editor also supports "Sequencer specific" meta events. These events start with FF7F. They'll be saved in (exported) MIDI files. They won't be sent to MIDI instruments (the MIDI specs don't allow for that).

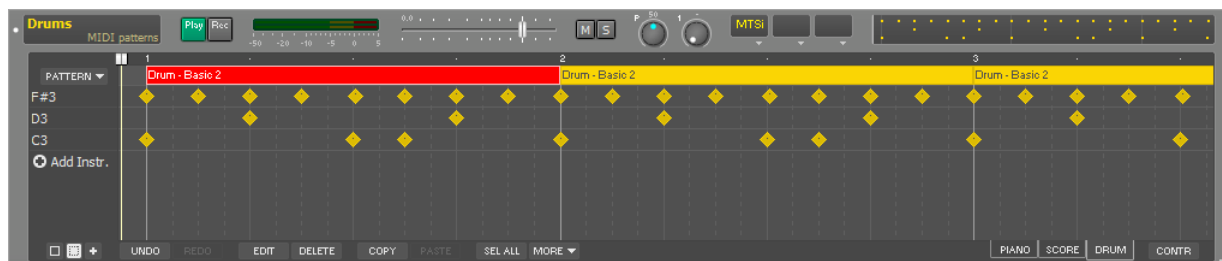
11.10 MIDI Pattern Editing

A pattern is a small piece of MIDI music. It typically has a size that makes sense in musical terms (eg. a bar, two bars, or even a verse).

The most important feature of the pattern editing concept is that there can be multiple instances of a pattern, and changing the pattern will change all instances. For example: you can change a pattern-based track's drum beat by changing just a few notes.

A plain MIDI track editor's MORE menu has an Enable Patterns options which turns the track into a pattern track. Alternatively, you can use the Add Track menu's Add MIDI Track option to create a new pattern-enabled MIDI track (make sure to set the Type box to '.mpt').

A pattern-enabled MIDI track features a Pattern Bar above the track's MIDI editor. Here you can add and move patterns.



Drum track with patterns

Adding Patterns

To create a new pattern click the PATTERN button and choose New Pattern. If something is selected in the track editor the new pattern will match this area, and any selected notes will be moved to the new pattern. If nothing is selected a new pattern will be created at the current transport position.

The PATTERN button also provides access to preset patterns. Clicking one adds it at the current transport position. Alternatively you can drag-and-drop presets to the Pattern Bar. You can create your own preset patterns using the Pattern Editor.

Tip: you can create a new pattern by dropping MIDI or audio on the Pattern Bar.

Editing the pattern arrangement

All editor buttons (Edit, Delete, Copy, Paste etc.) work as expected when one or more patterns are selected in the Pattern Bar. You can select a single pattern by clicking it. Additional patterns can be selected by clicking while pressing the Ctrl key (Windows) / Command key (Mac) key.

A new instance of the selected pattern(s) can be created in three ways:

- Drag the pattern while keeping the Ctrl key (Windows) / Option key (Mac) down copies the pattern.
- Use copy-and-paste.
- Use the Repeat option.

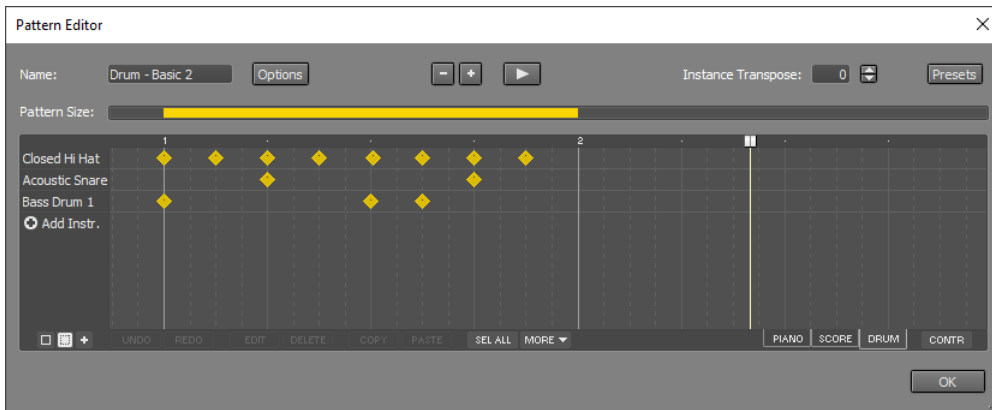
The track editor can be used as if it's an ordinary MIDI track. Patterns that are in the selected area will be moved/removed when the selected area is moved/deleted.

Editing individual notes is also possible. If a note that belongs to a pattern is modified the modifications will be remembered and they'll be applied again if the pattern itself is changed using the Pattern Editor. This works in an additive manner: the offsets will be added to the note's position, duration, pitch and velocity.

When a pattern is selected the EDIT button will invoke the Pattern Editor. Alternatively you can double-click a pattern.

Pattern Editor

The Pattern Editor can be used to edit a pattern.



Pattern Editor (showing a one bar drum pattern)

Any edits will be applied to the track immediately. You can use the **Play** button to loop the pattern, so you can hear the results of your edits live.

The **Name** box contains the name of the pattern. All instances of the pattern share the same name. This name doesn't mean anything to the program, ie. changing it to another pattern's name won't make the two patterns identical. Using the same name for different patterns obviously is a bad idea.

The **Pattern Size** bar determines the size of the pattern as it will appear in the track's editor.

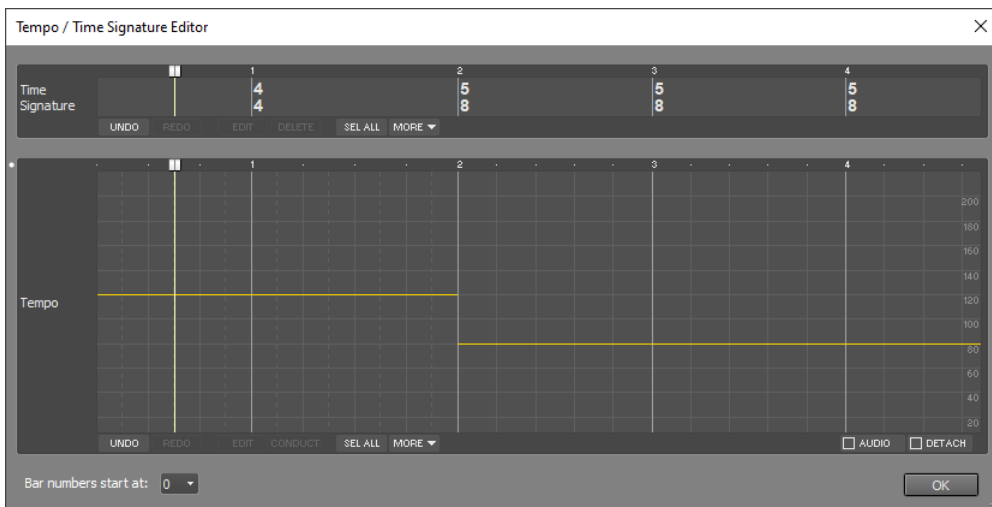
The **Options** button will bring up a menu with these items:

- **Color:** The color of this pattern (applies to all instances)
- **Clone:** Create a new Pattern that is identical to this one. All other instances of the original pattern will remain untouched if you edit this one.
- **Reset events for this instance:** clears all changes that have been made to this instance's events using the track editor.
- **Import:** Import a pattern from a MIDI file.
- **Export:** Export the pattern to a MIDI file.

Instance Transpose can be used to transpose this instance by a number of semitones. If, for example, the pattern is in C, you can use this feature to transpose a couple of instances to F or G.

11.11 Tempo/Time Signature Editing

The Tempo / Time Signature Editor window contains the Time Signature Editor and the Tempo Editor. It also lets you set the number of the first bar.



Tempo / Time Signature Editor window

The Tempo / Time Signature Editor window is available only if at least one track contains a MIDI file. That's because time signature and tempo information is stored in the MIDI files.

Time Signature Editing

The Time Signature (nominator/denominator) of a selected part can be changed using the Edit button. Editing the time signature does not affect the actual notes or controller values of MIDI tracks, use the Song Editor instead to achieve that.

The Paste and Repeat buttons take into account the global Ripple setting. The Cut and Delete buttons always act as if Ripple is on (ie. the righthand part shifts left if you delete a part).

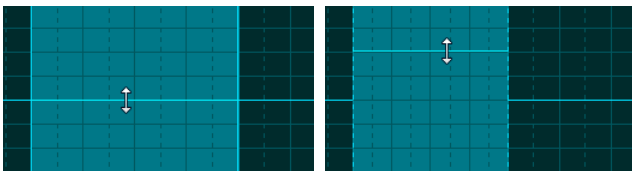
Tempo Editing

In Tempo Editor you can change the tempo (beats per minute, BPM).

By default the tempo editor affects MIDI tracks only. If the **Audio** button is checked audio tracks are affected as well. It's recommended to make sure any monophonic audio tracks use the monophonic transpose algorithm. Use their editor's EDIT button to access this option (a part needs to be selected for this button to be enabled). The Tempo Editor features tweakable edits, this helps in avoiding stretching audio parts multiple times.

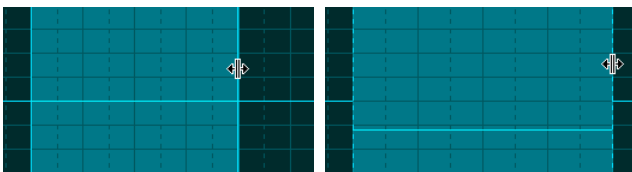
Note: The tempo editor can't be used while the transport is running.

The tempo of the selected part can be changed by dragging the line up or down:



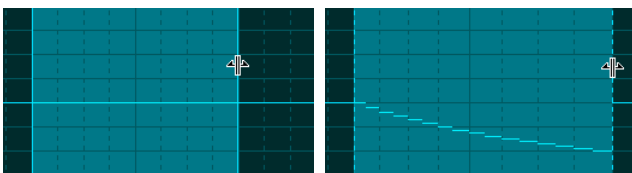
Dragging line vertically, before Dragging line vertically, after

If the right hand side of the selected part is dragged while keeping the Alt key (Windows) / Command key (Mac) down the tempo will be adjusted accordingly:



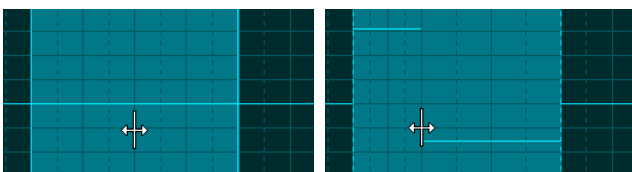
Stretch, before Stretch, after

Add the Ctrl key to create an accelerando or decelerando:



Stretch Accelerando, before Stretch Accelerando, after

Any grid line in the selected part can be moved if the Alt key (Windows) / Command key (Mac) is down:

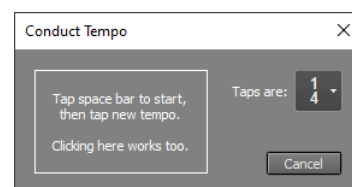


Warp, before Warp, after

The **Edit** button pops up a window which lets you type a BPM value, tap the tempo on the space bar or click the tempo on the **Tap tempo** box.

The **Conduct** feature lets you tap a new tempo. You can use this to create accelerandos etc. It works like this:

1. Select a part in the tempo editor.
2. Click the Conduct button. The Conduct Tempo window appears.
3. Press the space bar to start. Transport starts at least one bar before the selected part automatically.
4. Start tapping the beat on the space bar.
5. When the start of the selected part is reached the music will mute, and you can continue tapping the tempo for the selected part.
6. When you've tapped enough beats transport will stop, and you can click OK to close the Conduct Tempo window.



Conduct Tempo window

The **More** button gives you access to lesser used features like Delete, Cut, Copy, Paste and Repeat. Paste and Repeat take into account the global Ripple setting. Cut and Delete always work in Ripple mode (ie. the righthand part shifts left if you delete a part).

Edit operations affect the following items:

- MIDI tracks (the MIDI file, Automated Fader effects and automation data)
- If the Audio button is checked: Audio tracks (the audio file, Automated Fader effects and automation data)
- Automated Fader effects, Vocal Tuner effects and automation data of Groups, Effect Returns and Master sections are affected only if either the song contains no audio tracks or the Audio button is checked.

The **Detach** button detaches the tracks from the Tempo Editor. In this situation the tempo information can be edited without affecting the notes in the tracks. This feature can be used to match the tempo to a 'freestyle' recording, or to go from, for example, 100 measures at 120 BPM to 50 measures at 60 BPM.

Note: The Click Track and Chord Tracks will be updated even if Detach is engaged. These tracks follow the tempo (and time signature) by definition.

Bar Numbers

The **Bar numbers start at** box determines the number of the first bar. The default value is 0, so music starts at bar number 1 if the first bar is used for count-in. You can choose 1 if there's no count-in, or -1 if there's a two bar count-in. The lower limit is -9, which equals a ten bar count-in.

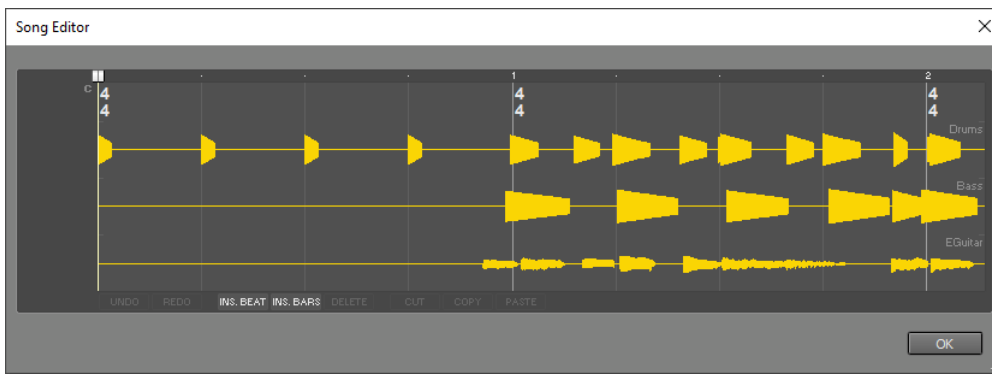
11.12 Song Editor

The Song Editor can be used to insert or remove parts of a song. It always works in 'Ripple mode', regardless of the Ripple button at the top of the main window. The song editor works in 'bar mode' if there are any MIDI tracks, regardless of the Bars button at the top of the main window.

The song editor affects "everything":

- Audio / MIDI files opened in the tracks
- Tempo and Time Signature
- Key Signature (as seen in Score editors)
- Chords and Lyrics
- Markers
- Automated Fader effects
- Automation data (Pro edition)

The Song Editor can't be used while the transport is running.



Song Editor window

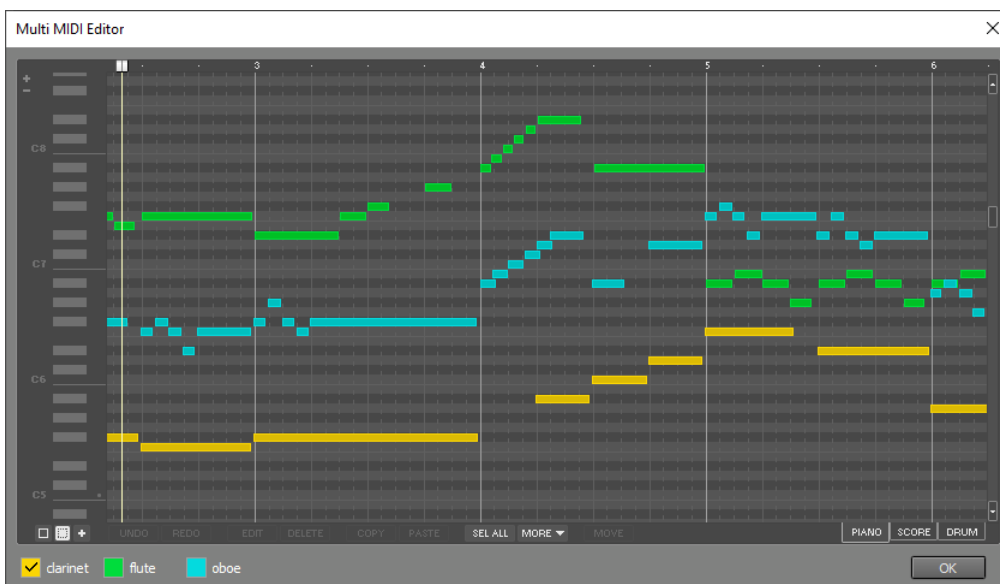
11.13 Multi MIDI Editor

The Multi MIDI Editor lets you work with multiple MIDI tracks in a single editor. It can be used to work on arrangements for string or woodwind sections etc.

The Multi MIDI is available from the Editing Options menu. You can choose to show MIDI tracks of a certain color, MIDI tracks that have their editor opened or all MIDI tracks. If you use suitable colors for your instrument groups you can open a group in the Multi MIDI Editor quickly by rightclicking a track's Edit button and choosing **Open same color MIDI tracks in Multi MIDI Editor**.

Pianoroll

The colored buttons at the bottom represent the tracks that are visible in the editor. The active one is larger and its text is bold. Any new notes you add will be in the active track. Selected notes can be moved to the active track using the **Move** button. In case of overlapping notes the active track will appear in front of the others.



Multi MIDI Editor window, showing 3 tracks in pianoroll view

Score

Each track gets its own staff (or a system of both bass and treble staves). Selected notes can be moved to another staff using drag-and-drop.

You can click the clef (on the left) and use the System Spacing setting to change the vertical distance between the systems. The note ranges are analyzed when the Multi MIDI Editor appears or on changing the System Spacing setting. You can manually make the program re-analyze the note ranges and adjust system spacing accordingly by picking the current setting from the System Spacing list. This may come in handy if you've added very high or low notes.



Multi MIDI Editor window, showing 3 tracks in score view

Drum

The colored buttons at the bottom only serve to show the names of the tracks. The drum instruments appear in the same order, and the notes appear in the corresponding colors. The Drum Instrument Selector, which appears on clicking the NEW INST button lists the instruments available in all the track's MIDI instruments. The track numbers, as they appear on the colored buttons, appear in the selector as well.

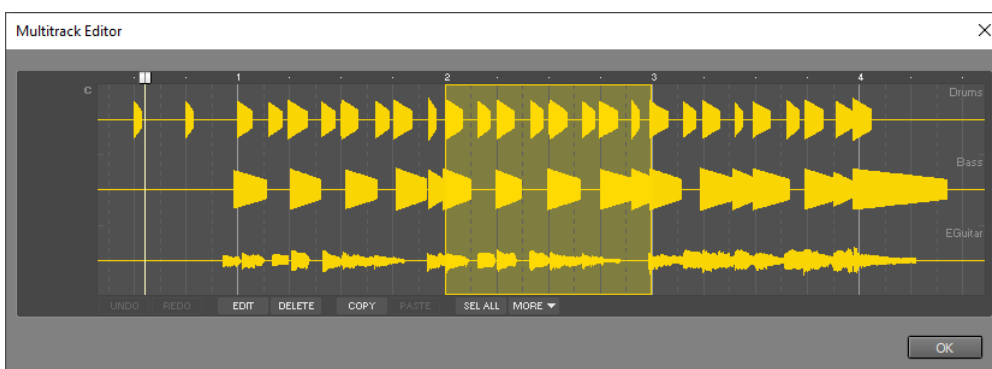
Edits in a single instrument are not tweakable, unlike a track's drum editor.

11.14 Multitrack Editing

Note: this feature is available in the Pro edition only.

Using the Multitrack Editor, multiple tracks can be edited simultaneously. The Multitrack Editor is available from the Editing Options menu. You can choose to show tracks of a certain color, tracks that have their editor opened or all tracks.

Hint: Use the Song Editor if you want to edit all tracks including tempo, automation and markers etc.



Multitrack Editor window, showing 3 tracks

The Multitrack Editor works just like a track editor. It features all common track editor buttons except Export. The Multitrack Editor's Edit Control's features depend on the types of the tracks being edited. The control can be an Audio Edit Control, a MIDI Edit Control or one that contains just a Volume fader and Fade, Reverse and Transpose options.

The Multitrack Editor can't be used while the transport is running.

11.15 Chords and Lyrics

Chords and Lyrics can be entered in the Chords Editor and Lyrics Editor respectively, which are available from the Editing Options menu. These Chords and Lyrics can be displayed in almost any editor, which makes it much easier to see "where you are". They can be made visible using small buttons labeled C and L which appear on the left hand side of the editors. The Chords appear at the top of the editor, the Lyrics appear at the bottom. The lyrics and/or chords can be displayed in the Lyrics Prompter too.

Entering Chords is pretty easy, since you probably have them on paper or in your head anyway. Entering Lyrics is a bit more work because it's not so easy to decide where the bars and beats are. It's recommended to type the lyrics first, and then add the bar separators (and optionally the beat separators).

Bars are separated by '|' characters. You can type '\' instead for convenience. Inside a bar, beats are separated by '-' characters. The chords editor understands multiple chords without '-' separators if the number of beats in the bar can be divided by the number of chords. You can, for example, use '|C F|' instead of '|C - C - F - F|'.

Here are examples of chords and lyrics:

```
|| empty bar for count in

Intro:
| C | Am | F | Gsus4 G |
| C | Am - Am - Am - Am/G | Bb | G7 |
```

Chords example

```
||
| The sky | is blue | and - I | love -- you |
| It's true | it's true | it's true | it's true|
```

Lyrics example

Note that any text which is not in a bar is ignored, and thus can be used to add comments. Spaces can be used anywhere you like. However, spaces aren't allowed in chord names (ie. you must type 'Gsus4' instead of 'G sus 4').

Since MultitrackStudio stores the tempo in MIDI files, there must be at least one MIDI track in a Song in order to be able to align the chords and lyrics with the tracks. See [Extracting tempo from track](#) if your song is audio only.

The lyrics editors **Copy** button copies the lyrics to the clipboard without any bar and beat separators. You can paste the lyrics in a text editor and print them.

The chords editor's **b** and **#** buttons can be used to transpose the selected chords. Any bass notes (separated from the chord by a slash, eg. C/B) will be transposed as well.

Creating MIDI Tracks from Chords

Using the Add Track menu's **Chord Track** option you can create MIDI tracks from the chords. Chord tracks can be used to make sure the chords are OK, or to quickly create backing tracks for practicing a guitar solo etc. Bass, Piano, Organ, Strings, Guitar, Banjo and Drums tracks can be created.

Chord tracks are updated automatically if you edit the chords or change the time signature etc. You can rename a track to keep it from being updated (remove the '(Chord)' part).

The following chords can be used: C, Cm, C6, Cm6, C7, Cm7, Cmaj7, Cmmaj7, Cadd9, Cmadd9, C9, Cm9, C11, Cm11, C13, Cm13, Csus2, Csus4 (or Csus), Cdim, Caug, Cdim7, Cm7b5. Any key can be used (Bbm, D7, C#maj7 etc.). Unrecognized chords will be underlined in red.

A chord track's Properties window (click the file name box) offers some options to control the generated parts. The **Pattern** box defines the rhythm pattern. Each beat can be in one of these states:

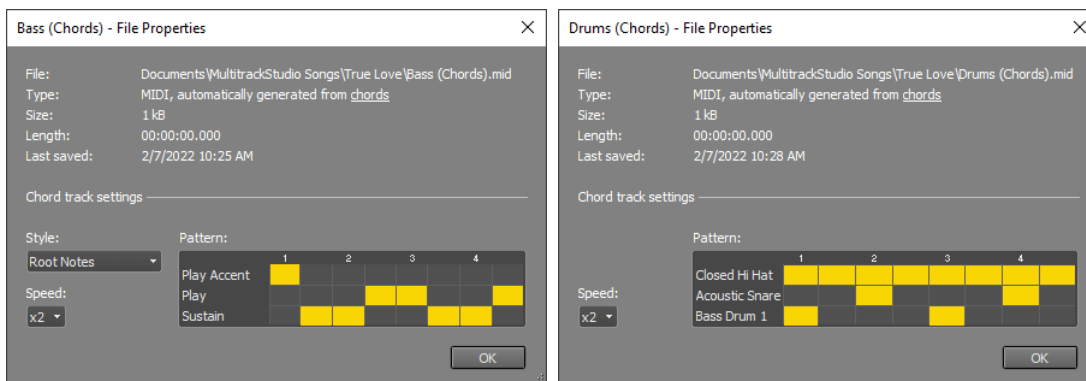
- **Play:** new notes are played.
- **Play Accent:** new notes are played, a bit louder.
- **Sustain:** notes played in an earlier beat keep sounding.
- **None of the above:** the beat is silent.

A drum track's Pattern box works differently: there are three instruments and you can hit them or not.

Speed controls the resolution of the Pattern box. x1, x2 and x4 equal 1/4, 1/8 and 1/16 notes respectively, x3 equals triplets.

Style offers options like 'Chords', 'Arpeggio' and 'Blues / Rock' depending on the instrument.

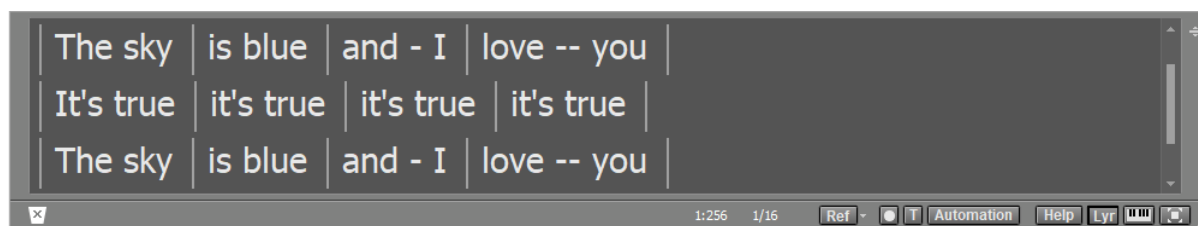
Tip: To hear the results of any tweaks immediately you can let the transport loop a couple of bars.



Chord track properties window (Bass)

Drums track pattern box

Lyrics Prompter



Lyrics Prompter

If any chords or lyrics are available a **Lyr** button appears near the bottom right corner of the main window. Clicking this button shows the lyrics prompter or hides it again. The lyrics prompter scrolls automatically if the transport is running, so it can be used to read the lyrics/chords while recording. Clicking a bar will move the transport position to this bar. Doubleclicking a bar will pop up the chords or lyrics editor and select that bar. The font size depends on the size of the lyrics prompter panel: if you make the panel taller the font will get taller as well.

If both chords and lyrics are available subtle C and L buttons appear on the left (see picture). Either or both can be displayed.

12 Devices

The audio and MIDI devices to be used by MultitrackStudio can be selected in the Studio menu's Devices window.

MultitrackStudio Pro supports up to 140 audio channels, up to four MIDI In devices and up to four MIDI Out devices. Lower editions support up to two audio channels, one MIDI In device and up to two MIDI Out devices.

Choosing an audio driver type

On **Windows** there are three audio driver types to choose from:

- **Windows:** Latency can be low, and it supports 'shared mode' so other apps can playback sound while MultitrackStudio is running.
- **ASIO:** Can only be used if the sound device comes with an ASIO driver. Latency can be very low. If your device comes with an ASIO driver you should use it. Be sure to try the Windows driver type if your ASIO driver causes system instability, or if it doesn't offer the sample rate you need. If your device doesn't come with an ASIO driver you should try the Windows driver type rather than use a generic ASIO driver.
- **Early Windows** is the last resort. It should work with any sound device, but latency is very high and there's no Soft Monitoring. Multichannel recording isn't possible using this driver type.

On **Mac** there's just one audio driver type: Core Audio.

Audio Output Control

The Audio Output Control (available from the Studio menu) can be used to set the properties (channel selection, levels etc.) of the audio output device. The controls depend on the audio driver type and devices used.

MPE MIDI Input

There's an MPE check box for each MIDI Input Device. MPE (MIDI Polyphonic Expression) uses separate MIDI channels for each note so each note can have its own pitch bend, brightness and aftertouch controls. MultitrackStudio maps these controls to MIDI 2.0 per-note pitch band / per-note brightness and MIDI 1.0 poly aftertouch respectively.

If an MPE keyboard sends RPN messages to change the MPE configuration, the MPE check box will be updated accordingly. MultitrackStudio may not even be running when your keyboard sends these messages, so you may have to switch it on yourself.

Note: do not use the MPE option if you don't have an MPE keyboard. There's no gain but many potential problems.

In most cases the incoming MPE data will go to MIDI channel 1. If an MPE keyboard sends a different configuration it could go to MIDI channel 16 or both 1 and 16 (two MPE zones).

MIDI Out Device Options

The Options button in the MIDI Out Devices section pops up the MIDI Out Device Options window. It contains settings regarding sync code and recording connections.

12.1 Windows Drivers

Note: this driver type is available for Windows only.

Windows drivers allow for low latency. Multichannel recording and playback is supported as well, provided the sound device driver supports this (Pro edition only).

In the **Audio In Device** section you can select the audio device that will be used for recording.

In the **Audio Out Device** section you can select the audio device that will be used for playback.

It's a good idea to use Audio In and Out devices that are on the same sound device. If they're not their sample rates probably aren't equal. This can be quite a problem, as recorded tracks will slowly go out-of-sync during playback.

Audio devices are opened in exclusive mode in order to ensure low latency. This means other programs can't use these audio devices while MultitrackStudio is running.

In Windows 10 (or newer) you can make the audio out device operate in shared mode using the **Shared mode** button. Shared mode allows other programs to playback audio while MultitrackStudio is running. Latency will be a bit higher, depending on the audio driver. MultitrackStudio will automatically revert to exclusive mode if shared mode can't be used for whatever reason.

The **Latency** box determines the time it takes before you hear the sound when playing MIDI soft instruments live or when using Soft Monitoring ('live effects'). You'll hear glitches if this settings is too low. MultitrackStudio has been designed to not let these glitches end up in the actual recording: If, for example, you record the Guitar Amp effect live using a low latency and you hear glitches while recording, the glitches won't be in the track and it will sound fine when you play it back.

Your sound device may not support latencies as low as the one you've selected. The actual latency appears if you hover the mouse over the Studio menu's Devices option.

The **No "pull mode"** button turns off "pull mode" (AKA "event mode"). "pull mode" works better, especially when CPU usage is high. You shouldn't need this option with Windows 10 or newer. If you do need it you might want to check if there's a better driver available for your device.

In the **MIDI In Devices** section you can select the device that is used for MIDI recording.

In the **MIDI Out Devices** section you can select the device that is used for MIDI playback. The 'Default' option uses the default Windows MIDI output device.

Audio Output Control

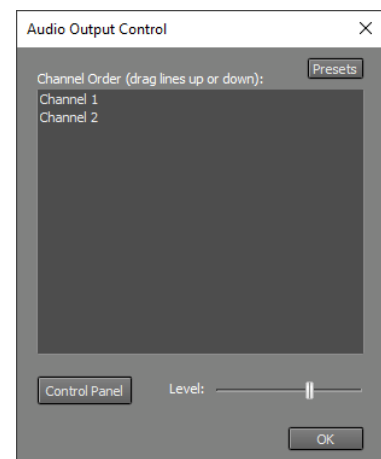
The Audio Output Control (available from the Studio menu) controls which outputs will be used. The listed outputs will be used from top to bottom. They can be reordered by dragging and dropping them.

The **Level** fader, which is only available if the sound device supports this, controls the playback level.

The **Control Panel** button pops up the audio page of the Windows Control Panel, where you can adjust detailed playback levels etc. if the sound device supports this.



Devices window using Windows driver type (Pro edition)



Audio Output Control using Windows driver

Under the hood

Windows Vista introduced a new low-latency driver model called "Core Audio" or WASAPI. That's what MultitrackStudio uses. Sometimes the term WaveRT is used as well, although this actually refers to a technology used by drivers internally. Windows Vista also introduced MMCSS (Multimedia Class Scheduler Service), which helps prevent audio glitches under high CPU load.

12.2 ASIO Drivers

Note: this driver type is available for Windows only.

ASIO drivers allow for low latencies. In addition they allow for multichannel recording (Pro edition only). If a sound device comes with an ASIO driver it's usually best to use it.

In the **Audio Device** section you can select the audio device that will be used.

On clicking the **Control Panel** button the driver's control panel will appear. This panel usually lets you set the buffer size. Buffers can be up to 4096 samples (this corresponds to 93 ms at 44.1/88.2 kHz and 85 ms at 48/96 kHz). A buffer size of 256 (at 44.1 kHz) can be considered a good compromise between reliability and low latency.

If the buffers are too small glitches will occur. This may not be a problem when playing back audio or recording MIDI, as the driver will usually stay in sync so any glitches will not appear in the final master. It's strongly recommended to use large enough buffers when recording audio, as glitches in the recorded track do appear in the master.



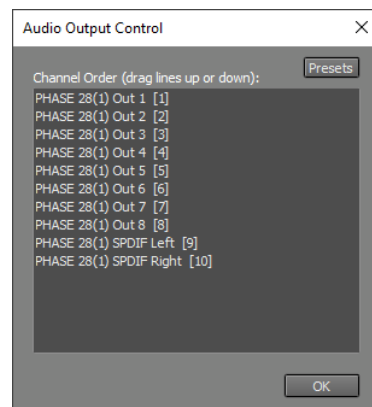
Devices window using ASIO driver (Pro edition)

In the **MIDI In Devices** section you can select the device that is used for MIDI recording.

In the **MIDI Out Devices** section you can select the device that is used for MIDI playback. The 'Default' option uses the default Windows MIDI output device.

Audio Output Control

The Audio Output Control (available from the Studio menu) controls which outputs will be used. The listed outputs will be used from top to bottom. They can be reordered by dragging and dropping them.



Audio Output Control using ASIO driver

12.3 Early Windows Drivers

Note: this driver type is available for Windows only.

This options uses classic Windows audio driver types. Latency is very high and there's no Soft Monitoring. Multichannel recording isn't possible using this driver type.

In the **Audio In Device** section you can select the device that is used for audio recording.

In the Audio Out sections you can select the devices that will be used for audio playback.

In the **Audio Out Device (High Latency)** section you can select the device that will be used when there is no recording MIDI soft instrument. The devices listed are MME devices (which are very reliable, even when CPU usage is high).

In the **Audio Out Device (Low Latency)** section you can select the device that will be used when there are one

or more recording soft instruments. The devices listed are DirectSound devices (which can have a lower, but still significant, latency).

In general you will use MME and DirectSound devices that use the same sound device. MultitrackStudio will automatically use the appropriate device.

The **24 bit** buttons can be used to enable 24 bit recording/playback. It's recommended to enable this only if the sound device actually supports it, if it doesn't the sound device's driver may perform bad or even crash your computer in some cases.

In the **MIDI In Devices** section you can select the device that is used for MIDI recording.

In the **MIDI Out Devices** section you can select the device that is used for MIDI playback. The 'Default' option uses the default Windows MIDI output device.

It's a good idea to use Audio In and Out devices that are on the same sound device. If they're not their sample rates probably aren't equal. This can be quite a problem, as recorded tracks will slowly go out-of-sync during playback.

If necessary you can use the Sample Rate Converter to correct the sample rate of every recorded track. To determine the required sample rate you should record a playing track. Use the track's editor to determine the timing difference between those two tracks (at the end of the track). The new sample rate is equal to original sample rate multiplied by the playing time of the original track and divided by that of the recorded track.

SoundBlaster Live! issues

Creative Labs SoundBlaster Live! sound devices (and its cheaper brothers like 128, 512, 1024, Ensoniq AudioPCI) use a slightly higher sample rate for recording than for playback at a sample rate of 44.1 kHz. MultitrackStudio features a unique compensation for this effect. This compensation can be turned on by checking the **EMU10k1 44.1 kHz Sync Correction** box.

When using a sample rate of 48 kHz this problem does not occur, and the 'EMU10k1 44.1 kHz Sync Correction' setting has no effect.

12.4 Mac audio/MIDI devices

Note: this feature is available for Mac only.

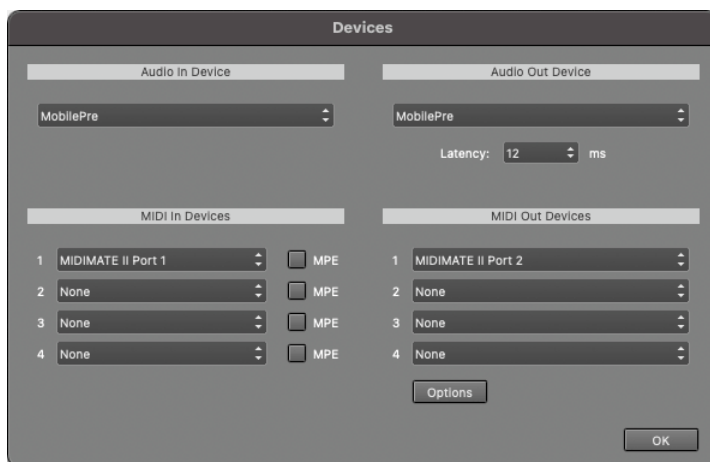
In the **Audio In Device** section you can select the audio device that will be used for recording.

In the **Audio Out Device** section you can select the audio device that will be used for playback.

It's recommended to use Audio In and Out devices which are part of the same sound device. If they're not their sample rates probably aren't equal. This can be quite a problem, as recorded tracks will slowly go out-of-sync during playback. To solve this problem you can create an 'aggregate device' using the Audio MIDI Setup application, and use this device in MultitrackStudio. macOS will then take care of syncing the two devices.



Devices window using Early Windows driver type (Pro edition)



Devices window (Pro edition)

The **Latency** box determines the time it takes before you hear the sound when playing MIDI software instruments live or when using Soft Monitoring ('live effects'). You'll hear glitches if this setting is too low.

Your sound device may not support latencies as low as the one you've selected. The actual latency appears if you hover the mouse over the Studio menu's Devices option.

In the **MIDI In Devices** section you can select the device that is used for MIDI recording.

In the **MIDI Out Devices** section you can select the device that is used for MIDI playback.

macOS 11 supports MIDI 2.0. MIDI In/Out Devices use the MIDI 2.0 protocol if the connected device uses this protocol.

Audio Output Control

The Audio Output Control (available from the Studio menu) controls which outputs will be used. The listed outputs will be used from top to bottom. They can be reordered by dragging and dropping them.

The **Level** fader, which is only available if the sound device supports this, controls the playback level.

The **Control Panel** button pops up the Sound page of the System Preferences, where you can adjust detailed playback levels etc. if the sound device supports this.



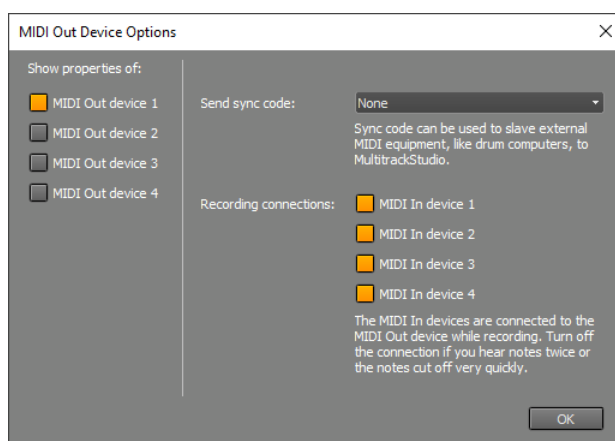
Audio Output Control

12.5 MIDI Out Device Options

The MIDI Out Device Options window (available from the Studio menu's Devices window) determines the behavior of the MIDI Out devices, and consequently the External MIDI Instruments.

The **Send sync code** section specifies the type of sync messages sent over the MIDI Out Device. This can be used to synchronize hardware or software sequencers with MultitrackStudio. The available options are None, MIDI Clock, MTC 24 frames/sec, MTC 25 frames/sec and MTC 30 frames/sec.

The **Recording connections** section defines the way MIDI In and Out devices will be connected when recording MIDI. By default, events received by the MIDI In device will be sent to the MIDI Out device that's being used by the recording track. This is fine if you're using an external 19 inch synthesizer module or an onboard soundcard synthesizer. However, it can cause problems if you're using a MIDI keyboard with built-in sounds that is connected to both the computer MIDI In and Out device (all notes may be triggered twice). This can easily be solved by unchecking the corresponding button.



MIDI Out Device Options window (Pro edition)

12.6 Compensating for driver issues

Note: this feature is available for Windows only

Note: this needs to be done in extremely rare situations only. Make sure you're using the latest drivers for your sound device first.

Aligning audio devices

Under normal circumstances all audio and MIDI devices will be aligned by MultitrackStudio, so that newly recorded tracks are perfectly aligned with existing ones. However, some sound device drivers fail to report the exact playback or recording position, and as a result MultitrackStudio can't align the devices accurately. Offsets to the reported positions can be specified in text files to compensate for such driver defects.

Aligning the audio input and output devices step-by-step

This section describes how to compensate the audio input device so that new tracks are aligned with existing ones.

Step 1

Start MultitrackStudio and load the 'C:\Program Files\MtStudio\Impulse.gjm' in a track. This file contains a single impulse at approx. 50 milliseconds. Set up another track that will record the first track.

Step 2

Connect the audio input device to the audio output device using an audio cable. If your sound device can do this routing internally you can use that feature instead of the cable.

Step 3

Click the Studio menu's Devices option. Now close the window that appears using the OK button, thus forcing the program to create sections in a file that you will be editing in the next step. Note that 'default' devices (Default, MIDI Mapper or Primary Sound Driver) can't be compensated, so any devices you want to compensate must be selected explicitly.

Step 4

Record the first track to the second track for about one second. Open the track editors and locate the impulses. Move the mouse over the impulses and read the positions in the bottom right corner of the window. The difference between the two positions is error that needs compensation.

Step 5

The settings for ASIO, Windows and Early Windows drivers are stored in the 'AsioSnd Settings.txt', 'VistaSound Settings.txt' and 'WinSound Settings.txt' files respectively. MIDI device settings are stored in the 'MIDI Settings.txt' file. These files are located in the 'C:\Users*Username*\AppData\Roaming\MtStudio' folder, and can be edited using Windows Notepad to compensate for the driver's error. The settings files consist of sections, indicated by [brackets], which can contain values.

Here's a small example of a settings file:

```
[Settings]
```

```
[Brand X Wave Device]  
audioin_offset_millisecs=15
```

The [Settings] section shouldn't be modified. The [Brand X Wave Device] section, where 'Brand X Wave Device' is the name of the audio input device as specified in the Devices window. The error value found in step 4 has been filled in here (15 milliseconds in this case).

Step 6

Close MultitrackStudio and start it again (this is necessary to force the program to read the settings file again). Now you can repeat steps 1..4 and verify the results.

Advanced options

It is also possible to specify offsets in samples instead of milliseconds, this can be useful if you want the compensation to work for multiple sample rates. The offset can also be specified in ASIO buffers (ASIO drivers only). MIDI devices can also be compensated.

This is the full list of possible compensation options:

Audio input devices support these values:

```
audioin_offset_millisecs=
```

audioin_offset_samples=
audioin_offset_buffers= (ASIO drivers only)

Early Windows high latency audio output devices and **ASIO output devices** support these values:

audioout_offset_millisecs=
audioout_offset_samples=
audioout_offset_buffers= (ASIO drivers only)

Early Windows high latency audio output devices support these values:

audiooutlowlat_offset_millisecs=
audiooutlowlat_offset_samples=

MIDI input devices support these values:

midiin_offset_millisecs=
midiin_offset_samples=

MIDI output devices support these values:

midiout_offset_millisecs=
midiout_offset_samples=

The _samples values must be integer values, the _millisecs and _buffers values can be fractional.

ASIO Delay

A small delay can be introduced to ASIO buffer processing. This can sometimes be used to work around certain sound device/mainboard/driver incompatibilities if these symptoms occur:

1. Recording a MIDI track using a soft instrument sounds fine while recording.
2. But it sounds gargled or extremely glitchy when played back.

To add an ASIO delay open the 'C:\Users*Username*\AppData\Roaming\MtStudio\AsioSnd Settings.txt' file in NotePad and add a 'AsioDelay=' line in the [Settings] section like this:

```
[Settings]  
AsioDelay=20000
```

The value has to be determined experimentally (the higher the value the longer the delay). MultitrackStudio should be restarted after editing the file.

ASIO MMCSS

Windows Vista introduced MMCSS (Multimedia Class Scheduler Service), which can help prevent glitches under high CPU load. While it's an ASIO driver's job to enable this some don't. You can add a 'MMCSS=1' line to the 'AsioSnd Settings.txt' file (see previous section) file to make MultitrackStudio turn on MMCSS. This line should appear in the [Settings] section:

```
[Settings]  
MMCSS=1
```

MultitrackStudio should be restarted after editing the file.

Note that not every ASIO driver will necessarily be happy with this. If it performs worse you should remove the line again.

13 Remote Control

A remote control is a hardware device which can be used to control MultitrackStudio's transport, mixer and effects.

Traditional 'control surfaces' use MIDI to communicate with the computer. MultitrackStudio can also be controlled with the MultitrackStudio Remote app (for iPad), or a web browser (on a phone or tablet).

MIDI Remotes

The Studio menu's Remote Control option pops up the Remote Control window. Ready to use presets for FaderPort (PreSonus), the TranzPort and AlphaTrack (Frontier Design Group), the BCF2000 (Behringer) and the UC33 (Evolution) are provided. There are also generic Mackie Control and HUI presets, and a basic MMC (MIDI Machine Control) preset.

If there's no suitable preset for your device you can assign remote control knobs to specific actions using the **Learn** function (see Remote Control Settings).

Use the **MIDI In** box to select the MIDI In device to be used for the remote. The MIDI Out device should be specified as well if the remote has LEDs or motorized faders.

The MIDI In device used by the remote can be selected as a regular MIDI In device (for recording a MIDI keyboard) as well. In this case the remote functions will have the highest priority, ie. only MIDI messages which aren't mapped to a remote control action will be recorded by MIDI tracks. This mechanism makes it possible to map some keys of a MIDI keyboard to remote control actions. You can, for instance, use a key to invoke the "Alternate Take" action.

Use the **Show Remote Control Bar** button to enable the Remote Control Bar. It shows the names of the mixer sections that are mapped to the remote control channels, and the names and values of effect knobs.

Note: the MIDI In/Out and Remote Control Bar options are only available if a preset is opened which corresponds to a device which uses MIDI. For advanced users: actually it's the 'Controller Type' box that matters rather than the preset.

13.1 Remote Control Settings

The Remote Control window defines the functionality of the remote control device being used. The **Preset** button can be used to load predefined presets, or to create new presets. The **Info** button shows information on the current settings if available. Use the **MIDI In** and **MIDI Out** boxes to select the MIDI devices corresponding to the remote control device.

The **Clear** button clears the highlighted action. The **None** preset can be used to clear all actions. If the **Learn** button is engaged any incoming midi messages will be mapped to the highlighted action. Custom mappings can be created easily this way.

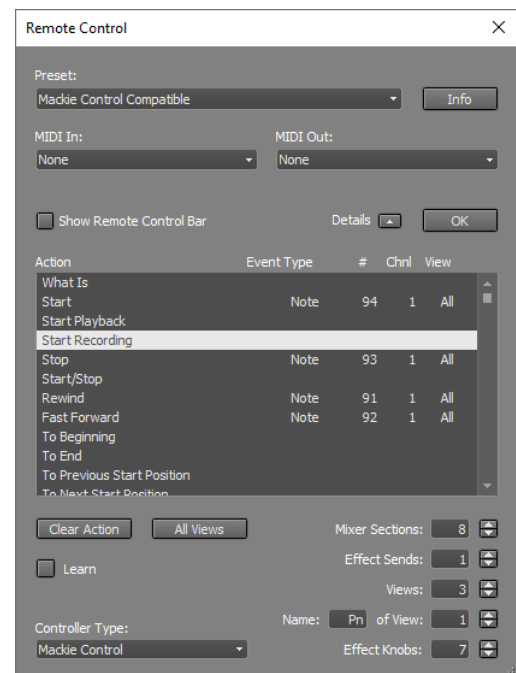
Remotes which are not plain MIDI are translated to plain MIDI. Several **Controller Types** can be selected:

- MIDI Controller: plain MIDI messages
- HUI
- Mackie Control
- FaderPort
- TranzPort
- AlphaTrack

Controlling Mixer Sections

The **Mixer Sections** settings will typically equal the number of channel strips the remote provides. The highest possible value is 64.

The **Effect Sends** settings determines the number of Effect Send knobs that can be controlled using the remote.



Remote Control window (Details expanded)

There can be multiple **Views**. This is typically used to control multiple actions using a single rotary knob (View 1 = Pan, View 2 = Effect Send 1 etc.). The **All Views** button makes the highlighted action appear in all views. You'll probably want volume faders, transport buttons etc. to be in all views.

Controlling Effects/Instruments

The **Effect Knobs** settings determines the number of rotary knobs available for controlling effect knobs. An effect can only be controlled while its user interface is visible on the screen. The knobs used to control effects will often be used to control mixer sections as well (pan knobs etc.). MultitrackStudio takes care of this automatically (there's no need to use views for this).

Effect parameter counts may exceed the number of available hardware knobs, in this case there will be multiple pages of parameters. You can assign the Effect Page Up and Effect Page Down actions to buttons, so you can step through the pages. Alternatively you can assign the Effect Page Up/Down action to a rotary knob, so you turn the knob to step through the pages.

Tip: You can rightclick a rotary knob in an effect/instrument window and choose 'Find on Remote Control'. This will

1. Move to the page that contains the control.
2. Flash the corresponding cell on the Remote Control Bar.
3. For Mackie Control or HUI devices the LED ring around the knob will flash.

CLAP/VST3 plugins have rightclick menus too if the plugin supports that. For other plugins you can click (or even move) a control, and then rightclick the right-hand area and choose 'Find last clicked on Remote Control'.

Actions

The following actions can be controlled by the remote. actions marked (cc) should be controlled by a continuous controller (rotating knob or fader), all other actions are supposed to be controlled by a button.

- What Is: Keep this button down while using another button or knob. A description of the associated action will be shown in the bottom left corner of the screen.

The following actions control the Transport:

- Start
- Start Playback: start transport only if no track Rec buttons are engaged (ie. the Play button has a green triangle)
- Start Recording: start transport only if any track Rec buttons are engaged (ie. the Play button has a red triangle)
- Stop
- Start/Stop: equivalent to hitting the space bar.
- Rewind
- Fast Forward
- To Beginning
- To End
- To Previous Start Position
- To Next Start Position
- To Nearest Bar
- Transport Wheel (cc)
- Transport Shuttle (cc)
- To Previous Marker
- To Next Marker
- To Marker (cc)
- Add Marker
- Delete Marker
- VariSpeed (cc) (*Pro edition only*)
- VariSpeed Mode (cc) (*Pro edition only*)
- Loop: toggle Loop on/off.
- Set Loop Start: set start of looping region (uses the current transport position).
- Set Loop End: set end of looping region (uses the current transport position).
- Counter: turn on/off remote's counter display.
- Counter Format: toggle bars/seconds.

- Zoom In
- Zoom Out
- Zoom In/Out (cc)
- Automation Recording (*Pro edition only*)
- Automation Touch Mode (*Pro edition only*)

These actions allow for opening songs:

- To Next Song: to next song of songlist.
- To Song (cc): to song of songlist (zero = first song).
If there's no songlist it looks for a file named 'setlist.txt' located in the 'root folder for new songs' as defined in the Preferences window. This file should map controller values to songs like this:

```
0=C:\My Songs\Yellow Sun\Yellow Sun.hdr
1=C:\My Songs\Blue Sky\Blue Sky.hdr
```

- To Song High (cc): adds another 7 bits to the 'To Song' action, so more than 128 songs can be used. 'To Song High' must be sent before 'To Song'. The song number is calculated as like this: song = 128 x 'To Song High' + 'To Song'.

Note: MultitrackStudio takes care things work smoothly if "Save 'everything' in song" (see Preferences) is enabled. It won't show 'save?' prompts for unimportant changes like transport position. After loading a song transport will go to zero and looping will be turned off automatically.

These actions control a couple of recording related things:

- New Audio Track: select a template from list of audio track templates
- New MIDI Track: select a template from list of MIDI track templates
- New Group
- New Effect Return
- Alternate Take: click the Recording option's Alternate Take item.
- Re-Arm: engage the Rec buttons of the last recorded tracks.
- Soft Monitoring: click the Soft Monitoring button.
- Punch: click the Punch button.

These actions control mixer sections:

- Section Play: toggle a track's Play button.
- Section Rec: toggle a track's Rec button.
- Section PlayRec: toggle between playback and record mode.
- Section Practice Mode: switch track to practice mode.
- Section Fader (cc)
- Section Mute
- Section Solo
- Section Half Solo: toggle between half solo and no solo.
- Section Pan (cc)
- Section Effect Send (cc)
- Section Slot: open an Effect Slot (show the effect's user interface).
- Section Select Slot (cc): pop up effect selector window
- Section Output Selector (cc)
- Section Editor: open/close a track's editor.
- Section Set Punch In: make start of the editor's selected part equal to the Transport position.
- Section Set Punch Out: make end of the editor's selected part equal to the Transport position.
- Section Set Punch In/Out: select the editor's selected part while the Transport is running. This should be done before recording.
- Section Goto Punch In: make Transport position equal to the start of the editor's selected part.
- Section Goto Punch Out: make Transport position equal to the end of the editor's selected part.
- Section Undo Punch: click track editor's Undo button
- Section Redo Punch: click track editor's Redo button
- Section Clone: add track with new file and similar settings.
- Section Remove
- Section Map: pop up selector to map a mixer section to remote control channel.
- Master Fader: controls the Master section's volume fader.
- Clear Solo: turn off any active Solo buttons.

- Level Meters: turn on/off the remote's level meters
- Faders Silent: suspend/resume motor fader control. Can be used to keep the (automated) faders from making noise while recording in the same room.
- Slot Select Button: press this button before pressing the Section Slot button. Now a Section Select Slot action will be sent instead of a Section Slot action.
- Mouse Control (cc): controls the knob the mouse points to.
- Send Snapshot: send all values to the remote (probably never needed).

These actions control views and banks:

- View Button
- View Down
- View Up
- View Up/Down (cc)
- Bank Down: move (typically) 8 sections down
- Bank Up: move (typically) 8 sections up
- Bank Up/Down (cc)
- To First Bank
- To Last Bank
- Section Down
- Section Up
- Section Up/Down (cc)
- To Section (cc)

The following actions are used to control Effects and Instruments. These actions can share knobs with non-effect actions (eg. Effect Knob and Section Pan can be on the same knob, Effect Page Up and View Up can be on the same button etc.).

- Effect Knob (cc): control an effect's knob.
- Effect Control Map: pop up selector to map an effect control to a remote control knob.
- Effect Mouse Control (cc): controls the effect knob the mouse points to. Both this one and "Mouse Control" can work with 3rd party plugins after you've clicked a knob or moved it a bit.
- Effect Page Down
- Effect Page Up
- Effect Page Up/Down (cc)
- Effect To First Page
- Effect To Last Page
- Effect Close: close the effect window.
- Effect Bypass. Also used for instrument channel, it can be (cc) in this case.

The following actions are used to select effects, sampler patches etc. These actions can share knobs with actions which are not in this group (eg. Selector Accept can be on the same button as Effect Close).

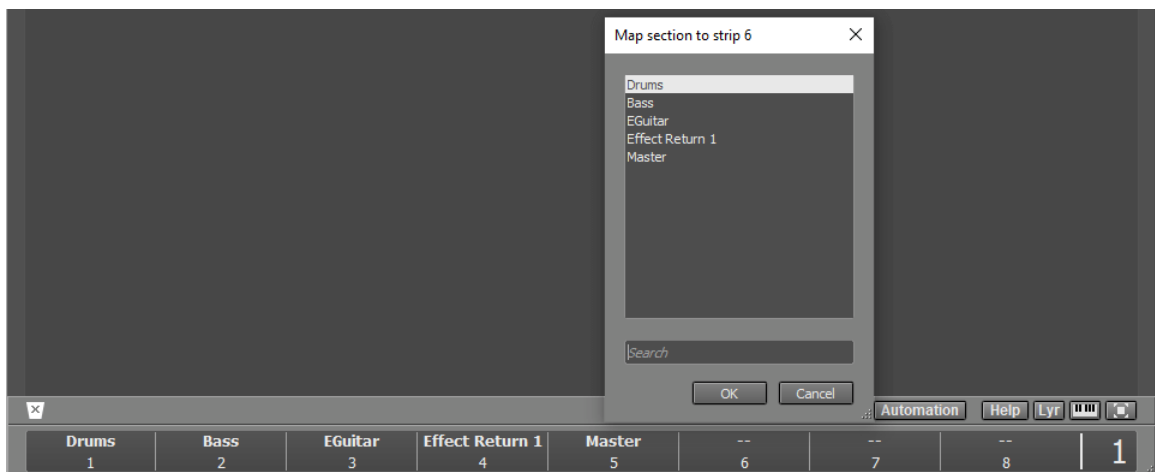
- Selector Down
- Selector Up
- Selector Up/Down (cc)
- Selector Category Down
- Selector Category Up
- Selector Category Up/Down (cc)
- Selector Accept: also used to invoke message dialog 'OK' or 'Yes' buttons.
- Selector Cancel: also used to invoke message dialog 'Cancel' or 'No' buttons.

13.2 Remote Control Bar

Cheaper remotes typically don't feature a display, therefore it's difficult to see what a knob's function is. MultitrackStudio features a Remote Control Bar at the bottom of the screen. It can be made visible using the Studio menu's Remote Control window.

The Remote Control Bar has eight sections (or more, depending on the number of mixer sections or effect knobs the remote control uses). These sections show the names of the mixer sections that are controlled by the corresponding remote control channel strips. The vertical line on the right can be moved to align the bar with the remote. The name of the current View is shown on the righthand side. This typically indicates the function of the remote's rotary knobs (Pan, Effect Send 1 etc.).

If an effect window is currently visible the names of the effect knobs will be shown, provided the remote is set up to control effects.



Remote Control Bar, strip 6 is being remapped

Mapping Mixer Sections

Songs can have more mixer sections than the available number of remote control channel strips. Traditionally remotes have bank up/down and/or section up/down buttons so any number of mixer sections can be accessed. These buttons can be used with MultitrackStudio.

In addition MultitrackStudio lets you freely map mixer sections to remote control channel strips in any order. There are several ways to do this:

- Click the Remote Control Bar and use the selector window that pops up.
- Drag cells within the Remote Control Bar.
- Drag a mixer section to the Remote Control Bar.
- Drag a cell from the Remote Control Bar to the Garbage Bin to unmap.
- Use remote control knobs. A very convenient setup can be achieved with rotary knobs which also have a push function:
 - Map the rotary function to Selector Up/Down actions.
 - Map the push function to Section Map and Selector Accept actions.

On pressing the knob a selector window appears which can be controlled using the knob. Note that the knob can still be used to control mixer section and/or effect controls as well.

Your custom mapping will be lost when you press the remote's bank up/down or section up/down buttons.

Mapping Effect Controls

Controls of the currently visible effect window can be mapped to Effect Knob actions. There will be multiple pages if the number of controls exceeds the number of knobs. The page name is displayed on the right. You'll typically want to switch pages using the remote control, but it can be done using the mouse too: either click the name on the right and select a page from the list, or use the mousewheel.

Controls can be mapped dynamically just like mixer sections, the only difference is that you can't drag an effect control to the Remote Control Bar.

Tip: tweak an effect control using the mouse, and then click the Remote Control Bar. The effect control is now highlighted in the selector window, and you can click OK to map it.

13.3 MultitrackStudio Remote

The MultitrackStudio Remote app for iPad turns an iPad into a powerful remote control for MultitrackStudio.

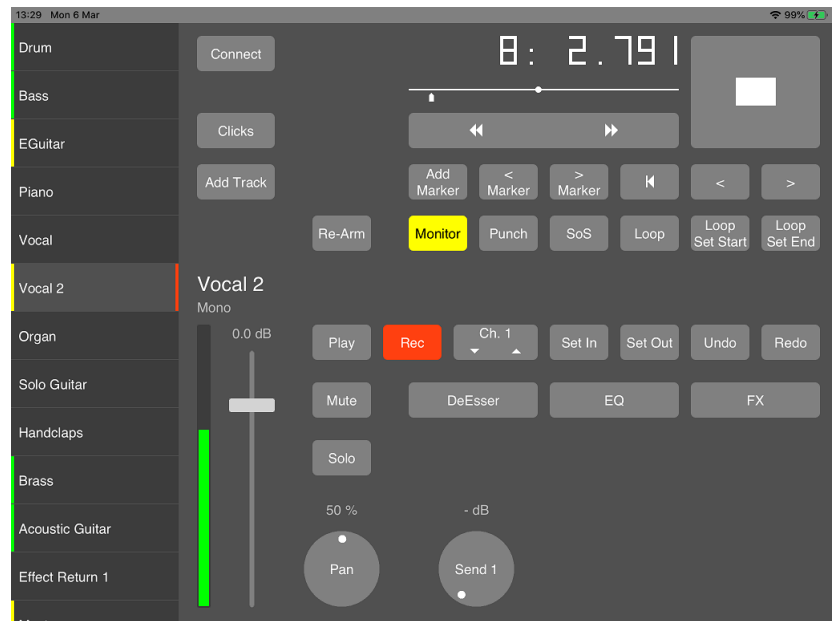
Connecting to MultitrackStudio

First of all the MultitrackStudio Remote app needs to be installed. It's available from the App Store. Connecting to MultitrackStudio goes like this:

1. In MultitrackStudio, go to the Studio menu and choose Remote Control. Select the MultitrackStudio Remote preset.
2. On iPad start the MultitrackStudio Remote app and tap the Connect button. Now enter the code that appears in the Remote Control Settings window and tap OK.
3. Close the Remote Control Settings window.

Now the mixer sections will appear on the left, and you can control MultitrackStudio using iPad.

The iPad must communicate via WIFI (4G etc. is not supported). Furthermore the iPad and your computer must both be connected to your home network.



MultitrackStudio Remote, recording a track

Tip: the code starts with the computer's IP address. If your computer has multiple network adapters you can simply replace it with the correct one.

Features

Using the MultitrackStudio Remote you can control many recording-related features:

- Control the transport, including VariSpeed, markers and cycling.
- Add and control tracks, groups, effect returns (up to 3) and the master section.
- Add and control effects and MIDI instruments.
- Toggle the Monitor / Punch / Sound On Sound buttons.
- Control the click track and the MIDI Keyboard Mapper's Split option.

All mixer sections appear as tabs on the left. A signal indicator appears on the left hand side of the tab, it can be green, yellow or red, corresponding to MultitrackStudio level meter colors. A tab's right hand side show a red bar if the track's Rec button is engaged. The lower half of the screen contains the current section's controls.

The transport controls appear in the upper half. The two buttons below the large start/stop button step through the history of recent transport start positions. The horizontal Shuttle Bar moves the transport slowly near the center and fast near the sides. While shuttling you'll hear the current track, and the track's audio/MIDI data appears below the transport counter.



Shuttle Bar in action

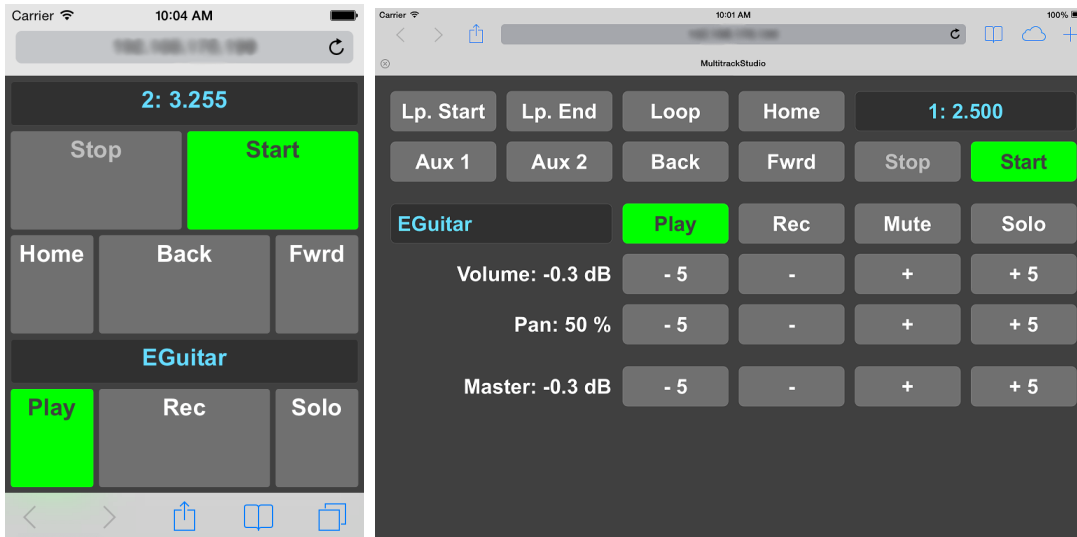
Some lesser-used features aren't easily discoverable:

- The position counter can be tapped to switch it from seconds to bars or vice versa.
- Pressing the position counter for a second moves to the start of the closest bar.
- Tapping a rotary knob centers it, but only if this makes sense (Pan, VariSpeed etc.) .
- In the 'Add Track' window you can tap the 'Add Track' title to change it to 'Add Group / Effect Return'.
- Moving a finger horizontally over the current tab (on the left) reveals a Remove button.
- The Set In and Set Out buttons can be pressed for a second to move the transport to the corresponding position.
- Pressing an effect slot for a second pops up the effect selector rather than the effect itself.
- Pressing the Solo button for a second enters 'half solo' mode.
- Pressing the Play button for a second switches the track to practice mode.
- Pressing the start/stop button for a second starts cycling.

13.4 Phone/tablet Web Browser

The Remote Control Settings window features **Web Browser (Phone)** and **Web Browser (Tablet)** presets. Once a preset is loaded MultitrackStudio's network address is shown, you can type this address in your phone or tablet's web browser. The phone/tablet must communicate via WIFI (4G etc. is not supported). Furthermore the phone/tablet and your computer must both be connected to your home network.

Note: The phone/tablet web page does not get updated automatically when you make changes using the computer mouse or keyboard. Please refresh the browser manually each time you've used the computer mouse or keyboard.



iPhone controlling MultitrackStudio iPad controlling MultitrackStudio

The phone preset allows for controlling the transport remotely. The upper half of the screen features transport Start/Stop and Home buttons. You can walk through the history of recent transport start positions using the Back and Fwrd buttons. Tapping the position indicator takes you to a new page listing all markers. The position indicator doesn't show the current position while the transport is running, it will just show "Playing" or "Recording".

The lower half of the screen show the Play/Rec and Solo buttons of the current track. Tapping the track name box takes you to a page listing all tracks.

The tablet preset allows for controlling track volume and pan. The bottom row of buttons controls the master section volume fader. The Aux 1 and Aux 2 buttons can be mapped to an action of your choice using the Remote Control Settings window.

14 Audio and MIDI Files

14.1 Audio Files

The following audio file formats are supported:

- **.WAV files:** 16 bit mono or stereo (Pro edition also supports 24 bit, 32 bit and 32 bit floating point files).
- **.AIF files:** 16 bit mono or stereo (Pro edition also supports 24 bit, 32 bit and 32 bit floating point files).
- **.GJM files:** 16 bit mono using lossless compression (Pro edition also supports 24 bit).
- **.GJS files:** 16 bit stereo using lossless compression (Pro edition also supports 24 bit).
- **.M4A files:** 16 bit mono or stereo files using lossy compression.
- **.MP3 files:** 16 bit mono or stereo files using lossy compression.
- **.AEM files:** contain references to audio files to play. .AEM files are application-generated (see Understanding Audio Editing).

The Windows version can open existing .aac, .ac3, .mp4 and .wma files (requires Windows 7 or newer).

The Mac version can open existing .aac, .ac3, .mp4, .aifc, .caf, .snd, .au and .sd2 files.

WAV files

WAV files can be used with almost any program that supports audio. You need a WAV file to create an audio CD.

AIF files

AIF files are similar to WAV files. They're widely supported on Mac computers, but rare on Windows.

GJM/GJS files

GJM/GJS files use lossless compression to reduce file size. The compression algorithm works best if the audio signal doesn't contain loud treble parts. This works well for multitrack recording since tracks typically have many silent or soft parts so the file size can easily be reduced to about 70% of its original size.

Note that sound quality isn't impaired in any way by the compressing action: if you save a .WAV file in .GJM format and then save that file in .WAV format again you get exactly the same file.

M4A files

M4A files use a lossy compression algorithm that degrades sound quality. Sound quality tends to be slightly better than MP3.

The Mac version supports lossless 'ALAC' compression.

MP3 files

MP3 files use a lossy compression algorithm that degrades sound quality. The resulting file size is 3..9% of the original size. This makes MP3 the format of choice if you want to publish your songs on the internet, or if you want to send them via email.

Every time a new MP3 file is created the audio quality can be chosen: Medium, High, Higher or Very High. These options correspond to 56, 128, 192 and 256 kb/sec (stereo files) or 32, 64, 96 and 128 kb/sec (mono files).

Note for Windows 7 users:

Windows 7 doesn't provide an MP3 encoder. A .dll is required for creating MP3 files:

The 64-bit version expects a 'lame_enc64.dll' file in the C:\Program Files\MtStudio folder.

The 32-bit version expects a 'lame_enc.dll' file in the C:\Program Files\MtStudio folder (C:\Program Files (x86) MtStudio on 64 bit Windows).

You can search the web for the files mentioned. If there's no dll file any ACM codecs which are on your system will be used.

Legacy files

Existing files of these obsolete types can still be read:

- **.LST files:** pre MultitrackStudio 5 equivalent of .aem files.
- **.SAM files:** 16 bit mono headerless raw data files.

14.2 MIDI Files

The following MIDI file formats are supported:

- **.MID files:** standard MIDI files. Additionally .MIDI and .KAR files can be imported, pasted or dropped, they'll be renamed to .MID automatically.
- **.MIDI2 files:** MIDI 2.0 Clip Files. This is a recent format that can store the MIDI 2.0 features. Isn't widely supported yet.
- **.MPT files:** MIDI Pattern Track files (see MIDI Pattern Editing).

.MID files can be saved as .MPT files and vice versa.

A MIDI file can contain more than one stream ('track' in MIDI terms, but renamed to avoid confusion). MultitrackStudio supports using multiple streams, although we don't recommend it. MultitrackStudio does not support patch changes in a stream. If a program change or bank change is encountered in a file that is being opened a new stream will be created. Furthermore MultitrackStudio streams can only send messages to one MIDI channel (it uses the channel the program change is sent to). So if a stream in your file sends messages to more than one MIDI channel (which is bad practice anyway) the file won't load as intended.

MIDI 2.0

.midi2 files can't be opened in a track directly. If you import one it will be converted to a .mid file. Exporting to .midi2 currently isn't supported.

Under the hood

MultitrackStudio stores MIDI 2.0 per-note controls in MIDI 1.0 files as NRPN values. Any software other than MultitrackStudio won't recognize the per note control values in exported MIDI files, but it will load the files regardless.

The higher MIDI 2.0 resolutions (16 bits for velocity, 32 bits for controllers etc.) are preserved in .mid files used in tracks too, again using NRPN parameters. The high resolutions do not appear in exported MIDI files, unlike per-note controls

15 Touch and Pen

Note: touchscreen support is available for Windows only

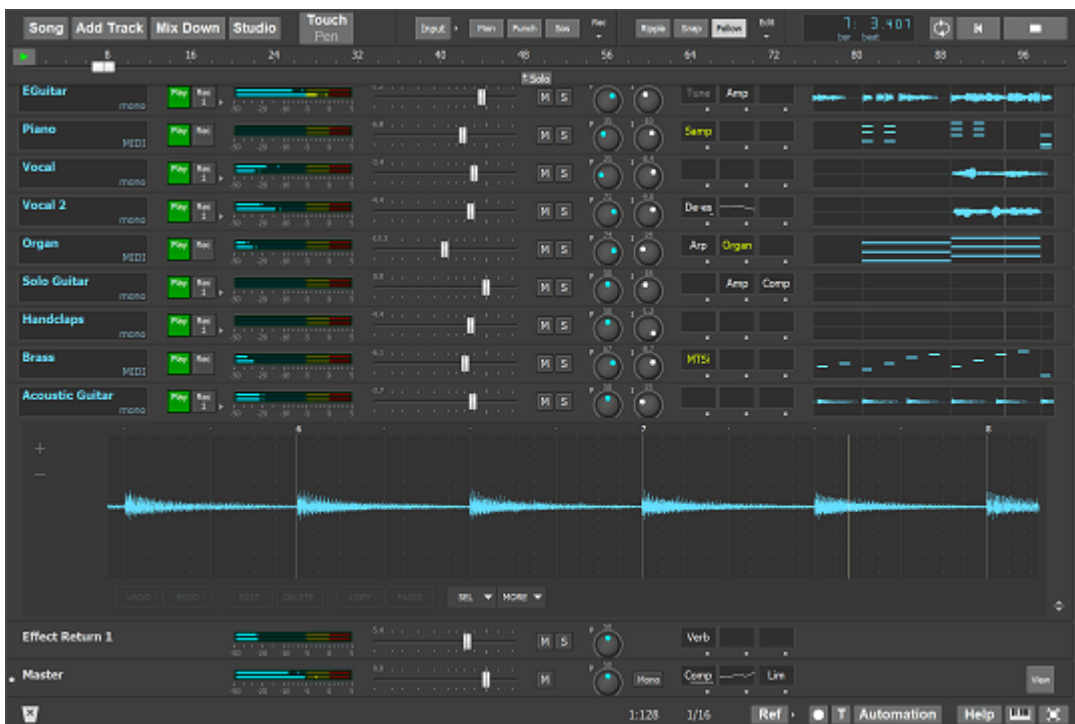
MultitrackStudio can be controlled using a touchscreen or a pen (stylus).

There's a special 'Pen with touch scrolling' mode to make the most out of devices like the Microsoft Surface.

15.1 Touch

Note: touchscreen support is available for Windows only

MultitrackStudio features a touchscreen mode which makes the program easy to use with tablets, convertible notebooks and touchscreen monitors. You can interact with the knobs you see on the screen directly without having to find your mouse and move it to the right location first.

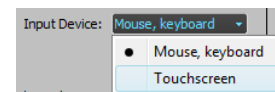


MultitrackStudio on Surface Pro tablet with Ultra Dark theme

Quickstart: 3 tips

1: Switch to touchscreen mode

MultitrackStudio will propose touchscreen mode if a touchscreen is detected. If it doesn't you can go to the Studio menu's Preferences window and select Touchscreen in the Input Device box. A 'Test Touchscreen...' button appears which lets you do a quick test. MultitrackStudio learns from this test whether it can distinguish between mouse movements and touch movements. Using the mouse in touchscreen mode will be a bit awkward if it can't, because mouse movements will be treated as touch.



Input Device selector

In touchscreen mode some controls are bigger to make them easier to use. The transport buttons are an example of this. Controls that don't get bigger still respond to a larger area to make them easier to use with touch.

2: Check Windows DPI setting

Touch screens are hard to use if controls are too small. Traditionally Windows runs at 96 DPI (DPI = dots per inch). Modern notebook screens can have 150 DPI or more, which makes everything significantly smaller unless you adjust the Windows DPI value accordingly. A MultitrackStudio track measures 9.5 mm in height if the Windows DPI value matches the screen's. It is highly recommended to make sure tracks aren't any smaller than this. You can increase the DPI value even more if you still can't use the touchscreen comfortably. If you'd rather not change the Windows DPI setting you can go to the Studio menu's Preferences window and use the Size setting to scale MultitrackStudio independently from the Windows DPI setting.

3: Use full screen mode

It's highly recommended to use full screen mode. The knobs at the top and the bottom bar are much easier to operate this way, and you avoid the risk of touching the 'X' button or Windows task bar inadvertently. There's a button in the bottom-right corner of the main window to enter/leave full screen mode.

In depth: using user interface elements with touch

Some things work a bit different with touch compared to using a mouse:

Mixer faders

- Put a finger on the fader and move it horizontally. The fader thumb doesn't move as fast as your finger does, so you can control it accurately.
- Tapping the left half moves it down one step, tapping the right half moves it up one step.



Fader

Rotary knobs

- Put a finger on the knob and either move it horizontally or make a rotating movement below the knob.
- Tapping the left half moves it down one step, tapping the right half moves it up one step.



Knob

Buttons/boxes with right arrows (like the Input button)

- Put a finger on the button/box itself and move it horizontally. After moving about half a centimeter a white area becomes visible, representing the menu which will appear when you take your finger off the screen.



Input button about to show dropdown menu

Up/down buttons

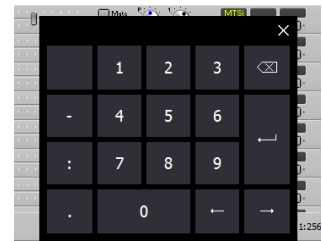
- Put a finger on the button and move it approx. 2 centimeters up or down to increase/decrease the value. If you keep the finger on the screen the button will continue to increase/decrease automatically.



Up/down button

Text boxes

- An onscreen keyboard appears if you tap a text box. Use the keyboard's Enter key to accept the new value, or close the keyboard to cancel.



Touch keyboard for position indicator

Effect/Instrument slots

- Press-and-hold can be used to pop up the effect/instrument selector of a non-empty slot (keep the finger down for about a second).
- To move a slot it should be moved horizontally at first, even if you want to move it vertically.

Overview Bar

- Even though the markers appear at the bottom you can (and should) touch them as if they span the full height.
- The Transport Options menu can be used to add markers. You can use it to delete markers as well (tap the marker before opening the menu).
- You can pull down a marker to pop up a menu with rename options, among others (see the "Buttons/boxes with right arrows" paragraph above).
- It's not possible to change the transport position while recording, in order to avoid doing that accidentally.



Tapping a marker

Transport

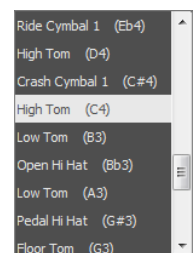
- You can move your finger horizontally over the transport position indicator to step through the history of recent start positions (just like pressing Alt+Left/Right Arrow).



Step through start history

Lists with a vertical scrollbar

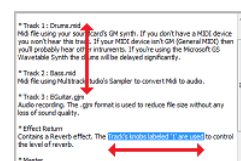
- Put a finger on the contents and move it up or down, no need to use the scrollbar.



Scrolling a list

Text in Comments window and Chords/Lyrics editors.

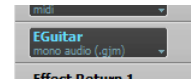
- An onscreen touch keyboard appears if you tap the text box.
- If there's a vertical scrollbar you can put a finger on the text itself and move it up or down, there's no need to use the scrollbar.
- Text can be selected by moving your finger horizontally. Once it's clear you're selecting rather than scrolling you can move vertically as well.
- With a multi-touch screen you can use two-finger zoom in/out gestures to make the text larger/smaller.



Text box: scrolling and selecting

Moving mixer sections

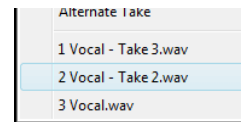
- To move a single section, put a finger on a tracks' file name box (or the corresponding area on an Effect Return etc.) and move it a couple of centimeters horizontally before moving vertically. Moving up or down immediately will scroll all mixer sections.



Move right before moving vertically to drag section

Track file history

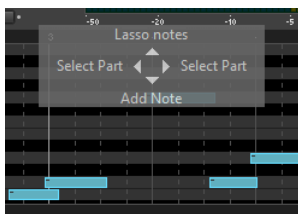
- A message box pops up on tapping a file, and you can choose whether you want to open it in the current track or in a new one.



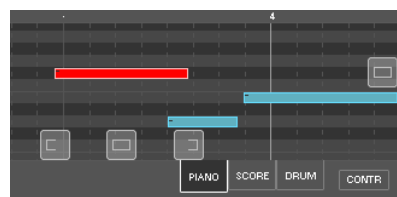
A track's file history

Editors

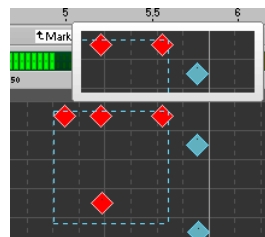
- The mode buttons in the bottom-left corner of an editor aren't available. A selector appears on touching an editor for about half a second (you can set this delay time in the Preferences window). You can pick an action by moving your finger in that direction (left, right, up or down).
- Selected parts can be moved directly. Touch handles appear near the edges of the editor when small items like notes or dots are selected, so you can move them easily. The duration of notes can be changed using a touch handle as well.
- You can scroll an editor horizontally using one finger. Scrolling vertically works too where applicable. With a multitouch screen you can zoom horizontally using two fingers as well. With a multi-touch screen the pianoroll, score and audio editors can be zoomed vertically using two fingers.
- While moving the start or end of a selected part you can zoom in by moving your finger down (to the bottom of the screen). The editor will zoom in until you release your finger again. You can use this feature to accurately set start/end points without having to actually zoom in and out again.
- A copy of part of the editor appears above the editor while lassoing notes so you can see the part covered by your finger.
- There's a semi-transparent "touchthumb" on the editor itself which can be used to move the needle. The time line bar above the editor can't be used with touch. Doubletapping the touchthumb starts the transport, tap-and-drag starts cycling.
- The SEL ALL button is replaced with a SEL button which pops up a menu with various options to select a part, play it cycling or stretch it.



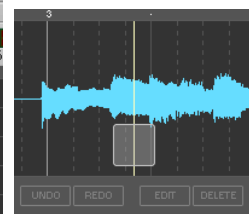
Mode selector (pianoroll)



Selected note with touch handles (pianoroll)



Lassoing (drum editor)



Touchthumb (audio editor)

Main window

- If the main window shows a vertical scrollbar you can put a finger anywhere on any mixer section and move it vertically to move all mixer sections.

Menus

- Tap outside of the menu to close it.

Touch hardware and Windows versions

A tablet or a convertible notebook (which lets you flip the lid, so the screen is outside when the lid is closed) would be a nice computer to use. Another interesting option would be a touchscreen mounted on a stand, connected to your computer. It's best to have the screen sloped towards you.

The best touch experience is provided by Windows 8 or newer, combined with a multi-touch screen. Multi-touch means you can use multiple fingers simultaneously. The onscreen MIDI keyboard benefits from this, and it allows for two-finger zooming.

MultitrackStudio can be used with single-touch touchscreens or older Windows versions. Note that older monitors based on resistive technology require a significant amount of pressure applied by your finger. Such a monitor is not recommended because it makes it very hard to drag your finger over the screen, so controlling faders, knobs and editors etc. is very difficult.

Features not available in touchscreen mode

Some features are not available in touchscreen mode. Most notably:

- Labels aren't available.
- Collapsing mixer sections isn't possible. The buttons would get in the way and the collapsed sections would be too small.
- The editor's warp feature currently can't be used with touch.

15.2 Pen

MultitrackStudio can be controlled using a pen (stylus) instead of a mouse. It basically works just like a mouse, but there are some convenient extras:

- You can scroll mixer sections vertically by grabbing a mixer section and moving the pen. Do not place the pen on a control (a knob, a button etc.). Using the level meter is OK.
- Pianoroll and Score editors can be scrolled vertically using the lefthand part of the editor.
- Editors can be scrolled horizontally using the main window's bottom bar.
- You can pull a track's Edit button horizontally to pop up its rightclick menu.
- You can pull a mixer section's collapse button (in the top right corner) horizontally to pop up its rightclick menu.
- You can pull down a marker to pop up a menu with rename options etc.
- You can press an effect/instrument slot for a second to pop up the effect/instrument selector.
- There are onscreen keyboards for typing text (see the "Keyboards for Pen" button in the Preferences window).

Important note for Windows 10/11 users

Windows 10 build 1709 (fall 2017) changed the way the pen works by default: moving the pen now causes the window to scroll rather than move notes etc.

You need to change a setting in Windows to change this behavior:

- Windows 10: Go to the 'Pen & Windows Ink' setting and check the "Let me use my pen as a mouse in some desktop apps" option.
- Windows 11: Go to the 'Pen & Windows Ink' setting and check the "Let me use my pen as a mouse when it's available" option.

15.3 Microsoft Surface

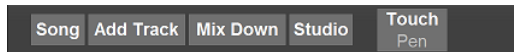
Note: this feature requires Windows 8.1 or newer

The Microsoft Surface Pro 3 not only comes with multitouch, but with an active pen too. MultitrackStudio has a 'Pen with touch scrolling' mode to make the most out of these features. This mode should work with devices other than the Surface Pro 3 as well, provided it has both multitouch and an active pen.

The 'Pen with touch scrolling' mode works with pen almost exclusively. You can use touch to scroll and zoom editors, to scroll the mixer sections vertically, to scroll lists and to play the onscreen MIDI keyboard. All other touch actions are ignored, so you can't tap something accidentally with the hand palm.

'Pen with touch scrolling' mode is great for MIDI editing because the pen is far more accurate than the touch screen. You can edit rapidly using the pen and navigate easily using touch.

A button is available in the main window for switching between pen and touch mode quickly. This button appears next to the Studio button. It's present when the 'Input Device' setting (see Preferences) is set to either Touchscreen or 'Pen with touch scrolling'.



Touch / Pen button

In 'Pen with touch scrolling' mode the pen works slightly different (compared to the regular pen behavior), so it nicely matches the touchscreen mode. Most notably, resizing notes in the piano roll editor works similar to the touchscreen behavior.

The following Preferences settings are recommended for the Surface Pro 3:

- Size: 240%
- Input Device: Touchscreen or 'Pen with touch scrolling'
- Keyboard for Pen: enabled
- Color Theme: Ultra Dark

These settings are used automatically if MultitrackStudio is installed on a Surface Pro 3 provided no settings from an older version are present.

Tip: you can disable the Surface's Windows Button (in the bezel) using the Surface app in order to avoid pressing it accidentally.

16 Keyboard Shortcuts

16.1 Keyboard Shortcuts (Windows)

Transport

These shortcuts work in the main window, effect/instrument windows and editor windows:

- **Home:** Go to start of song.
- **End:** Go to end of song.
- **Space Bar:** Toggle transport start/stop. The 'media start/pause' key works too.
- **Shift+Space Bar:** Start at last start position (if transport stopped), Stop and move to start position (if transport running).
- **Left/Right Arrow:** Rewind/Fast Forward.
Several modifier keys can be used combined with the left/right arrow keys:
 - **Alt:** Walk through history of recent start positions (and the last stop position if transport is stopped). These positions are also available from the Transport menu.
 - **R:** To last recording start/end.
 - **M:** To previous/next Marker.
 - **L:** To loop start/end point.
 - **B:** To previous/next bar.
 - **Shift-B:** To previous/next beat.
 - **S:** One second backward/forward.
 - **I:** One minute backward/forward.
 - **Q:** One quarter hour backward/forward.
 - **H:** One hour backward/forward.
 - **Ctrl:** Move one pixel in the editors. The actual amount of time depends on the zoom level.
- **Page Up/Down:** Move one editor page. The actual amount of time depends on the zoom level and the window width.
- **Ctrl+L:** Toggle Loop button.
- **F6:** Loop selected part of focused track.
- **F7:** Set looping region start point.
- **F8:** Set looping region end point.
- **L+Space Bar:** Engage the Loop button and start transport.
- **Ctrl+-:** Zoom Out.
- **Ctrl++:** Zoom In.
- **Ctrl+Shift+R:** Toggle Automation Recording button.
- **Ctrl+Shift+T:** Toggle Automation Touch Mode button.

These work in the main window only:

- **Ctrl+M:** Add Marker.
- **Ctrl+Alt+V:** Show/Hide VariSpeed control (*Pro edition only*).

Main Window

- **Up/Down Arrow:** Scroll mixer sections up/down. Add Ctrl key to scroll one page. In Multi Column Rack mode (see Preferences) these keys scroll one section's width left or right.
- **Tab / Shift+Tab:** Focus next/previous section. Add Ctrl key to focus last / first section.
- **Ctrl+S:** Save song.
- **Ctrl+N:** Show Comments window.
- **Ctrl+I:** Show Windows audio recording settings.
- **Ctrl+J:** Toggle Soft Monitoring.
- **Ctrl+P:** Toggle Punch In/Out recording.
- **Ctrl+Q:** Toggle Sound On Sound recording.
- **Ctrl+T:** Add empty track.
- **Ctrl+Alt+A:** Add Audio Track.
- **Ctrl+Alt+M:** Add MIDI Track.
- **Ctrl+Alt+I:** Import audio/MIDI file.
- **Alt+T:** Alternate Take, add Shift to avoid rewinding.

- **Ctrl+Alt+T**: Alternate Take (in new tracks), add Shift to avoid rewinding.
 - **Ctrl+R**: Show Delay Before Recording window.
 - **Ctrl+K**: Show Keyboard Mapper window.

 - **Insert**: Toggle Ripple button.
 - **Ctrl+G**: Toggle Snap button.
 - **Ctrl+B**: Toggle Bars button.
 - **Ctrl+F**: Toggle Follow button.
 - **Ctrl+E**: Show Tempo / Time Signature Editor.
 - **Ctrl+Alt+E**: Show Song Editor.
 - **Ctrl+U**: Show Multi MIDI Editor with all MIDI tracks.
 - **Ctrl+Alt+U**: Show Multi MIDI Editor with MIDI tracks that have same color as focused track.
 - **Ctrl+H**: Show Chords Editor.
 - **Ctrl+Alt+H**: Show Lyrics Editor.

 - **Ctrl+O**: Show Audio Output Control.
 - **Ctrl+D**: Show Devices window.
 - **F11**: Enter / leave full screen mode.
 - **F1**: Show help on the item the mouse points to.

 - **E+Up Arrow**: Close all editors. Collapses all mixer sections if all editors are closed already.
 - **E+Down Arrow**: Expand all mixer sections. Opens editor of focused track if all mixer sections are expanded already.
 - **E+Left Arrow**: Temporarily switch off the "Align Editors with Editor Preview panes" option, this expands the editors to the left.
 - **E+Right Arrow**: Temporarily switch on the "Align Editors with Editor Preview panes" option, this shrinks the editors to the right.
- The E+Left Arrow and E+Right Arrow options don't change the setting in the Preferences window.

Editors

Most editors can be operated using the standard Windows keyboard shortcuts. A track editor can only be controlled using keyboard shortcuts if the track has focus.

The following shortcuts are supported:

- **Alt+Enter**: Edit
- **Ctrl+Z**: Undo
- **Ctrl+Y**: Redo (Ctrl+Shift+Z also works)
- **Ctrl+X**: Cut
- **Ctrl+C**: Copy
- **Ctrl+V**: Paste
- **Delete**: Delete
- **Ctrl+A**: Select All
- **Ctrl+Shift+I**: Make punch-in point equal to transport position
- **Ctrl+Shift+O**: Make punch-out point equal to transport position
- **Shift+Left/Right Arrow**: Shift editors left/right while keeping transport position
- **Alt**: Temporarily switch between Select Notes/Dots and Add mode

The Multi MIDI Editor also features:

- **Up/Down Arrow**: scroll up/down. Add Ctrl key to scroll all the way up/down.
- **Tab / Shift+Tab**: make next/previous track active.
- **Alt+M**: Move selected notes to active track.

Chords/Lyrics editors:

- **Tab / Shift+Tab**: to next/previous bar.
- **Ctrl+-**: Zoom Out.
- **Ctrl++**: Zoom In.

Add Audio Track window

- **Ctrl+M**: Mono
- **Ctrl+S**: Stereo
- **Ctrl+N**: Show # of tracks box (*Pro edition only*).

Effect/Instrument selectors

- **F5**: Rescan CLAP / VST plugins.

Effect/Instrument windows

- **F3** or **Ctrl+F**: Show effect/instrument selector
- **F5**: Reset Level History (Compressor, Dynamics, Noisegate), Reset spectrum averaging (EQ), Reload plugin (CLAP / VST plugin window).
- **S+Left Arrow**: Close this window and open the first slot on the left that isn't empty.
- **S+Right Arrow**: Close this window and open the first slot on the right that isn't empty.
- **Ctrl+M**: Reset custom remote control knob mappings

MultitrackStudio Instruments window

- **Up/Down Arrow**: Step through available instruments.

External MIDI Instrument window

- **Up/Down Arrow**: Step through available patches.

Alt shortcuts

Most windows, including the main window, feature shortcuts using the Alt key. If you press the Alt key the shortcut characters will appear underlined. The shortcuts will hide again when the Alt key is released. The shortcut key should be pressed before the Alt key is released.

In the main window, only the mixer section which has focus can be controlled using Alt shortcuts. A dot appears on the left hand side of the mixer section indicating it is focused. Tab and Shift+Tab can be used to move focus. Clicking a section (including any of its controls) will focus that section as well. The Preference and EQ windows have a similar focus mechanism.



Focus indicator (left) and Pan knob after pressing Alt+P (right).

Volume faders and rotary knobs can be edited using Alt shortcuts as well. An edit field appears in which a new value can be typed. Pressing Enter accepts the new value, Esc discards it. Instead of typing a value you can use the up/down arrow keys to move the control.

Note: the left Alt key should be used on some international keyboards.

Mouse modifier keys

Mouse modifier keys change the effect of a mouse click if you keep the key down while clicking.

Standard modifier keys

- **Ctrl** (while selecting): Select item without deselecting existing items (MIDI editor notes, track Solo buttons)
- **Ctrl** (while dragging): Copy item instead of move it (editors and effect slots)

Transport

- **Alt** (on Overview Bar thumb): drag to select looping region and start transport
- **Shift** (on Start button): Start at last start position
- **S** (on Start button): Re-Arm (engage the Rec buttons of the last recorded tracks)
- **T** (on counter): Show text edit box to type new value

Rotary Knobs

- **A**: Show automation editor
- **T**: Show text edit box to type new value
- **C**: Move to center position

Faders

- **A**: Show automation editor
- **T**: Show text edit box to type new value

Effect Slots

- **B**: Toggle effect's Bypass button
- **A**: Open all slots in the same group of slots (eg. all slots in a track, or in a Multi Effect etc.)

Track buttons

The Play, Rec, Mute, Edit and collapse buttons of all tracks will be toggled if you keep the 'A' (or Ctrl) key down while clicking a button.

You can use the 'C' (or Alt) key to toggle same-color tracks only. This also works with the Solo buttons.

'A' and 'C' can also be used on Editor Preview panes, and on collapsed tracks.

Note: you can use Click..Shift+Click to toggle any range (click a button on the first track, and then shift-click the same button on the last track).

Editor Time Bars

- **Alt**: drag to select looping region and start transport

Audio/MIDI editors

- **Alt** (on edges selected part): Stretch selected part
- **Alt** (in selected part): Warp selected part

Pianoroll, Score and Drum editor notes

- **V**: Velocity of note
- **D**: Duration of note
- **S**: Sharpen note (one semitone up)
- **F**: Flatten note (one semitone down)
- **Q**: Quantize note (move it to the current grid)
- **L**: Legato (extend duration to next note)
- **R**: Remove (delete) note
- **T**: Transpose note one octave up or down

- **X**: eXpand to chord (eg. click a C and select major: an E and a G will be added)
- **1**: make it a whole note
- **2**: make it a half note
- **3**: make it a quarter note
- **4**: make it an 8th note
- **5**: make it a 16th note
- **6**: make it a 32nd note
- **A**: add/remove dot (score only)
- **Shift**: ignore the Snap button, so you can add/move notes anywhere
- **M**: move to active color (Multi MIDI Editor pianoroll)

The V, D, T and X mouse modifiers pop up a small selector, which will disappear when you release the mouse button. You can select an item by moving the mouse while the mouse button is still down.

The Drum Editor doesn't support mouse modifiers which don't make sense for percussion instruments (like Duration, Sharpen, Expand to chord etc.).

The **1..6** and **A** modifiers can also be used on the score editor's note duration box.

Mouse wheel

The mouse wheel or touchpad can be used in various places:

- Move mixer sections vertically.
- Move faders and rotary knobs (in main window use horizontal movements or add the Shift key).
- Scroll lists.
- Scroll MIDI editors vertically.

Combined with Shift key:

- Zoom editors horizontally.

Combined with Ctrl key:

- While mouse is over left hand side of editor: zoom editor vertically.
- Zoom Lyrics Prompter.

16.2 Keyboard Shortcuts (Mac)

Transport

These shortcuts work in the main window, effect/instrument windows and editor windows:

- **Home** or **Option-Left Arrow**: Go to start of song.
- **End** or **Option-Right Arrow**: Go to end of song.
- **Space Bar**: Toggle transport start/stop.
- **Shift-Space Bar**: Start at last start position (if transport stopped), Stop and move to start position (if transport running).
- **Left/Right Arrow**: Rewind/Fast Forward.

Several modifier keys can be used combined with the left/right arrow keys:

- **Command**: Walk through history of recent start positions (and the last stop position if transport is stopped). These positions are also available from the Transport menu.
- **R**: To last recording start/end.
- **M**: To previous/next Marker.
- **L**: To loop start/end point.
- **B**: To previous/next bar.
- **Shift-B**: To previous/next beat.
- **S**: One second backward/forward.
- **I**: One minute backward/forward.
- **Q**: One quarter hour backward/forward.
- **H**: One hour backward/forward.
- **Ctrl**: Move one pixel in the editors. The actual amount of time depends on the zoom level.

- **Page Up/Down:** Move one editor page. The actual amount of time depends on the zoom level and the window width.
- **Command-L:** Toggle Loop button.
- **F6:** Loop selected part of focused track.
- **F7:** Set looping region start point.
- **F8:** Set looping region end point.
- **L+Space Bar:** Engage the Loop button and start transport.
- **Command--:** Zoom Out.
- **Command-+:** Zoom In.
- **Shift-Command-R:** Toggle Automation Recording button.
- **Shift-Command-T:** Toggle Automation Touch Mode button.

These work in the main window only:

- **Option-M:** Add Marker.
- **Option-Command-V:** Show/Hide VariSpeed control (*Pro edition only*).

Main Window

- **Command-S:** Save song.
- **Command-I:** Show System Preferences audio settings.
- **Command-J:** Toggle Soft Monitoring.
- **Command-P:** Toggle Punch In/Out recording.
- **Option-Command-P:** Toggle Sound On Sound recording.
- **Command-T:** Add empty track.
- **Option-Command-A:** Add Audio Track.
- **Option-Command-M:** Add MIDI Track.
- **Option-Command-I:** Import audio/MIDI file.
- **Option-T:** Alternate Take, add Shift to avoid rewinding.
- **Option-Command-T:** Alternate Take (in new tracks), add Shift to avoid rewinding.
- **Command-Y:** Show Delay Before Recording window.
- **Command-K:** Show Keyboard Mapper window.
- **Command-R:** Toggle Ripple button.
- **Command-G:** Toggle Snap button.
- **Command-B:** Toggle Bars button.
- **Command-F:** Toggle Follow button.
- **Command-E:** Show Tempo / Time Signature Editor.
- **Option-Command-E:** Show Song Editor.
- **Command-U:** Show Multi MIDI Editor with all MIDI tracks.
- **Option-Command-U:** Show Multi MIDI Editor with MIDI tracks that have same color as focused track.
- **Option-Command-C:** Show Chords Editor.
- **Option-Command-L:** Show Lyrics Editor.
- **Command-O:** Show Audio Output Control.
- **Command-D:** Show Devices window.
- **Ctrl-Command-F:** Enter / exit full screen mode.
- **Command-,:** Show Preferences window.
- **Shift-Command-?:** Open Help menu, including an item that shows help on the control under the mouse pointer in the active window.
- **Command-M:** Minimize window.
- **Up/Down Arrow:** Scroll mixer sections up/down. Add Command key to scroll one page. In Multi Column Rack mode (see Preferences) these keys scroll one section's width left or right.
- **Ctrl-A:** Open Add Track menu.
- **Ctrl-B:** Edit BPM box.
- **Ctrl-E:** Open Edit menu.
- **Ctrl-I:** Edit Time Sig box.
- **Ctrl-L:** Open Songlist menu (if songlist bar is visible).
- **Ctrl-N:** Open transport position menu.
- **Ctrl-Q:** Open Tempo menu.
- **Ctrl-R:** Open Recording menu.

- **Ctrl-S**: Open Song menu.
- **Ctrl-U**: Open Studio menu.
- **Ctrl-W**: Edit transport position box.
- **Ctrl-X**: Open Mix Down menu.
- **Ctrl-Z**: Open editor zoom factor selector.

The mixer section which has focus responds to keyboard shortcuts. A dot appears on the left hand side of the mixer section indicating it is focused. Tab and Shift-Tab can be used to move focus. Clicking a section (including any of its controls) will focus that section as well.



Focus indicator (left) and Pan knob after pressing Ctrl-P (right).

There are keyboard shortcuts for Volume faders and rotary knobs as well. An edit field appears in which a new value can be typed. Pressing Enter accepts the new value, Esc discards it. Instead of typing a value you can use the up/down arrow keys to move the control. Note that you'll have to press Esc to accept this value, since Enter accepts the edit field's value.

- **Tab/Shift-Tab**: Focus next/previous section. Add Ctrl key to focus last / first section.
- **Ctrl-C**: Toggle Rec button focused track.
- **Ctrl-D**: Open editor focused track.
- **Ctrl-F**: Open file menu focused track.
- **Ctrl-M**: Toggle Mute button focused section.
- **Ctrl-O**: Toggle Solo button focused section (Mono on Master section).
- **Ctrl-P**: Edit pan knob focused track.
- **Ctrl-Y**: Toggle Play button focused track.
- **Ctrl-V**: Edit volume slider focused track.
- **Ctrl-1**: Edit effect send 1 knob focused track (2= second effect send etc.).
- **Ctrl-F1**: Open first slot (effect/instrument) focused section.
- **Ctrl-F2**: Open second slot focused section.
- **Ctrl-F3**: Open third slot focused section.

Note: macOS may override the Ctrl-function key shortcuts.

- **E-Up Arrow**: Close all editors. Collapses all mixer sections if all editors are closed already.
 - **E-Down Arrow**: Expand all mixer sections. Opens editor of focused track if all mixer sections are expanded already.
 - **E-Left Arrow**: Temporarily switch off the "Align Editors with Editor Preview panes" option, this expands the editors to the left.
 - **E-Right Arrow**: Temporarily switch on the "Align Editors with Editor Preview panes" option, this shrinks the editors to the right.
- The E-Left Arrow and E-Right Arrow options don't change the setting in the Preferences window.

Editors

Most editors can be operated using the standard macOS keyboard shortcuts. A track editor can only be controlled using keyboard shortcuts if the track has focus.

The following shortcuts are supported:

- **Command-/**: Edit
- **Command-Z**: Undo
- **Shift-Command-Z**: Redo
- **Command-X**: Cut
- **Command-C**: Copy
- **Command-V**: Paste
- **Delete**: Delete
- **Command-A**: Select All
- **Shift-Command-I**: Make punch-in point equal to transport position
- **Shift-Command-O**: Make punch-out point equal to transport position
- **Shift-Left/Right Arrow**: Shift editors left/right while keeping transport position
- **Option**: Temporarily switch between Select Notes/Dots and Add mode

The Multi MIDI Editor also features:

- **Up/Down Arrow:** scroll up/down. Add Command key to scroll all the way up/down.
- **Tab / Shift-Tab:** make next/previous track active.
- **Option-M:** Move selected notes to active track.

Chords/Lyrics editors:

- **Tab / Shift-Tab:** to next/previous bar.
- **Command--:** Zoom Out.
- **Command-+:** Zoom In.

Add Audio Track window

- **Command-M:** Mono
- **Command-S:** Stereo
- **Command-N:** Show # of tracks box (*Pro edition only*).
- **Ctrl-T:** Open Type selector.
- **Ctrl-C:** Open Channels selector.
- **Ctrl-Q:** Open Quality selector.

Effect/Instrument selectors

- **Command-R:** Rescan CLAP / VST plugins.

Effect/Instrument windows

- **Command-F:** Show effect/instrument selector
- **Command-R:** Reset Level History (Compressor, Dynamics, Noisegate), Reset spectrum averaging (EQ), Reload plugin (AU / CLAP / VST plugin window).
- **Command-M:** Reset custom remote control knob mappings
- **S+Left Arrow:** Close this window and open the first slot on the left that isn't empty.
- **S+Right Arrow:** Close this window and open the first slot on the right that isn't empty.
- **Ctrl-B:** Toggle effect Bypass button.
- **Ctrl-C:** Edit instrument Channel box.
- **Ctrl-M:** Toggle sidechain effect Monitor button.
- **Ctrl-P:** Open Presets menu.
- **Ctrl-F1:** Open sidechain effect sidechain source menu.

MultitrackStudio Instruments window

- **Up/Down Arrow:** Step through available instruments.

SoundFont Player window

- **Up/Down Arrow:** Step through presets provided by current soundfont.

External MIDI Instrument window

- **Up/Down Arrow:** Step through available patches.

Mouse modifier keys

Mouse modifier keys change the effect of a mouse click if you keep the key down while clicking.

Standard modifier keys

- **Command** (while selecting): Select item without deselecting existing items (MIDI editor notes, track Solo buttons)
- **Option** (while dragging): Copy item instead of move it (editors and effect slots)

Transport

- **Option** (on Overview Bar thumb): drag to select looping region and start transport
- **Shift** (on Start button): Start at last start position
- **S** (on Start button): Re-Arm (engage the Rec buttons of the last recorded tracks)
- **T** (on counter): Show text edit box to type new value

Rotary Knobs

- **A**: Show automation editor
- **T**: Show text edit box to type new value
- **C**: Move to center position

Faders

- **A**: Show automation editor
- **T**: Show text edit box to type new value

Effect Slots

- **B**: Toggle effect's Bypass button
- **A**: Open all slots in the same group of slots (eg. all slots in a track, or in a Multi Effect etc.)

Track buttons

The Play, Rec, Mute, Edit and collapse buttons of all tracks will be toggled if you keep the 'A' (or Command) key down while clicking a button.

You can use the 'C' (or Option) key to toggle same-color tracks only. This also works with the Solo buttons.

'A' and 'C' can also be used on Editor Preview panes, and on collapsed tracks.

Note: you can use Click..Shift-Click to toggle any range (click a button on the first track, and then shift-click the same button on the last track).

Editor Time Bars

- **Option**: drag to select looping region and start transport

Audio/MIDI editors

- **Command** (on edges selected part): Stretch selected part
- **Command** (in selected part): Warp selected part

Pianoroll, Score and Drum editor notes

- **V**: Velocity of note

- **D**: Duration of note
- **S**: Sharpen note (one semitone up)
- **F**: Flatten note (one semitone down)
- **Q**: Quantize note (move it to the current grid)
- **L**: Legato (extend duration to next note)
- **R**: Remove (delete) note
- **T**: Transpose note one octave up or down
- **X**: eXpand to chord (eg. click a C and select major: an E and a G will be added)
- **1**: make it a whole note
- **2**: make it a half note
- **3**: make it a quarter note
- **4**: make it an 8th note
- **5**: make it a 16th note
- **6**: make it a 32nd note
- **A**: add/remove dot (score only)
- **Shift**: ignore the Snap button, so you can add/move notes anywhere
- **M**: move to active color (Multi MIDI Editor pianoroll)

The V, D, T and X mouse modifiers pop up a small selector, which will disappear when you release the mouse button. You can select an item by moving the mouse while the mouse button is still down.

The Drum Editor doesn't support mouse modifiers which don't make sense for percussion instruments (like Duration, Sharpen, Expand to chord etc.).

The **1..6** and **A** modifiers can also be used on the score editor's note duration box.

Trackpad gestures

Trackpad gestures can be used in various places.

Two finger swipe:

- Move mixer sections vertically.
- Move faders and rotary knobs (only horizontal movements work in main window).
- Scroll lists.
- Scroll editors horizontally.
- Scroll MIDI editors vertically.

Pinch:

- Zoom editors horizontally.
- While pointer is over left hand side of editor: zoom editor vertically.

Mouse wheel

The mouse wheel can be used in various places:

- Move mixer sections vertically.
- Move faders and rotary knobs (in main window use horizontal movements or add the Shift key).
- Scroll lists.
- Scroll MIDI editors vertically.

Combined with Command key:

- Zoom editors horizontally.
- While mouse is over left hand side of editor: zoom editor vertically.
- Zoom Lyrics Prompter.

17 Preferences

The Preferences window contains some general settings:

User Interface:

- **Color Theme:** Choose a color theme. The Classic themes (*Windows only*) make the program look like pre-version 5 MultitrackStudio.
- **Layout:** 3 predefined layouts are available:
 1. **Desktop:** Transport control in the middle, editors aligned with editor preview panes.
 2. **Laptop:** Full width editors.
 3. **Classic:** Looks like older MultitrackStudio versions (meters on the right, no editor preview panes).The 4th option ('Custom') lets you choose your own preferences:
 - **Transport at center:** Place the transport control in the middle, this makes them easier to reach on a large screen.
 - **Meters Left:** Place the level meters between the Rec button and the Volume fader.
 - **Large Meters:** Use larger level meters.
 - **Editor Preview panes:** Tracks can have an Editor Preview pane that displays a compact view of the data in the track editor. Editor Preview panes appear only if there's enough room.
 - **Align Editor with Editor Preview panes:** An open track editor will replace the Editor Preview pane.
 - **Editor Preview panes replace Edit buttons:** If enabled the editor preview pane can be clicked to open/close the track editor. If "Align Editor with Editor Preview panes" is enabled the editor can be closed using the cross in the editor's top-left corner.
 - **Multi Column Rack:** this option arranges the mixer sections using multiple columns instead of just one. If the sections don't fit the screen a horizontal scrollbar appears. Can be used for dual-monitor setups.
- **Size:** If you have problems reading or operating the user interface you can make it larger. The Auto option uses the Windows DPI setting on Windows. A suitable value is used on Mac. Size setting changes have no effect until you've restarted MultitrackStudio.

The "Plugin Scaling (blurry)" option makes the program not dpi aware, so Windows scales it automatically. This looks blurry, but it does scale plugins too. Only use this if the Plugin Manager's scaling option doesn't work right with your plugins. Plugin scaling depends on the Windows DPI setting exclusively, while MultitrackStudio scaling values can be chosen from the Size box. Sizes which are smaller than the Windows DPI setting can't be used if "Plugin Scaling (blurry)" is checked.
- **Effect Slots:** Mixer sections can have 3, 4, 5 or 6 effect slots. If a song is opened in a MultitrackStudio version that has fewer slots the extra effects will appear in a Multi Effect.
- **Name Width:** Changes the width the track name boxes.
- **CPU Usage / Disk Usage:** Show the CPU/disk usage on the bottom bar.
- **Input Device (*Windows only*):** Choose Touchscreen if you're using a touchscreen, choose "Mouse, Keyboard" otherwise. If the computer has a pen there's also a 'Pen with touch scrolling' option.
- **Show tooltips:** Turn on/off the tooltips that appear on moving the mouse over a control. Note that many tooltips provide helpful information which you won't be able to see if you turn them off.
- **Keyboards for Pen:** Show onscreen keyboard on tapping a text box with a pen.
- **Knob Style:** Using the Rotary style you can "grab the dot" and move it. Use the Vertical/Horizontal style if you'd rather use horizontal or vertical mouse movements instead.

If Input Device is set to Touchscreen (*Windows only*) the Knob Style selector offers Horizontal/Rotating and Vertical styles. Using the Horizontal/Rotating you can either move your finger horizontally, or you can draw a circle below the knob. Using the Vertical style knobs can be controlled using vertical movements exclusively. Note that the Vertical style doesn't allow for scrolling mixer sections vertically while touching a pan or effect send knob.

Transport:

- **Stop playback at end of song:** Stop transport when it reaches the end of the Overview Bar, ie. at the end of the longest track or at the last marker, whichever comes last. Reverb tails etc. are played back correctly, so it may play past the end of the overview bar and then jump back. Transport doesn't stop if there are any recording tracks.
- **Rewind on stop:** When transport stops, rewind to position where it started.
- **Mute click track during playback:** Engage the click track's Mute button when playback starts, and unmute again when transport stops. Use this to only hear the click track during recording.
- **Switch counter to bars automatically:** switch the transport count and overview bar to bars if there's at least one MIDI track in the song.

Editors:

- **Scrubber on track editors:** The track editor scrubbing feature can be turned on/off. Also affects MIDI note lassoing.
- **Show all buttons (no "More"):** Hide the More button that appears on some editors and show buttons for all the options.
- **"Wave" tab (MIDI editors):** Adds a "Wave" tab to the Piano/Score/Drum tabs. The Wave editor shows the MIDI data as if it were an audio signal.
- **Switch grid to bars automatically:** switch the time grid to bars if there's at least one MIDI track in the song.
- **Default MIDI Editor:** Here you can choose the type of MIDI editor that appears by default.
- **Default Mode (MIDI):** Determines which of the three buttons in the bottom left corner of the MIDI editors is 'on' by default. It defaults to Select Part, which works similar to audio editors and is suitable if you do a lot of MIDI recording. You might want to switch to Select Notes or Add Notes if you enter notes using the mouse a lot.
- **Touch selector delay (Windows only):** Determines how long it takes for the touch selector to appear when you touch an editor. A shorter delay allows for quicker editing, but if it's too short the selector will pop up inadvertently if you intend to move or zoom the editor content. Affects touchscreen only.
- **Left-handed touch handles (Windows only):** Place the handles that are used for moving notes etc. on the left hand side. You might prefer this if you're left-handed. Affects touchscreen only.

General:

- **Save 'everything' in song:** by default, songs remember only the things required to play it back. With this option they can remember almost everything you see on the screen (open editors, the buttons at the top of the main window, loop points, transport position etc.). There will obviously virtually always be a 'save?' prompt when unloading a song. Undo histories aren't saved. Versions and templates don't contain 'everything'.
- **Middle C Name:** Determines the name of MIDI note 60. Can be C3, C4 or C5 (C5 is the default value).
- **Default Instrument:** Determines the MIDI instrument that appears in a new track. Options are "MultitrackStudio Instruments" and "External MIDI Instrument 1".
- **MIDI File Format:** Determines the timing precision used for saving MIDI files. '480 ticks per quarter note' (default) is the most compatible option, but '30 frames per sec./200 ticks per frame' offers the highest resolution. The latter is not as widely supported, music notation software typically won't open this type of files.
- **Presets: Export:** Save all presets and templates to a zip file.
- **Presets: Import:** Read presets and templates from a zip file.
- **Bring back 'don't show again' messages:** Make all messages appear again.

Folders:

- **Root Folder for New Songs:** A new folder will be created in this folder for each new song. It defaults to "My Documents\MultitrackStudio Songs" (Windows) / "/Users/*username*/Music/MultitrackStudio Songs" (Mac).
- **Sampler patches:** Specifies the folder that contains sampler patches (see organizing your patches)
- **Convolver impulse responses:** Specifies the folder that contains impulse responses. This box is empty by default. You can create a folder for your IR files and select it here.

18 Tools

The following tools are available from the Studio->Tools menu:

- **Sample Rate Converter**
- **Stereo Merger**

Sample Rate Converter

Changes the sample rate of a file. Can be used (for instance) for CD(44.1 kHz)/DAT(48 kHz) conversion. Sample rate can be thought of as being the digital equivalent of the analog tape recorder's tape speed.

The **Noise Shaping** button determines whether or not to apply noise shaping to the dither signal.

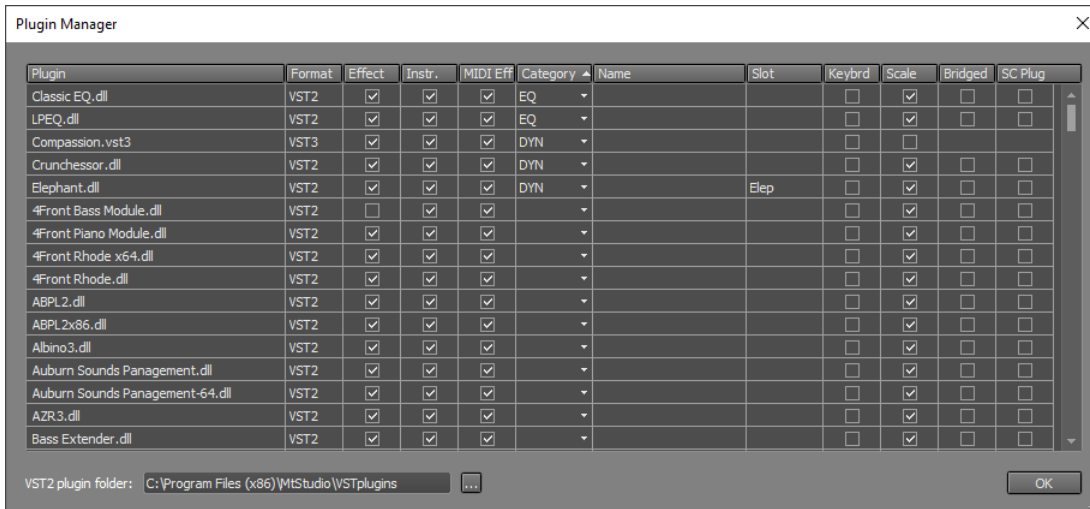
Stereo Merger

The Stereo Merger takes two mono audio files and merges them into one stereo audio file. One file is used for the left channel, the other for the right channel.

19 Miscellaneous

19.1 Plugin Manager

The Plugins section of a selector features a 'hamburger' button on the right. You can click it to pop up the Plugin Manager. Alternatively you can rightclick a plugin in the selector and choose 'Show in Plugin Manager'.



Plugin Manager window

Hide from Effect/Instrument/MIDI Effect selector

MultitrackStudio tries to show plugins in appropriate selectors only, but it needs to err on the safe side. You can hide a plugin from some, or all, selectors manually.

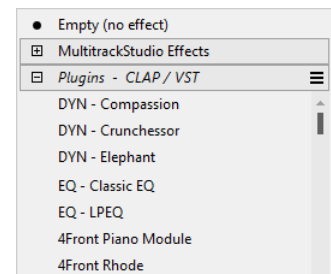
Categories

You can assign category names to plugins. These categories will appear in plugin selectors. A 'My Compressor' plugin with a 'COMP' category name, for example, appears in effect selectors as 'COMP - My Compressor'. Plugins with a category will appear at the top of the list in plugin selectors.

It's best to use very short category names, so the names fit the selectors.

Override name

You can override the names that appear in selectors.



Categories in effect selector

Override slot text

By default the first 4 or 5 characters of the plugin name appear in effect/instrument slots. You can override these texts. You might want to do this if a bunch of plugin names start with the same company name, for example.

Note: slot texts must be very short, typically not more than 4 or 5 characters.

Keyboard Focus

MultitrackStudio tries to prevent plugins from stealing keyboard shortcuts for transport control (see Controlling the Transport). If this causes problems you can check the Keybrd box to disable this feature.

Bridging

Note: bridging is available for Windows only.

VST2 plugins can run 'bridged'. Bridged plugins run in a separate process, so they can't crash MultitrackStudio. See also VST Plugins.

Note: you don't need to check this option in order to use a 32 bits plugin in 64 bits MultitrackStudio or vice versa. This is handled automatically.

Scaling

Note: scaling is available for Windows only.

Many VST plugin don't scale their UI, so they're very small on a 4k monitor. If the Scale box is checked MultitrackStudio will let Windows scale the UI if the following conditions are met:

1. Windows system scale setting is 150% or higher.
2. The plugin doesn't scale the UI itself (in a way MultitrackStudio can detect).
3. The scaled UI will fit the screen.
4. Windows 10 version 1803 (April 2018) or newer.

Note: scaling may not work correctly with some plugins.

The Scale option is on by default for VST2 plugins.

Sidechain input plugins

Some older VST2 plugins use a second plugin to pick up sidechain input. This does not work reliably on multi-core computers. This option adds a "Sidechain Plugin" box, you can load the input plugin here and use the MTS sidechain routing.

Under the hood

The plugin manager settings are stored in a file called "C:\Users\Username\AppData\Roaming\MtStudio\Plugins.txt" (Windows) / "/Library/Application Support/MultitrackStudio/Plugins.txt" (Mac).

VST2 Plugin folder

Windows: Specifies the VST Folder. All VST Plugins you want to use should be located in this folder or one of its subfolders. See also Customizing the VST folder.

Note: the 64-bit version will ask for permission to run "MtStudio.exe" as Administrator. That's to update the registry, so VST plugin installers can find the VST folder.

Mac: VST plugins are typically located in the user or system Library/Audio/Plug-ins/VST folder, so there's no need to specify a folder here. You can specify an additional folder if you have one.

19.2 Patch Editor

The Patch Editor allows you to modify existing Sampler patches or create new patches.



Patch Editor window

A patch consists of one or more samples. A sample is an audio file containing a single note of the instrument the patch is for (a single piano key hit for instance).

Samples

Samples can be triggered by three trigger sources: "Note On", "Note On with Sustain" and "Note Off". Most patches use "Note On" samples only.

The main grid lists the samples and their properties. The highlighted row can be edited. You can highlight a row by clicking it. You can click the button in the bottom left corner to play the highlighted sample.

For every sample the following properties must be defined:

- **Note:** The note of the recorded sample (for instance 'C5')
- **Velocity:** The velocity layer the sample is in. The value is the lower limit.
- **File:** Audio file containing the sample. Can be either mono or stereo.
- **Rate:** The sample rate of the audio file (44100 for example). This parameter can also be used for fine-tuning (example: multiplying the sample rate with 1.0116 increases the perceived pitch by 20 cents).

The following properties are optional:

- **Lowest Note:** The lowest note this sample will be used for. Use this to override the Sampler's default note-assignment rules, or to set the lowest note the patch can produce.
- **Highest Note:** The highest note this sample will be used for. Use this to override the Sampler's default note-assignment rules, or to set the highest note the patch can produce.
- **LoopStart:** The position in samples at which the loop starts.
- **LoopEnd:** The position in samples at which the loop ends. Should always be higher than LoopStart.
- **LoopGain:** The relative volume level of a loop iteration relative to the previous iteration (for instance '0.900'). If loopgain is equal to the sample's level at LoopEnd divided by the level at LoopStart a natural decay results.
- **Release:** The time it takes to reach 60dB attenuation after a note-off event is received. If this value is empty an infinite release time will be used, which means the sample will play until it has reached the end. This is useful for drum patches.
- **Exclusive Group:** Only one note can be active at once per group, so currently playing notes will be stopped if a new one arrives. This can be used to mute a hi-hat when it's closed. Values can be 1..255 (0 = none).
- **Gain:** Gain level, 1.000 is neutral
- **Pan:** Pan position, 50 is center
- **Output:** Send output to output mixer channel 1..8. There's no output mixer if all samples use output 1.

You can add multiple samples having the same note and velocity. They will be used in Round Robin fashion. All samples involved are supposed to have identical Lowest Note and Highest Note values.

Sustain, release and pedal noise samples

"Note On with Sustain" and "Note Off" samples are typically used for large piano patches.

"Note On with Sustain" samples are used instead of "Note On" samples if the Sustain controller is 64 or higher at the time the note is played.

"Note Off" samples are fired when a note ends. The **Match Note-Off Levels** button can be used to automatically match the level of the "Note Off" sample with the current level of the playing note. The sample's Gain property determines the highest allowed level in this situation.

The highest note (G10) samples of the "Note On with Sustain" and "Note Off" type are used for a special purpose. They are triggered by sustain pedal down and up movements respectively. They can be used to play samples of the sound a piano pedal makes.

General Controls

- **Volume:** the level of the patch.
- **Piano Sustain:** Make the sustain pedal behave like it does on a piano, ie. the sustain pedal can still "catch" the sound of keys that have been released if the corresponding strings aren't fully damped yet.

These controls provide the default values for their counterparts in the Sampler itself:

- **Variation:** Subtly change the brightness and volume level of every note. This makes the instrument more natural sounding. It also serves to avoid machine-gun effects when notes are played repetitively.
- **Velocity Curve:** controls the dynamics.
- **Brightness:** controls the relative level of a sample's harmonics.
- **Detune:** control the pitch of the patch.

Tip: When a library is opened in the Sampler the patch with the latest file time stamp will be loaded. So you can open the patch editor and click Save to make the current patch the default one.

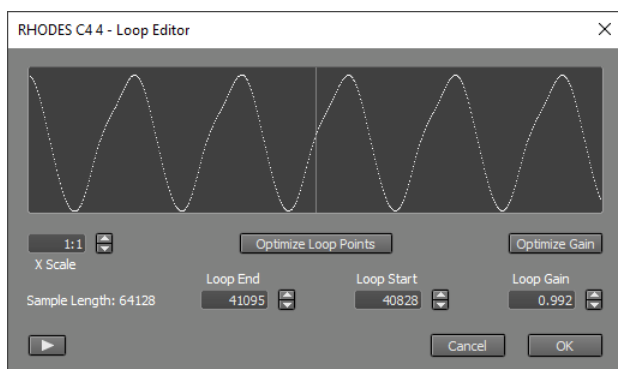
Tools

The Tools menu offers several options:

- **Loop Editor:** invoke the loop editor for the highlighted sample (see below).
- **GM Drum outputs:** map the samples to 6 outputs (kick, snare, hihat, toms, cymbals, other), assuming they're mapped to GM notes.
- **All to output 1:** map all samples to output 1, and hence remove the output mixer.
- **Highlight last played sample:** if you've heard something odd you can use this to find out which sample caused this.
- **Remove sample:** remove the highlighted sample.

Loop Editor

The Loop Editor, available from the Tools menu, can help you set the LoopStart, LoopEnd and LoopGain properties for the highlighted sample.



Loop Editor window

The left hand side of the display shows the part before the LoopEnd point. The right hand side shows the part start at the LoopStart point. In addition the left hand side shows a dimmed version of the part before the LoopStart point, and the right hand side shows a dimmed version of the part starting at the Loop End point. The

loop will sound good if the bright curves cover the dimmed curves. This will make the left and right hand parts connect nicely in the middle of the display.

The **LoopStart**, **LoopEnd** and **LoopGain** boxes contain the values for the corresponding values in the Patch Editor.

The most important feature is the optimize buttons: **Optimize Loop Points** moves LoopEnd to a zero crossing and finds the best LoopStart to go with it. **Optimize Gain** finds the best loop gain.

The button in the bottom-left corner plays the sample, so you can hear how the current settings sound.

19.3 Patchmap Files

MultitrackStudio uses patchmap (*.pmp) files to define the names of patches and drum instruments of hardware synths, so they can be displayed instead of plain bank:program numbers where appropriate.

External MIDI Instrument window Patchmap menus have an Import option to import your patchmap. Alternatively you can drop the file on an External MIDI Instrument window. If you've edited the file you can simply import it again.

Tip: you can search the web for a .ins (instrument definition) file for your synth. It will be converted to .pmp when it's imported.

Under the hood

Windows: User patchmap files are stored in the 'C:\Users\Username\AppData\Roaming\MtStudio\PatchMaps' folder.

Mac: User patchmap files are stored in the user's 'Library/Application Support/MultitrackStudio/PatchMaps' folder.

Patchmap files can be edited using NotePad (Windows) / TextEdit (Mac) . The following examples demonstrate how to create patchmap files for your own hardware synthesizer. The italic texts are comments, these shouldn't be in the actual patchmap files.

Example 1: Banks and Patch Names

This example shows a plain simple patchmap having just two banks.

```
[patchmap]  mandatory identifier
```

```
[bank 0]    This sections holds the first bank. Note it's 0, not 1. Also note the space.  
bank=1280  The MIDI bank it applies to. This number equals 128 * MSB + LSB.  
           MSB and LSB correspond to MIDI controllers #0 and #32 respectively.  
           In this example MSB=10 and LSB=0.
```

```
0=Piano    MIDI program 0 is a piano  
1=Bass     MIDI program 1 is a Bass  
           These values can go up to and including 127
```

```
[bank 1]    This sections holds the second bank. Banks must be numbered sequentially  
bank=1281  MSB=10 and LSB=1  
32=Guitar  MIDI program 32 is a guitar  
33=Violin  MIDI program 33 is a violin
```

Example 2: Drum Instrument Names

Assume our synth has one drum patch. Let's add both the patch and the drum instrument names to the patchmap:

```
[patchmap]
```

```
[bank 0]  
bank=1280
```

0=Piano

[bank 1]

bank=1281

32=Guitar

33=Violin

64=Acoustic Drum Kit *The drum patch is on program number 64*

[drum 0]

bank=0

*The drums are in bank 0. This equals 128 * MSB + LSB, see explanation in [bank 0] section of example 1.*

patch=8

The drums are on MIDI program 8

36=Bass Drum

Note 36 is a bass drum

40=Snare

Note 40 is a snare

Additional drum kit sections must be numbered sequentially ([drum 1], [drum2] etc.)

Example 3: Percussion Channel

Assume it's a GM synth, which has one bank only, and drums on channel 10:

[patchmap]

[bank 0]

bank=-1

-1 means "all banks", we do this because GM doesn't support banks

If you omit the "bank=" statement then it will default to 0 because it's

the [bank 0] section. [bank 1] defaults to 1 etc.

channel=1,2,3,4,5,6,7,8,9,11,12,13,14,15,16 *[bank 0] is not valid for channel 10*

0=Piano

1=Bright Piano

12=Marimba

25=Acoustic Guitar

26=Electric Guitar

[bank 1]

bank=-1

-1 means "all banks", we do this because GM doesn't support banks

[bank 1] is valid for channel 10 only

channel=10

0=Drum Kit

[drum 0]

channel=10

These instrument names are valid for channel 10

36=Bass Drum

40=Snare

Example 4: Patch Categories

Let's add some categories. They will appear in the MIDI Port's patch selector.

[patchmap]

[category]

This is the section which defines the categories

#0=Piano

The first section must be #0. In this case it holds the pianos

#1=Guitar

The second section holds the guitars

Categories must be numbered sequentially

[bank 0]

bank=-1

0=Piano#0

Add #0 to the name, so MultitrackStudio knows it's in category #0

1=Bright Piano#0

12=Marimba

No category specified here, it will end up in the "Other" category

25=Acoustic Guitar#1 *Add #1 to the name, so MultitrackStudio knows it's in category #1*
26=Electric Guitar#1

Example 5: Drum Instrument Categories

Drum Instrument Categories can be defined locally within a drum section:

[patchmap]

[bank 0]
bank=0
0=Piano
1=Bright Piano

[drum 0]
#0=Bass *The first section must be #0. In this case it holds the bass drums*
#1=Snare *The second section holds the snare drums*
35=Acoustic Bass#0 *Add #0 to the name, so MultitrackStudio knows it's in category #0*
36=Bass Drum 1#0
38=Acoustic Snare#1 *Add #1 to the name, so MultitrackStudio knows it's in category #1*
39=Hand Clap *No category specified here, it will end up in the "Other" category*
40=Electric Snare#1

Example 6: Controller Names

Let's override some default controller names with custom ones:

[patchmap]

[bank 0]
bank=0
0=Piano
1=Bright Piano

[controllers]
2=Joystick -Y *New name for controller 2*
83=Dynamic Modulation

NRPNs can be named too:

[patchmap]

[bank 0]
bank=0
0=Piano
1=Bright Piano

[nrpn]
160=Cutoff *New name for nrpn 160 (=128 * MSB + LSB)*
161=Resonance

Example 7: GM compatibility

GM2, GS and XG use bank messages while GM doesn't. You can specify a compatibility mode to ensure the patchmap works regardless of the bank being specified or not. It also affects the handling of GM percussion channel.

[patchmap]
compatibility=XG *Can be GM2, GS or XG*

[bank 0]

```
bank=0
0=Piano
1=Bright Piano
```

Example 8: Supported Controls

The controllers, NRPNs etc. that are supported can be listed. They appear in the controller editor's VIEW menu:

```
[controllers]
supported=pitchbend,7,10,nrpn100,aftertouch,polyaftertouch,sysex
2=Joystick -Y Controller name as per example 6
```

Example 9: Channel Names

Channel names appear in the channel selector dropdown menu:

```
[channels]
10=Percussion
```

Example 10: Patch Switch Time

Some synths need quite some time to load a patch. Let's make sure MultitrackStudio sends the patch change messages in time. Note that it's usually not necessary to add this.

```
[patchmap]
patchswitchtime=750 Schedule patch changes 750 milliseconds earlier
```

```
[bank 0]
bank=0
0=Piano
1=Bright Piano
```

Example 11: Initialization Sysex

A sysex message can be sent before recording or playback starts. This can be used to switch a synth to multi-mode for example.

```
[patchmap]
initsysex=f0123456f7 Hex numbers representing system-exclusive MIDI message
```

```
[bank 0]
bank=0
0=Piano
1=Bright Piano
```

If a sysex needs to be send to each MIDI channel used you can replace a hex digit with "<channel>":

```
[patchmap]
initsysex=f0123<channel>56f7 Hex numbers representing system-exclusive MIDI message
"<channel>" will be replaced with the actual MIDI channel.
```

```
[bank 0]
bank=0
0=Piano
1=Bright Piano
```

19.4 Level Meters

Level meters shows several things:

- The current level.
- Signal peaks are being shown by a single segment for 2 seconds.
- The peak recording level since transport start is shown by a red line (legacy color themes use a dimmed segment instead). Only recording audio tracks have this feature.
- The right-hand segment will start flashing if clipping occurred (ie. if the level exceeded 0 dB). This only happens if this overload actually is a problem:
 - Recording audio tracks
 - Recording MIDI soft instrument tracks
 - Master section
 - Group and Effect Return sections which are routed to the sound device (*Pro edition only*).

You can click a meter to reset it, so it stops flashing.

- A speaker symbol appears to indicate output clipping in soft-monitored audio tracks (the meter itself shows the input level).

The Level Meters are based on DIN PPM meters, where 0db = 0dBFS.

If the audio signal is stereo a meter will display both the left and the right channel, the upper signal being the left channel.

You can rightclick a meter to temporarily change the size. Options are Small, Large and Huge. The latter can be used if you need to watch the meter from a distance (to set up recording levels for example).



Small meter



Large meter



Huge meter

19.5 Dither

MultitrackStudio's internal data format is 32 bit fixed point. Every time truncation to 16 or 24 bit is performed (for instance: when sending the mixer output to the sound device, or when saving files created by the Sample Rate Converter) adequate dithering is applied. Dithering turns distortion (caused by truncation) into random noise. This noise is less objectionable because of its random nature. The dither signal used is called HP-TPD (High Pass Triangular Probability Dither).

Noise Shaping can be used to move the dither noise to frequencies the ear can't hear very well, thereby improving the perceived sound quality even more. However, this type of dither should only be used when you are sure the file will never be processed again, as doing so will increase noise. MultitrackStudio uses third order noise shaping at 44.1/48 kHz, and second order noiseshaping at higher sample rates. Noise Shaping is applied only when truncating to 16 bit, not when truncating to 24 bit.

20 Requirements

MultitrackStudio has been designed to run very efficiently, so computer requirements are fairly modest. Some performance issues are discussed in the following sections. With newer computers the sound device usually is the only thing to worry about.

Operating System

Windows: The 64-bit version works with the 64-bit versions of Windows 11/10/8/7. The 32-bit version of MultitrackStudio can be used on any computer that runs Windows 11/10/8/7, including the 64-bit versions.

Mac: MultitrackStudio works with macOS 14, 13, 12, 11, 10.15/14/13/12 and OS X 10.11. Both Apple Silicon and Intel Macs are supported natively.

Sound Device

At minimum, a 16 bit/44.1kHz/stereo sound device capable of full-duplex operation (ie., simultaneous playback and recording) is needed for audio recording/playback. Virtually any modern device will be capable of this.

CPU

Real time audio processing requires a fast processor. MultitrackStudio is very efficient, so any computer in use today should be fine. You need a faster computer if you want to use higher sample rates like 96 or 192 kHz (Pro edition).

MultitrackStudio takes advantage of multiple core CPUs (up to eight CPUs can be used).

32 bits Windows version: features that use audio pitch shifting are only available if the CPU supports SSE2. SSE2 was introduced in 2000, so virtually every computer in use today supports this.

Memory Usage

MultitrackStudio's memory requirements are very modest, unless you're using very large sampler patches.

Note that some sample based instrument plugins can use lots of memory, if you use a lot of those then having 2 or 3 GB of memory is a good idea.

Disk Speed

If your songs contain about ten audio tracks a fast hard disk (7200 RPM as opposed to the once standard 5400 RPM) is recommended.

Audio Gear

You may need some special wires to connect microphones etc. to your sound device, especially if you have a cheaper sound device which typically use 3.5mm jack plugs, whereas microphones use XLR connectors or 6.3mm jack plugs.

Using an external high-quality mic preamp can significantly improve the sound quality of your recordings. They usually provide Phantom Power as well, so you can use condenser mics.

An analog compressor can reduce the risk of overloading the sound device's input. It also allows you to get more out of a 16 bit sound device's resolution.

Not all stereo sound devices allow you to set different recording levels for left and right channels. This can be quite a problem if you want to record two tracks at the same time (for instance a vocal track and an electric guitar track). You can solve this problem by using two mic preamps (that have a level control). Using a small analog mixer may be a cheaper alternative.

21 Troubleshooting

All other tracks are on the track I recorded. What's wrong?

Your sound device is recording its own audio output. If your sound device comes with some kind of mixer window you can search for the problematic setting there.

My vocals are on the left or right channel only.

Record to mono audio files. Microphones are mono, so recording to a stereo file results in one channel being silent.

Track's Play or Rec Button turns gray when starting Transport.

There is no audio/MIDI device available to play or record this file.

Audio recording doesn't work in Windows 10.

A Windows 10 update introduced some privacy changes that may keep you from recording audio. To fix this go to Start > Settings > Privacy, and make sure the 'allow apps access to your microphone' setting is switched on.

Other programs are silent while MultitrackStudio is running.

MultitrackStudio uses Windows audio devices in 'exclusive mode' in order to provide the lowest latency possible. You can go to the Studio menu's Devices window and switch on 'Shared mode'. This requires Windows 10 or newer.

I can't load my master file in my CD writer program.

Make sure the file is a stereo .wav file. If you're using the Pro edition then also make sure it's a 16 bit file (CDs are always 16 bit).

Can't load MIDI files recorded with MultitrackStudio in another application.

In the Preferences window switch the MIDI File Format to '480 ticks per quarter note', this format is more widely supported than the other one.

There are glitches/short bursts of static in my recordings. or

MIDI device seems to 'pause' periodically. or

Transport stops with 'Buffer over/underrun' message now and then.

Close all other programs.

My audio tracks are out of sync. What can I do?

- Make sure you're using the latest drivers for your sound device
- Try using a sample rate of 48 Khz rather than the default 44.1 kHz (see Song Properties).
- **Windows:** Try using a different audio driver type.
- **Windows:** MultitrackStudio's support for the Early Windows audio driver type includes an 'Apply EMU10k1 44.1 kHz Audio Sync Correction' setting. Soundcards of the Soundblaster Live! type (including 128, 512, 1024 and Ensoniq AudioPCI) use slightly different sample rates for playback and recording when using a sample rate of 44.1 kHz. MultitrackStudio compensates for this effect if the 'Apply EMU10k1 44.1 kHz Audio Sync Correction' button is engaged in the Devices window. Make sure this button is engaged if you have one of the aforementioned soundcards, make sure it isn't if you don't.
- **Mac:** If you're using different devices for audio recording and playback you can create an "aggregate device" using the Audio MIDI Setup application and use that device instead.

My songs play back too fast. What can I do?

- If your sound device's control panel has a sample rate setting, make sure its value is identical to the one used in the MultitrackStudio Song menu's Properties window.
- **Windows:** In the Windows Control Panel, set Sound Scheme to "No Sounds".

I hear another instrument while recording using a soft instrument. or

I don't hear a recording soft instrument.

The track you are recording is using a MIDI channel that is not equal to the one your MIDI keyboard uses.

I want to restore the previous version of a file.

Song, songlist, MIDI, patch and .aem files are backed up every time they are saved to disk. The old versions receive a file extension starting with '~': .hdr, .lml, .mid, .ptc and .aem become .~hdr, .~lml, .~mid, .~ptc and .~aem respectively. The old versions can be made ready for use by renaming them to a file with the correct extension.

I hear glitches when opening windows etc. in Windows.

If you're using an ASIO driver: try turning on MMCSS (see Compensating for driver issues).